

# ***Escherichia Coli* in *Musca Domestica* Flies toward the Incidence of Diarrhoea in Children Under Five Years in around the Location of Traditional Fish Processing in the North Jakarta**

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## **Abstract**

Poor environmental sanitation can cause diarrhoea. Transmission of diarrhoea can occur with faecal to oral transmission. For example, faeces that contain bacteria, viruses, protozoa and worms transferred to food or drinks either with zoonotic or anthroponotic cycles depending on the pathogen. Faecal to oral transmission in infectious diarrhoea carried out by an intermediary zoonotic cycle has considered the insect fly as a potential mechanical agent for the transmission of diarrhoeal disease. This study aims to assess the relationship of *Escherichia coli* (*E. coli*) in *Musca domestica* flies to the incidence of diarrhoea in children under five in a residential area around a traditional fish processing location in North Jakarta. This research used a cross-sectional design; the study conducted from May to June 2019. The study population was children under-fives with a total sample of 97 respondents. Interviews and observations were carried out on mothers of children under-fives as respondents about characteristics of children under-fives, mothers and basic sanitation factors. The study also was done by measuring the density of flies using the Scudder technique with the Fly Grill tool. The existence of *E. coli* measured by examining samples of *Musca domestica* flies caught by the Most Probable Number (MPN) technique. There were significant results by statistical testing for independent variables, which are high levels of fly density, incomplete childhood immunization, maternal education, basic sanitation factors that did not include eligible for clean water supply facilities, household waste disposal, wastewater management, and drinking water sources. Bivariate analysis revealed that there was a significant relationship in positive *E. coli* sample of *Musca domestica* flies to diarrhoea in infants with p-value=0,007. While non-exclusive breastfeeding and family toilet that did not eligible significantly related to the incidence of children under five diarrhoea in the region.

**Keywords:** *Diarrhoea; E. coli; children under five; flies; sanitation, North Jakarta.*

## **Introduction**

Until now, diarrhoea is an environmental-based disease that is still a problem in the world, especially in developing countries. It is the second leading

cause of death in the world after pneumonia<sup>[1][2]</sup>, causing morbidity and mortality in all regions and ages<sup>[3][4][5]</sup>. WHO and UNICEF, say around 2 billion cases of diarrhoea occur worldwide every year, as many as 1.9 million attack children aged younger than five years, even causing death. Developing countries are the countries with the most cases<sup>[1][6]</sup>. In Indonesia, diarrhoeal disease is still a health problem in the community. The spread of diarrhoea can be through contaminated food/drinks, or from person to person as a result of poor sanitation. The magnitude of the number of incidents in infants is due to the vulnerability of infants the immunity that is still weak so it is easier to cause

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fluid loss<sup>[8][9][10]</sup>. Poor environmental sanitation can also cause diarrhoea. Transmission of diarrhoea can occur by faecal to oral transmission, where diarrhoea occurs due to contamination of food drinks by poor environmental sanitation, for example, due to faeces containing bacteria, viruses, protozoa and worms transferred to food or drinks both with zoonotic and or anthroponotic cycles depending on the pathogen<sup>[11]</sup>. Faecal to oral transmission in infectious diarrhoea carried out by an intermediary zoonotic cycle has considered the insect fly as a potential mechanical agent for the transmission of diarrhoeal disease.<sup>[12][13][14]</sup>

The location of traditional fish processing in North Jakarta is a place for processing various types of fish that traditionally done. The processing location is not far from residential areas. Based on data from health service facilities in the region the incidence of diarrhoea ranks second out of the ten most extensive types of diseases in the region. Diarrhoea attacks many children under-fives in the area. It suspected that the cause of diarrhoea is due to a large amount of garbage that causes the density of flies. The ability of flies as a mechanical vector can carry pathogenic agents that cause diarrhoea, especially *E. coli*. Based on the above background, researchers are interested in examining the relationship of the presence of *E. coli* in the *Musca domestica* flies to the incidence of children under five diarrhoea in a residential area around a traditional fish processing location in Jakarta. This study aimed to analyze the relationship between the presence of *E. coli* in *Musca domestica* flies and the incidence of children under five diarrhoea around traditional fish processing locations in North Jakarta.

