Determinants of Food Safety Practices in Food Handlers: A Literature Review

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ABSTRACT

Food safety is an effort to ensure food is safe for consumption, free from physical, chemical, and biological hazards, so that there is no risk of it causing disease if consumed. Creating these conditions is closely related to food safety practices among food handlers. It is necessary to control food safety practices that can be carried out if the determining factors are known in advance. Thus, this study aims to summarize and describe the determinants of food safety practices among food handlers based on previous research articles. This study uses the literature review method to identify research articles that are relevant to the research objectives. The keywords used are “food safety practices” and “food handler” from the PubMed, SAGE, and Wiley databases. Search articles using the PRISMA method. Of the 974 identified articles, 10 met the inclusion criteria and research objectives. The results obtained identified 12 variables related to food safety practices, namely food safety knowledge (7 articles), education level (6 articles), food safety training/courses (5 articles), attitudes towards food safety (4 articles), household income/wealth household (3 articles), work experience (2 articles), sanitation facilities (2 articles), work status (1 article), marital status (1 article), ethnicity (1 article), and registered food seller (1 article). It can be concluded that the dominant determinants of food safety practices among food handlers are knowledge of food safety, level of education, food safety training or courses, attitudes towards food safety, household income or wealth, work experience, and sanitation facilities.

INTRODUCTION

Food safety is a form of effort to ensure food is safe for consumption free from physical, chemical and biological hazards by exercising control throughout the food chain (Selamat & Iqbal, 2016). On the other hand, food is the most basic thing to fulfill every day. Consuming unsafe food will be at risk of causing disease which is often referred to as foodborne disease. It is estimated that the incidence of foodborne disease worldwide reaches 600 million cases each year, more than half of which even lead to death (WHO, 2022).

Creating safe food is closely related to the role of food handlers in selecting food ingredients until the food is served. This is because food handlers have the potential to contribute to contamination of food which causes foodborne disease (Fooladvand et al., 2019). The practice of food handlers in handling food needs to be...
controlled so as not to cause this potential. In order for the control of food safety practices to be effective, the fundamental thing in determining it is to know in advance about the various factors that influence it.

Food safety practices in food handlers have many factors that are interconnected with one another. Where it is known that the factors that determine one's practice include the knowledge and attitude one has towards a value (da Vitória et al., 2021). Differences in practice are also related to a person's socio-demographic condition (Derso et al., 2017). However, until now there has not been a definite point on what factors are consistently related to food safety practices, so further research is needed. Therefore, this study aims to summarize and describe the determinants of food safety practices among food handlers based on previous research articles. State the work's objectives and provide appropriate background information without avoiding a lengthy literature survey or a description of the outcomes.

METHOD
Design search method

This study used a literature review design. Identification of the problem in the article is based on factors related to food safety practices in the food handlers studied. Search articles using the keywords "food safety practices" and "food handler" from several databases, namely PubMed, SAGE, and Wiley. Then the researcher selected articles based on inclusion criteria in the form of articles using English, years of publication from 2013 to 2022, fulltext articles can be accessed at no cost, and examined correlations related to factors related to food safety practices. The exclusion criteria in selecting articles were literature review articles and articles with qualitative research designs.

Search outcome, data abstraction, and data analysis

As shown in Figure 1. Flow of article search, articles in this study were searched using the PRISMA (Preferred Reporting Items for Systematic Review and Meta Analysis) method which has stages in the form of identification, screening, eligibility, and inclusion. Thus, a search for articles examining factors related to food safety practices initially found 974 articles to identify. After the articles were filtered from the title, abstract, to the findings, 18 articles were obtained for collection and review. Then, after a full review of the 18 articles to find articles that showed a relationship between the factors studied and the food safety practices of food handlers, 10 articles were obtained that contained these criteria.

![Figure 1: The article Search Flow Uses the Prism Mode](image-url)
RESULT

Tabel 1: Review of Research Articles Containing Determinants of Food Safety Practices in Food Handlers

