

## Conference Paper

# Intestinal Parasitic Worm Infections among Food Handlers in the Canteens of a University

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## Abstract

This research aims to identify intestinal parasitic worm infections in food handlers and to assess the knowledge, attitude, and behavior of respondents based on the Five Keys to Safer Food manual [21]. The research design is descriptive analytic and uses the variables knowledge, attitude, behavior, and intestinal parasitic worm infections. A purposive sampling method was applied to determine the population and sample. The sample consisted of 99 food handlers from 16 locations in the canteens of University X in Depok, West Java, Indonesia. The results showed that four respondents had an intestinal parasitic worm infection: *Trichuristrichiura* (3 respondents) and *Hymenolepis diminuta* (1 respondent). The assessment of the respondents' knowledge, attitude, and behavior was predominantly in the category 'unsatisfactory': knowledge was rated unsatisfactory for 54% of respondents, attitude was rated unsatisfactory for 46%, and behavior was rated unsatisfactory for 57%. Respondents found to be infected were reported to the management team at the university that carries out follow-up action. It is important to conduct routine inspections related to sanitation, to provide regular hygiene education in all canteens, and to create a certification program to improve the quality of sanitation and hygiene.

**Keywords:** Intestinal parasites worm, food handler, Five keys to safer food, canteen

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## 1. INTRODUCTION

About six in ten parasites of food borne diseases are parasitic worms such as *Taenia solium*, *Echinococcus granulosus*, *Echinococcus multilocularis*, *Trichinella spiralis*, *Opisthorchiidae spiralis*, and *Ascaris* spp. (Liu et al. 2003). An estimated 1,121 million people in the world are infected with *Ascaris*, 795 million are infected with *Trichuris trichiura* (whipworm), and 740 million are infected with hookworm [5]. Intestinal parasitic worms are mostly found in fish, crabs, mollusks, meat, and vegetables in poor and developing countries located in tropical/subtropical regions, such as Africa,

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South Asia, and Southeast Asia [10]. One profession that is strongly associated with the risks of infection and worm contamination is food handlers [6].

The World Health Organization (WHO) has for a long time been aware of the need to educate food handlers about their responsibility for food safety. In the early 1990s, WHO developed Ten Golden Rules for Safe Food Preparation, which was widely translated and reproduced [21]. However, simpler and more widely accepted rules were needed. After a year of discussion involving experts on food safety and risk, WHO introduced the Five Keys to Safer Food poster in 2001. The poster simplified the message of the Ten Golden Rules into a more memorable form. The core messages of the Five Keys to Safer Food are: (1) keep clean; (2) separate raw and cooked; (3) cook thoroughly; (4) keep food at safe temperatures; and (5) use safe water and raw materials. This concept has been translated into more than 40 languages over the world, and it is still utilized to spread the WHO food hygiene message globally.

A previous study showed that almost 50% of food handlers in the cafeteria at University X were infected with intestinal worms [15]. University X has not carried out research related to intestinal worms, and has instead focused only on *Escherichia coli*. Hence, research into food contamination at the university should identify the presence of intestinal worms and should also analyze the knowledge, attitude, and behavior of food handlers. The Five Keys to Safer Food can be used as a tool for identifying the knowledge, attitude, and behavior of food handlers in respect of sanitation and hygiene in the processing of food. With such an analysis of food handlers' knowledge, attitude, and behavior, it will be easier to identify the risk factors that should be prioritized by the program for improving food safety and food hygiene.

## 2. METHODS

The study was a descriptive analytic study, and the sample consisted of 99 food handlers from 16 canteens at University X, in the town of Depok, West Java. The canteens were selected based on their location, including a canteen for each faculty, and a purposive sampling technique was used. All food handlers directly involved in food preparation and handling (permanent employees or contract workers) were eligible for sampling. Data related to knowledge, attitude, and behavior were collected in face-to-face interviews using a structured questionnaire and an observational checklist.