**Method**

The study design uses a quantitative approach to a cross-sectional study design. The study population was mothers who have children under five. The sample size of this study obtained through the calculation of the proportion <sup>[15]</sup> binomial formula with the results of 97 mothers. The sample selection uses a multi-stage sampling technique with a simple random sampling method. Interviews and observations were carried out with a questionnaire. The measurement of the density of the respondent’s house flies was done inside the house as many as five points and outside the house of the respondent as many as five points using the Scudder technique using the Fly grill, Thermo hygrometer, hand counter, and stopwatch. The sampling of *Musca domestica* flies carried out after measurements taken. Identification of the presence of *E. coli* in flies was carried out using the Most Probable Number (MPN) technique. Data analysis performed with the chi-square test ( $X^2$ ) with a value of  $p \leq 0.05$ . The interpretation of fly density on the fly grill is 0-2: low and >2: high/dense. The dependent variable of this study is the incidence of diarrhoea in children under five with independent variables of the presence of *E. coli* in *Musca domestica* flies, as well as covariable levels of fly density, children under five factors exclusive breastfeeding and completeness of immunization, maternal factors in the form of education level and basic sanitation factors such as clean water supply facilities, management of household garbage, sewage disposal, faeces disposal and drinking water sources for children under-fives.

**Results**

The results of the bivariate analysis can be illustrated in the table below (Table. 1)

**Table 1. Bivariate analysis between Laboratory Results, Flies density, Exclusive breastfeeding, Complete Immunization, Mother’s Education, Water supply facilities, Waste processing facilities, Family toilet facilities, Wastewater disposal facilities, Children under five’s drinking water facilities to *E. coli* in *Musca domestica* flies to the incidence of children under five diarrhoea in a residential area around traditional fish processing locations in North Jakarta**

Variable	The Incident of Diarrhoea					OR (95%)	p Value
	n	%	n	%	N		
<b>Laboratory Results</b>							
Positive	20	69	9	31	29	3.822 (1.511-9.672)	0,007
Negative	25	36,8	43	63,2	68		

Variable	The Incident of Diarrhoea					OR (95%)	p Value
	n	%	n	%	N		
<b>Flies density</b>							
Low	31	88.6	4	11.4	35	26.571 (8.007-88.173)	0.000
High	14	22.6	48	77.4	66		
<b>Exclusive Breastfeeding</b>							
No	17	56.3	21	43.8	48	2.214 (.981-4.9447)	0.085
Yes	18	36.7	31	63.3	49		
<b>Complete Immunization</b>							
No	12	80	3	20	15	5.939 (1.555-22.681)	0.011
Yes	33	40.2	49	59.8	82		
<b>Mother's Education</b>							
Low	20	64.5	11	35.5	31	2.982 (1.227-7.247)	0.025
High	25	37.9	41	62.1	66		
<b>Water supply facilities</b>							
No	27	64.3	15	35.7	42	3.700 (1.588-6.220)	0.004
Yes	18	32.7	37	67.3	55		
<b>Waste processing facilities</b>							
No	28	59.6	19	40.4	47	2.861 (1.253-6.532)	0.020
Yes	17	34	33	66	50		
<b>Family toilet facilities</b>							
No	34	54	29	46	63	2.451 (1.024-5.867)	0.068
Yes	11	32.4	23	67.6	34		
<b>Wastewater disposal facilities</b>							
No	35	55.6	38	44.4	63	3.000 (1.233-7.032)	0.024
Yes	10	29.4	24	70.6	34		
<b>Children under five's drinking water facilities</b>							
No	30	56.6	23	43.3	53	2.522 (1.103-5.765)	0.045
Yes	15	34.1	29	65.9	44		

## Discussion

*E. coli* is known as the lower intestine inhabitants of warm-blooded animal channels, including humans, and often discharged into the environment through faeces<sup>[16][17]</sup>. *E. coli* bacteria in faeces can move to water or food with the help or through animal contact (faecal to oral). Flies can carry *E. coli* obtained from rubbish, household waste and other sources of sewage and then transmitted from the mouth through vomit drops, faeces and other body parts. *E. coli* can be carried by flies on the exoskeleton, legs, in the mouth and the intestinal tract<sup>[18]</sup>. Proboscis and the six feet of the fly equipped with fine hairs and the feet release sticky fluid making the fly easily carry the pathogen *E. coli*<sup>[19]</sup>. The results of laboratory tests conducted of 97 samples of flies from the respondent's house were found as many as 29 samples found positive *E. coli* (29.9%) and 68 negative samples of *E. coli* (70.1%).