<table>
<thead>
<tr>
<th>Author</th>
<th>Subject</th>
<th>Statistic test</th>
<th>Findings of Statistical test results (against Food Safety Practices)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alemayehu et al. (2021)</td>
<td>Food handlers work in food companies</td>
<td>Multiple logistic regression test</td>
<td>There is no significant relationship between education level and marital status with safe food handling practices. There is a significant relationship between work experience (p&lt;0.001; AOR=1.24 CI 95%=1.10-2.81), food safety training (p&lt;0.001; AOR=2.05 CI 95%=1.31-3.19) and knowledge of food safety (p&lt;0.05; AOR=1.68 CI 95%=1.40-3.17) with safe food handling practices.</td>
</tr>
<tr>
<td>Tessema et al. (2014)</td>
<td>Food handlers in food and beverage companies</td>
<td>Multiple logistic regression test</td>
<td>Marital status (p&lt;0.02; AOR=7.52 CI 95%=1.45-38.97), monthly income (p&lt;0.001; AOR=0.395 CI 95%=0.25-0.62), knowledge (p&lt;0.04; AOR=1.69 CI 95%=1.05-2.73), availability of bathroom facilities (p&lt;0.02; AOR=1.89 CI 95%=1.12-3.21) and separate changing rooms (p&lt;0.04; AOR=1.97 CI 95% CI=1.11-3.49) were found to be significantly associated with safe food handling practices in multivariate analysis with p&lt;0.05.</td>
</tr>
<tr>
<td>Tuglo et al. (2021)</td>
<td>Street food handler</td>
<td>Chi-square/fisher’s exact test and multiple logistic regression test</td>
<td>There is no significant relationship between gender (p=0.525), age (p=0.648), marital status (p=0.496), and work experience (p=0.467) with food safety hygiene practices in the analysis using the chi-square test/fisher’s exact. There is a significant relationship between educational status (p=0.001), average monthly income (p=0.001), registered street food seller (p=0.001), and food safety training (p=0.001) and food safety hygiene practices in the analysis using chi-square test/fisher’s exact. The results of multivariate analysis using logistic regression test found that the strongest relationship with food safety hygiene practices started from the factor of registered street food vendors (p&lt;0.001; AOR=7.50 CI 95%=4.27-13.19), food safety training (p=0.001; AOR=5.97 95% CI=3.50-10.18), educational status (p=0.003; AOR=4.06 CI 95%=1.63-10.11), then average income-monthly average (p=0.006; AOR=4.89 CI 95%=1.56-15.34).</td>
</tr>
<tr>
<td>Yemane &amp; Tamene (2022)</td>
<td>Food handlers in the household</td>
<td>Multiple logistic regression test</td>
<td>There is no significant relationship between age, water source, availability of solid waste disposal, availability of liquid waste disposal, type of latrines, kitchen cleanliness, and the presence of insects/pests in the kitchen with food safety practices. There is a significant relationship between education (p&lt;0.01; AOR=3.33 CI 95%=1.41-6.31), food safety training (p&lt;0.001; AOR=2.85 CI 95%=1.31-3.19), wealth status (p&lt;0.001; AOR=2.18 CI 95%=1.21-3.93), knowledge (p&lt;0.05; AOR=1.95 CI 95%=1.23-3.08), attitude (p&lt;0.05; AOR=2.04 CI 95%=1.09-3.82), and handwashing area near the toilet (p&lt;0.001; AOR=2.61 CI 95%=1.86-3.02) with food safety practices.</td>
</tr>
<tr>
<td>Asiedu et al. (2021)</td>
<td>Pregnant mother</td>
<td>Chi-square/fisher’s exact test and multiple logistic regression test</td>
<td>There was no significant relationship between age, religion (p=1.000, gestational age (p=0.885), and number of children (p=0.296) and food safety practices in the analysis using the chi-square/fisher’s exact test. There is a significant relationship between education level (p=0.000), ethnicity (p=0.013), employment status (0.000), and level of knowledge (p=0.002) and food safety practices in the analysis using the chi-square test/fisher’s exact. The results of multivariate analysis using the logistic regression test found that the only significant relationship with food safety practices was employment status (p=0.014; AOR=10.31 CI=0.12-0.79) and education level (p=0.007; AOR=19.80 CI 95%=1.87-51.21).</td>
</tr>
<tr>
<td>Nkkehenyane &amp; Lues, (2020)</td>
<td>Hospital food handlers</td>
<td>Chi-square/fisher’s exact test</td>
<td>There is a significant relationship between attendance at food safety courses (p&lt;0.001) and food safety practices.</td>
</tr>
</tbody>
</table>
Subjects belonging to food handlers are very diverse from any background. The results of a review of 10 research articles included several identified food handlers, 2 articles conducted research on food handlers at food/beverage companies, 2 articles conducted research on snack food handlers, 3 articles conducted research on housewives (including pregnant women), 1 article conducted research on food handlers in hospitals, 1 article conducted research on food handlers at tertiary institutions, and 1 article conducted research on food handlers in restaurants. As for testing the relationship between variables at most using the chi-square/fisher’s exact test on 4 articles with 2 of them followed by multiple logistic regression tests. There are also 3 articles that examine the relationship between direct variables using multiple logistic regression tests. Other test variations, 1 article using the independent t-test/ANOVA test followed by the Pearson correlation test, 1 article using the Kendal test or followed by the linear regression test, and 1 article using the Spearman rank test. A number of determinants of food safety practices in food handlers are then extracted into Table 2 below.

