

ORIGINAL ARTICLE

Prevalence of Bacterial Infection in Rectal Swab Culture of Some Prospective Workers

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ABSTRACT

Introduction: Bacterial infection is one of the health problems caused by bacteria which can infect all organs of the body, including the digestive tract. Some companies require prospective workers to carry out a rectal swab checking for bacterial infection in the body. This study aimed to determine the prevalence value of bacterial infection among several prospective workers. **Methods:** This study used the Cross-Sectional method. We collected data from patients undergoing rectal swab examination. Examination of swab samples was performed using several bacterial culture methods to detect several species of bacteria including, *Salmonella* sp., *Vibrio* sp., *Shigella* sp., and pathogenic-*Escherichia coli*. **Results:** A total of 5 samples from 106 samples showed positive results (4.7%), while 101 samples showed negative results (95.3%). Positive samples were only found in 2018 while in 2017 were not found. There was significant differences between the group of ages (p -value = 0.007). More positive samples were found in prospective workers with ages over 27 years old compared to under 27 years old with an OR value = 0.878 (CI: 0.783-0.984). There was no significant differences in gender (p -value= 0.648; OR= 2.516; CI: 0.271-23.344). The laboratory test results also showed that only *Salmonella paratyphi* were found in all positive samples. **Conclusion:** The prevalence rate of bacterial infection among some prospective workers was 4.7%, which means that maintaining hygiene and sanitation are still needed.

Keywords: Bacterial infection, Rectal swab, Prospective workers

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INTRODUCTION

Infectious diseases are always associated with the transmission of pathogenic microorganisms such as viruses, bacteria, fungi, or parasites. This type of infection can spread from person to person, directly or indirectly. The symptoms and treatment caused by each infectious disease are vary depending on the type of microorganism. Infectious disease is still a major problem in several countries, especially in developing countries, including Indonesia (1).

One of the most common infectious diseases is an infection of the digestive tract or gastroenteritis. Gastroenteritis can be caused by viral, bacterial, and parasitic infections. Some of the bacteria that cause this disease include *Escherichia coli*, *Salmonella*, *Shigella*, *Vibrio*, *Clostridia perfringens*, and *Staphylococcus* (2–5). Until now, gastroenteritis, or also known as diarrhea, is

still a public health problem in developing country like Indonesia. In 2017, the number of diarrhea sufferers of all ages who were 4,274,790 and an increase in 2018 to 4,504,524 or 62.93% of the estimated diarrhea in health facilities. The national incidence of diarrhea for all ages is 270 / 1,000 population (6).

There were ten outbreaks of diarrhea in 2018 spread across 8 provinces, 8 districts/cities. Tabanan Regency and Buru Regency each had 2 outbreaks. The number of sufferers 756 people and the death of 36 people (CFR 4.76%). The mortality rate (Case Fatality Rate) of the outbreak was also increased from 2017 (1.97%) to 2018 (4.76%). When the outbreak of diarrhea happened, it is expected that the case mortality rate (CFR) reach <1% (7).

Rectal swab examination is an examination that is generally required in food or beverage factories, restaurants, cafes or places where staf or employees come into contact with food or drinks (8). This examination aims to detect the carrier of germs that cause digestive disorders. These microorganisms include *Salmonella* species that cause Typhoid, *Shigella*, and

pathogenic-*E coli* that cause diarrhea or gastroenteritis (9). A person can be a carrier of these bacteria even if he is not sick himself but can spread these bacteria to other people and cause illness (8). The transmission of these bacteria is coming from rectum then without thorough hand washing and guaranteed hygiene; it can get under the nails and spreading to food or drinks that are produced or served.

Not finding the bacteria that cause gastroenteritis is one of the conditions for whether someone works in a food and beverage manufacturing or service company. If the results of the rectal swab examination are positive, the bacteria that cause gastroenteritis are found, then the person concerned must undergo treatment until the bacteria is proven undetectable.

MATERIALS AND METHODS

This study used a cross-sectional method conducted at Ultra Medica Clinical Laboratory from 2017 to 2018. The criteria of the patients were patients of all age and gender. The samples that have been taken using swab tools were placed into *carry and blair* media then transferred to the laboratory for further examination. The positive results of rectal swab were confirmed using culture methods to detect several species of bacteria, including *Vibrio* sp., *Shigella* sp pathogenic-*Escherichia coli* and *Salmonella* sp.