Before interview, respondents were asked to bring for examination a fresh stool sample of 2–3 mgramm a plastic cup with a tight-fitting lid. The collected stool specimens were first examined microscopically through the direct method and then examined again using the Kato-Katz method at the laboratory of the Department of Parasitology, Faculty of Medicine, Universitas Indonesia. The data was managed and analyzed using SPSS Statistics software package.

The variables of knowledge, attitude, and behavior of the respondents were determined by using the WHO's Five Keys to Safer Food. These variables were grouped into five indicators; keep clean, separate raw and cooked, cook thoroughly, keep food at safe temperatures, and use safe water and raw materials. Each indicator was associated with a question and a statement that each respondent was required to answer.

### 3. RESULTS

#### 3.1. Prevalence of intestinal parasites

Based on present study, participants with a worm infection were in a small minority (4.2%) (see Table 1).

TABLE 1: Description of respondents infected with parasitic worms.

Code	Sex	Age	Education	Type of worm	Eggs/g
R81	Male	42	Elementary school	<i>Trichuris trichiura</i>	48
RR27	Male	35	Elementary school	<i>Trichuris trichiura</i>	192
RR51	Female	50	Elementary school	<i>Hymenolepis diminuta</i>	2640
RR56	Male	59	Elementary school	<i>Trichuris trichiura</i>	228

Identification of knowledge, attitudes, and behavior was based on 31 items from the five indicators based on the Five Keys to Safer Food. Each respondent was obliged to try to answer correctly. A correct answer was taken to indicate that the respondent understands and can put into practice the relevant indicator from the Five Keys to Safer Food. Each correct answer was awarded one mark, and total marks were calculated to determine respondents' knowledge, attitudes, and behavior.

#### 3.2. Assessment of knowledge, attitude, and behavior of food handlers

Respondents' knowledge varied from item to item. Around 95% of respondents answered correctly on the items "It is important to wash hands before handling food" and

TABLE 2: Percentage of respondents answering correctly.

KNOWLEDGE	% of answers correct (n=100)
It is important to wash hands before handling food.	95%
Wiping-cloths can spread microorganisms.	90%
The same cutting board can be used for raw and cooked foods provided it looks clean.	43%
Raw food needs to be stored separately from cooked food.	87%
Cooked foods do not need to be thoroughly reheated.	49%
Proper cooking means cooking meat to 40 °C.	59%
Cooked meat can be left to cool overnight at room temperature before refrigerating.	64%
Cooked food should be kept very hot before serving.	69%
Refrigerating food only slows bacterial growth.	82%
Safe water can be identified by the way it looks.	85%
Fruit and vegetables should be washed.	95%
ATTITUDE	
I agree that frequent hand washing during food preparation is worth the extra time.	53%
I agree that keeping kitchen surfaces clean reduces the risk of illness.	98%
I agree that keeping raw food and cooked food separate helps to prevent illness.	96%
I agree that using different knives and cutting boards for raw foods and cooked foods is worth the extra effort.	47%
I agree that meat thermometers are useful for ensuring food is cooked thoroughly.	48%
I agree that soups and stews should always be boiled to ensure safety.	83%
I agree that thawing food in a cool place is safer.	76%
I agree that it is unsafe to leave cooked food out of the refrigerator for more than two hours.	74%
I agree that inspecting food for freshness and wholesomeness is valuable.	98%
I agree that it is important to throw away foods that have reached their expiry date.	98%
BEHAVIOR	
I always wash my hands before and during food preparation.	58%
I always clean surfaces and equipment used for food preparation before reusing them for other food.	69%
I always use separate utensils and cutting boards when preparing raw food and cooked food.	65%
I always separate raw food and cooked food during storage.	74%
I always check that meats are cooked thoroughly by ensuring that the juices are clear or by using a thermometer.	45%
I always re-heat cooked food until it is piping hot throughout.	54%
I always thaw frozen food in the refrigerator or some other cool place.	28%
I always store any leftovers in a cool place within two hours.	38%
I always check and throw away food that is beyond its expiry date.	81%
I always wash fruit and vegetables with safe water before eating them.	82%