The high density of flies has a significant relationship to the occurrence of diarrhoea in infants, has a potential of 26,571 times the risk of causing diarrhoea in infants. This study is in line with the study of Manalu et al. (2012) that there is a significant relationship between high fly density and the incidence of diarrhoea in infants living around the Namo Bintang Garbage Landfill. Flies are one of the Diptera orders that are closed to human settlements and can affect public health<sup>[20]</sup>; the population is very high. The morphology of the body of a small fly the ability to fly away, as well as a short life cycle, and includes omnivorous animals (all-eaters). Besides that, this insect also has high reproductive power and is a multivoltine (several generations in one year)<sup>[20]</sup>. Fly control has been linked to diarrhoea prevention. Efforts to reduce the population of *Musca domestica* is by vector control including physical, chemical and biological control which is carried out comprehensively by improving environmental cleanliness in settlements.

Diarrhoea caused by pathogenic germ transmission is oral-faecal. Risk factors for the spread of this disease are the means of disposal of faeces that do not meet the requirements and the process of washing hands that are not good after defecation and contact with faeces before processing food. Bandages (diapers) thrown directly into the trash, invites the arrival of flies. The habit of flies looking for food in dirty places causes bacterial germs to stick to the body and the hairs of their feet so that germs carried by flies can pollute food and cause pain.

Clean water supply facilities, waste management facilities, wastewater disposal facilities, and drinking water sources have a significant relationship with the incidence of children under five diarrhoea. Wastewater disposal has a significant relationship with the incidence of children under five diarrhoea. This study is in line with Hariyanto (2015) that there is a significant relationship between waste management and the incidence of diarrhoea in Bogor Regency ( $p=0,000$ ). The study is also in line with Wilar (2017) stating that there is a significant relationship between waste disposal facilities and the incidence of diarrhoea in infants in the Banggai Community Health Center in Banggai Lau Regency. Household waste is rubbish generated from daily activities in the household that do not include faeces. Trash is a source of diseases such as breeding grounds for flies, mice and cockroaches. Garbage can invite flies to perch for food and lay eggs in a pile of garbage. The flies then fly and descend the food so that the food can be contaminated with germs carried by flies. Based on the behaviour of flies, at the adult stage the fly chooses a habitat with much organic material that is undergoing decomposition, for example, organic waste that is wet and during the day the fly rests on the edge of the food and electric wire.

The presence of *E. coli* in the *Musca domestica* house fly has a significant relationship with the incidence of children under five diarrhoea. This relationship is in line with research conducted by Venti in Surabaya, which states that *E. coli*, Salmonella, Shigella and Staphylococcus found in *Musca domestica*. Nevertheless, of the three flies, *Musca domestica* is a species that has more potential as a mechanical vector of the disease caused<sup>[21]</sup>. The same thing was also expressed by Putri in her research that, bacteria found in the body of flies divided into six isolates, including genus Salmonella, Providencia, Escherichia and Vibrio<sup>[22]</sup>.

## Conclusion

The variables that show a significant relationship to the incidence of diarrhoea under five years are positive *E. coli* examination results on *Musca domestica* flies, fly density, education, complete immunization status, clean water supply facilities, household waste management facilities, water disposal facilities waste, and sources of drinking water for children under-fives at the location. Efforts made between related agencies jointly carry out inspection and supervision of clean and healthy environmental conditions in the region, especially regarding basic sanitation conditions in addition to increasing public knowledge of the importance of clean and healthy living behaviour by carrying out health promotion activities. It is recommended to collect, sort waste and dispose of garbage every day in a place that does not pollute the environment.

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