Vibrio sp detection

The samples were cultured in TCBS (*Thiosulfate Citrate Bile Salt Sucrose*) media after previously grown on an enrichment media for *Vibrio* sp, *Alkaline Peptone Water* (APW). Colonies with yellow, convex, cloudy and granular were presumed as *Vibrio cholera*. Confirmation test was performed using biochemical media, including TSIA (*Triple Sugar Iron Agar*), SIM (Sulfide Indole Motility), and Simmon Citrate (SC) agar. Positive results for *Vibrio cholerae* on TSI media are shown with yellow butt with red slant. In the SIM medium, the growth of bacteria can be observed spreading like tree roots. The media changed color to blue indicated a positive result of SC test(10). Serological test was carried out by taking one loop of culture from TCBS media and placed on object glass then dripped and emulsified with 0.85% saline solution. Then, placed one drop of each polyvalent antiserum, Inaba, and Ogawa, on the object glass. A positive result was obtained when there was a clot in the culture solution (11).

Salmonella sp. and *Shigella* sp. detection

Salmonella sp. detection in samples used several isolation and identification media including *Salmonella* Shigella (SS) agar, TSIA, SIM, and SC. Samples were confirmed as *Salmonella* positive when the bacteria colonies in SS media appeared colorless with black centers. This appearance is due to this bacteria are not

able to ferment lactose but produce hydrogen sulfide (H_2S) gas. These bacteria also showed red slant with yellow butt, gas and H_2S production in TSIA, motility positive and indole negative in SIM, and positive SC. While samples were confirmed as *Shigella* positive showed colorless colonies with no H_2S , red slant with yellow butt without gas and H_2S production in TSIA, motility and indole negative in SIM, negative SC. The further test for detection of *Salmonella* and *Shigella* sp using serological test. Four types of antiserum were used for detecting *Salmonella typhi* and *Salmonella para typhi*. While detection for *Shigella* used antisera of *Shigella dysenteriae*, *Shigella flexineri*, *Shigella boydii*, dan *Shigella sonnei*.

Pathogenic-*Escherichia coli* detection

Escherichia coli isolation on samples was conducted using Mac Conkey (MC) agar and Eosin Methylene Blue (EMB) agar. Then followed by biochemical tests using TSIA, SIM, and SC. Colonies confirmed as positive *E. coli* has grown as red or pink with a mucoid appearance in MC. Positive colonies also showed blue-black bulls eye and may have a green metallic sheen in EMB. In biochemical tests showed as yellow in both butt and slant with gas but without H_2S production in TSIA, motility and indole positive in SIM, and negative SC. Colonies of bacteria presumed as *E. coli* O157:H7 was identified by latex agglutination using H7 antisera.

Data analysis

The percentage of positive results described as prevalence rate was analyzed using crosstab and chi-square to determine the correlation. All data were calculated with SPSS statistics 20 for windows.

RESULTS

Data distribution of rectal swab examination

Data on rectal swab examination of prospective workers from 2017 to 2018 showed that the number of an examination was higher in 2017 (70.8%) than in 2018 (29.2%), while the percentage of examination of men was higher than women, respectively 62.3% and 37.7% (Table I). Patients with age ≤ 20 years old had the highest percentage about 38.7%, then followed by 21-30 years old at 31.2%, 31-40 years old at 15.1%, 41-50 years old at 8.5%, and > 50 years old had the smallest percentage of 6.6%.

The prevalence of bacterial infection

The results showed that five samples were positive for *Salmonella paratyphi*, while the other 101 samples were negative or no bacteria were found (Table II). The prevalence of bacterial infection was 4.7%. Bacterial infection was more likely to be found in the year 2017's samples compare to 2018's samples (OR 1.192; 95%; CI 1.022-1.391).

Table I : Data distribution of rectal swab examination from prospective workers in 2017-2018

Age Category	2017		2018		Total	
	Male	Female	Male	Female	Male	Female
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
≤ 20 tahun	17 (22.7)	17 (22.7)	5 (16.1)	2 (6.5)	22 (20.8)	19 (17.9)
21-30 tahun	18 (24.0)	5 (6.7)	9 (29.0)	1 (3.2)	27 (25.5)	6 (5.7)
31-40 tahun	5 (6.7)	6 (8.0)	4 (12.9)	1 (3.2)	9 (8.5)	7 (6.6)
41-50 tahun	2 (2.7)	1 (1.3)	3 (9.7)	3 (9.7)	5 (4.7)	4 (3.8)
> 50 tahun	2 (2.7)	2 (2.7)	1 (3.2)	2 (6.5)	3 (2.8)	4 (3.8)
Total	44 (58.7)	31 (41.3)	22 (71.0)	9 (29.0)	66 (62.3)	40 (37.7)