"Fruit and vegetables should be washed." For the attitudes variable, 98% of respondents answered correctly on the items "I agree that keeping kitchen surfaces clean reduces the risk of illness," "I agree that inspecting food for freshness and wholesomeness is valuable," and "I agree that it is important to throw away foods that have reached their expiry date." For the behavior variable, 82% of respondents answered correctly on the items "I wash fruit and vegetables with safe water before eating them" and "I always check and throw away food that is beyond its expiry date." Analysis of our data in terms of the Five Keys to Safer Food found that 54% of respondents had unsatisfactory knowledge, 46% of respondents had unsatisfactory attitudes, and 57% of respondents had unsatisfactory behaviors.

#### 4. DISCUSSION

The results of the current study are similar to those of Ramakrishnaiah (2014), who found a 4% rate of *Trichuris trichiura* infection among food handlers in India. People with light *Trichuris trichiura* infections usually have no symptoms, whereas people with heavy infections can experience painful passage of stools that contain a mixture of mucus, water, and blood. Humans can become infected by *Trichuris trichiura* through contact with hands with contaminated dirt on them, or from consumption of fruit or vegetables that have not been carefully cooked, washed, or peeled [5].

Infection with *Hymenolepis diminuta*, only found in one respondent in this study, indeed it is less frequent globally. It is most often asymptomatic, although heavy infections can cause weakness, headaches, anorexia, abdominal pain, and diarrhea [5].

The majority of respondents in the present study said that cooked foods do not need to be reheated, this finding is similar to research conducted by Gomes-Neves et al. (2010), who found that food handlers did not take into account the importance of temperature control during cooking and storing of food. In fact, some studies have shown that reheating food can reduce microbes and intestinal parasite contamination [9]. The majority of respondents in the present study also did not realize that different cutting boards should be used for raw foods and cooked foods. Another study found similar results, with 40% of food handlers resisting the use of different cutting boards, despite the fact that using the same kitchen utensils, including cutting boards, can cause cross-contamination between raw and cooked or ready-to-eat food [1]. However, respondents in the present study understood and answered correctly that washing fruit and vegetables is important because it can eliminate dirt, such as soils and

pesticides. Washing fruit and vegetables is important during food processing, because intestinal parasites are found on 68% of fruit and vegetables [19]. Respondents also realized that handwashing is important to avoid microbes. Good hand washing habits can help to control intestinal worm infections, because one of the infection risk factors among food handlers is not washing their hands after using the toilet and not using hand soap [12].

In terms of attitudes, it was clear that many respondents did not use different cutting boards for different food materials. This might be because food handlers have limited equipment and the requirement to change equipment is easily forgotten or ignored, as other research has found [1]. In relation to food thermometers, some respondents disagreed about their usefulness because they are not familiar with thermometers and prefer using traditional methods (such as sight, smell, and touch) to check the maturity of food. Hence, the understanding among food handlers of the value of using food thermometers needs to be improved, because thermometers are a significant tool for avoiding the spread of food borne illness [20]. Most respondents understood the importance of maintaining hygiene, keeping food fresh, and throwing away expired foods, because those are basic concepts for workers who work in kitchens and interact with food.

The behavior variable was assessed based on how frequently respondents did what was written in the relevant statements. "I always thaw frozen food in the refrigerator or in some other cool place" and "I always store any leftovers in a cool place within two hours" are particularly important points for the avoidance of food contamination by microorganisms, because the processes of cooling and storing in a covered place are important for the maintenance of food quality [4, 7].

## 5. CONCLUSIONS

The Five Keys to Safer Food could be used as a measurement indicator of the knowledge, attitude, and behavior of food handlers in relation to intestinal parasite contamination. Although the present research was unable to identify any association between the knowledge, attitude, and behavior of respondents toward intestinal worm infection, it did identify areas for improvement in their knowledge, attitudes, and behaviors, such as using different cutting boards for raw and cooked foods, using thermometers during the cooking food process, and using the correct procedure for thawing frozen foods.

Food handlers infected with intestinal worms should be given access to medical checkups at an infection clinic and to an appropriate health treatment program.

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