Table 2. Extracts of Determinants of Food Safety Practices of Food Handlers

<table>
<thead>
<tr>
<th>Variabel</th>
<th>No. Artikel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food safety knowledge</td>
<td>[1], [2], [4], [5], [7], [8], [10]</td>
</tr>
<tr>
<td>Level of education</td>
<td>[3], [4], [5], [7], [8], [9]</td>
</tr>
<tr>
<td>Food safety training/courses</td>
<td>[1], [3], [4], [6], [8]</td>
</tr>
<tr>
<td>Attitude towards food safety</td>
<td>[4], [7], [9], [10]</td>
</tr>
<tr>
<td>Household income/wealth</td>
<td>[2], [3], [4]</td>
</tr>
<tr>
<td>Work experience</td>
<td>[1], [7]</td>
</tr>
<tr>
<td>Sanitary facilities (including bathrooms, changing rooms, hand washing)</td>
<td>[2], [4]</td>
</tr>
<tr>
<td>Employment status</td>
<td>[5]</td>
</tr>
<tr>
<td>Marital status</td>
<td>[2]</td>
</tr>
<tr>
<td>Ethnicity</td>
<td>[5]</td>
</tr>
<tr>
<td>Registered food seller</td>
<td>[3]</td>
</tr>
</tbody>
</table>

Based on Table 2, the total determinants of identified food safety practices are 11 variables. The dominant variables studied and related to food safety practices are food safety knowledge (7 articles), education level (6 articles), food safety training/courses (5 articles), attitudes towards food safety (4 articles), household income/wealth ladder (3 articles), work experience (2 articles) and sanitation facilities (2 articles).
Knowledge and food safety practices

Seven (7) research articles revealed that food safety knowledge is related to food safety practices in food handlers. Tessema et al. (2014) stated that good knowledge is 1.69 times more likely to have good food safety practices than having bad knowledge. Knowledge is also mentioned as a key element in determining food safety practices in food handlers (Alemayehu et al., 2021). This is in accordance with the assumption that the better a person's knowledge will initially affect their attitude and ultimately be reflected in practice (Kwol et al., 2020; Ruby et al., 2019; Soon et al., 2020).

Specific knowledge related to food safety can be obtained from education and training (Yemane & Tamene, 2022). However, formal education generally does not provide specific knowledge related to food safety, so the education referred to here is formal education in the related health sector (Nkhebenyane & Lues, 2020). In addition, other factors such as age, income, and work experience also contribute to an increase in the knowledge of food handlers (Abid et al., 2022).

Level of education and food safety practices

Six (6) research articles reveal that education level has a relationship with food safety practices. Asiedu et al., (2021) stated that education is the factor that most influences food safety practices when compared to other factors such as ethnicity, employment status, and knowledge. Formal education is also known to have a significant effect on the hygiene practices of food handlers, while hygiene practices are an important point in food safety practices (Derso et al., 2017). In addition, formal education can be a direct factor in food safety practices, as well as indirect factors, for example, related to knowledge and attitudes first and then bring up food safety practices (Chen et al., 2018; Dagne et al., 2021).

The educational process consists of information exchange activities, so that someone who attends education will receive information (WHO, 2010). Nonetheless, general formal education (not health) does not have a direct effect on food safety practices (Yemane & Tamene, 2022). However, this formal education at least raises awareness, the ability to receive information, and the ability to develop information into practice (Tuglo et al., 2021). Thus, when a food handler who has a high level of education receives information related to food safety, it will provide an opportunity to practice, including food safety practices.

Food safety training/courses and food safety practices

Five (5) research articles revealed that food safety training/courses had a relationship with food safety practices. Madilo et al., (2022) even stated that the participation of food handlers in food safety training/courses is the only sure way to build food safety practices if followed regularly and continuously. This is also in line with the assumption that food safety training programs directly play an important role in improving food safety practices (Ahmed et al., 2021).