Table II : Laboratory test results of rectal swab

Year	Laboratory test results		Number of Samples (%)	p value	OR (CI)
	Positive (%)	Negative (%)			
2017	0 (0.0)	75(70.8)	75 (70.8)	0.002	1.192 (1.022-1.391)
2018	5 (0%)	26 (100%)	31 (29.2)		
Total	5 (4.7)	101 (95.3)	106 (100.0)		

Factors associated with bacterial infection

Factors associated with bacterial infection were then observed among different gender and group of age. The difference in gender didn't correlate with the prevalence of bacterial infection (*p-value* 0.648; OR 2.516; CI 0.271-23.344, Table IV). In comparison, the bivariate analysis suggested that patients over 27 years old were 0.8 times more likely susceptible to bacterial infection, compared with those patients under 27 years old (95%; CI 0.783-0.984, Table IV).

Table III : Detected bacteria from rectal swab samples

Spesies	Number of Samples	Percentage (%)
<i>Vibrio sp.</i>	0/106	0
<i>Salmonella paratyphi</i>	5/106	4.7
<i>Shigella sp</i>	0/106	0
Pathogenic- <i>Escherichia coli</i>	0/106	0

companies related to food hygiene and sanitation. Food handling is an effort to control food safety during the production process. The existence of control of the production process can minimize the risk of food contamination, both from foodstuffs, food handlers, places and equipment to be safe for consumption and prevent disease transmission (12).

There are three groups of people with diseases that should not be involved in food handling, including respiratory, digestive and skin diseases. These three diseases can infect other people through food processed or served by an infected person. Important procedures for workers in the food sector are handwashing, hygiene and personal health (13). These workers must carry out periodic health checks at least two times a year, because workers in the food sector must be healthy and not suffer from infectious diseases. Food workers can carry disease germs that can transmit the disease to others (14).

Table IV : Associated factors of bacterial infection on prospective workers

Factors	Laboratory test results		Number of Samples	p value	OR (CI)
	Positive (%)	Negative (%)			
Age					
> 27 years old	5 (15.6%)	36(87.8%)	41	0.007	0.878 (0.783-0.984)
≤ 27 years old	0 (0%)	65 (100%)	65		
Gender					
Male	4(6.1%)	62(93.9%)	66	0.648	2.516 (0.271-23.344)
Female	1 (2.5%)	39(97.5%)	40		

DISCUSSION

Patients who did health check up at Ultra Medica Clinical Laboratory are prospective workers in food and beverage division such as restaurants, hotels or

In this study, the percentage of patients with a bacterial infection on rectal swab culture was more likely found in male sex than female may be associated with other complication such as diarrhea, urethritis, and UTI (Urinary Tract Infection). According to research at

Prof. Dr. R.D. Kandou, Manado, acute diarrhea with severe dehydration was more common in male with a percentage of 73.5% (15). This difference may be due to poor hygiene and sanitation. Another factor could be due to greater exposure outside for men compared with women. Men are more active outside the home (high mobility) (16). While in Indonesia, due to a lot of activities outside, their habit of consuming readily available food without paying attention to personal hygiene can cause a high incidence of typhoid cases (17,18). But further study with more population sample is required to assess difference gender in associating risk factor for typhoid.

This study was shown that the infection was more common in productive age or younger people, around 27 years old, compared to over 27 years old. All positive samples were found in patients with an age of over 30 years old (Table III). The similar explanation also applied to those individuals over 27 years old which has high mobility. The risk factor associated with the incidence of typhoid fever can be caused by consuming food from street vendors and lack of personal hygiene before eating (18).

The study found that five samples were positive for *Salmonella paratyphi*. *Salmonella paratyphi* is known as the cause of enteric fever and other complications, including intestinal inflammation and systemic diseases (Paratyphoid fever), Enterocolitis (Gastroenteritis) and diarrheal diseases (19). The spread of *Salmonella paratyphi* bacteria occurs orally through food and drinks that have been contaminated by bacteria enters the mouth through the digestive tract to the intestines (20). After entering the wall of the small intestine, *Salmonella paratyphi* begins to invade through the lymph system, which causes swelling of the veins then invades the bloodstream. Blood flow that carries bacteria will also attack the liver, gallbladder, lymph, kidneys, and bone marrow where these bacteria then multiply and cause infection of these organs (19).

CONCLUSION

The prevalence rate of bacterial infection in rectal swab cultures was 4.7%. The bacterial infections were more likely found in male patients than female and patients with age over 27 years old. The most common bacteria found was *Salmonella paratyphi*.

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