Food safety training/courses contribute greatly in raising awareness, increasing knowledge and attitudes so that it is then manifested in the form of food safety practices. However, this will further reduce the strength of the relationship when the training/course has been carried out more than 1 year previously (da Vitória et al., 2021). As such, da Cunha et al., (2014) recommends that it is necessary to conduct food safety training/courses at least 2 times a year or at least 1 time per year.

Attitude and food safety practices

Four (4) research articles revealed that attitudes towards food safety have a relationship with food safety practices. According to Naeem et al., (2018) the positive attitude of food handlers makes food handling practices better than food handlers who have a negative attitude. In addition, the attitude towards food safety of food handlers is considered as the main determinant along with the level of knowledge of good food safety practices (Ncube et al., 2019). Then this statement was also proven in the research of Ncube et al., (2020) furthermore that the predictors of safe food handling practices are the knowledge and attitudes of food handlers.

Nonetheless, attitude is only an indirect factor for influencing the emergence of good food safety practices (da Cunha et al., 2019). This makes attitudes towards food safety must be adequate and consistent at all times. One of the suggested ways to maintain a consistent attitude towards food safety is through participation in food safety training from basic to advanced levels (Ncube et al., 2020).

Household income/wealth and food safety practices

Three (3) research articles reveal that household income/wealth has a relationship with food safety practices. Tessema et al. (2014) stated that low monthly income has a 60.5% chance of causing poor food safety practices. This is considered reasonable on the grounds that those who have adequate and even fairly high monthly income are able to get a higher education, safer work experience so that the knowledge they have is also good, including related to food safety practices. In addition, it is also stated that high monthly income

makes food handlers able to buy more adequate cooking equipment for each stage of food management and have the ability to manage their leftovers to prevent cross-contamination (Tuglo et al., 2021).

If reviewed further, household income/wealth is only an indirect factor influencing food safety practices. Yenealem et al., (2020) through their research stated that income is not even related to food safety practices. Adequate monthly income may be directly related to the knowledge and attitudes of food handlers, but not all good knowledge and attitudes can be reflected in food safety practices (Abid et al., 2022). However, adequate monthly income also enables these food handlers to attend food safety training, so that their knowledge and attitudes can be monitored so that they are reflected as good food safety practices.

Work experience and food safety practices
Two (2) research articles revealed that work experience has a relationship with food safety practices. According to Alemayehu et al. (2021) the chance of practicing good handling practices increases with long work experience. This is probably because experience can help food handlers gain good knowledge and skills in food safety practices. In other words, those who have been food handlers for a longer time are more likely to learn from experience compared to those with only a few years of work experience (da Vitória et al., 2021; Teffo & Tabit, 2020).

Even so, among the ten research articles studied, there were three studies that were inconsistent and stated that work experience was not related to food safety practices (Madilo et al., 2022; Ncube et al., 2020; Tuglo et al., 2021). This is possible because the determination of the length of work experience studied is different in each study. There needs to be a standardization of the length of work experience that can be used as a criterion for classifying food handlers as experienced or inexperienced (Ncube et al., 2019). But broadly speaking, work experience of more than 5 years is quite a big opportunity to influence food safety practices (da Vitória et al., 2021).

Sanitary facilities and food safety practices
Two (2) research articles revealed that sanitation facilities have a relationship with food safety practices. Tessema et al. (2014) stated that food handlers who work in places with sanitation facilities (bathrooms) are 1.89 times more likely to have good food handling practices compared to those who work in places without sanitation facilities. This is also in line with the results of a study (Yemane & Tamene, 2022) which stated that food handlers who have sanitation facilities (a place to wash their hands beside latrines) have a 2.61 times greater chance of handling safe food than those who do not have sanitation facilities. The availability of facilities is a prerequisite for putting knowledge into practice and helping to prevent food handling errors (Alqurashi et al., 2019). In this regard, the availability of sanitation facilities enables food handlers to maintain cleanliness in their food processing practices. When food handlers do not maintain good personal hygiene, especially hand hygiene, it will cause food safety problems (Odipe et al., 2019).

CONCLUSION
The dominant determinants of food safety practices among food handlers are food safety knowledge, education level, food safety training/courses, attitude towards food safety, household income/wealth, work experience, and sanitation facilities. However, if the article review is carried out more broadly, it is possible that there are many determinants of food safety practices in food handlers. It is suggested for future research to study the determinants of food safety practices in Indonesia for a more specific group of food handlers because the conditions of society between countries and certain groups may vary. In addition, it is suggested that if conducting a literature review on the same topic it would be better to use a systematic literature review design and expand the scope of the article search in order to minimize bias in determining the determinants of food safety practices.).
REFERENCES


