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MODEL OF BACTERIAL CONTAMINATION ON STREET FOOD SOLD AT PRIMARY SCHOOLS By Diah Titik M

Original Research Article Microbiology International Journal of Pharma and Bio Sciences ISSN 0975-6299 MODEL OF BACTERIAL CONTAMINATION ON STREET FOOD SOLD AT PRIMARY SCHOOLS TJIPTO RINI*[1] AND DIAH TITIK MUTIARAWATI[2] [1]Department of Microbiology, School of Environmental Health, Health Polytechnic Institute Jakarta II, Indonesia [2]Department of Bacteriology, School of Medical Laboratory Health Polytechnic Institute Surabaya, Indonesia ABSTRACT Street food might be contaminated by bacteria through unhygienic preparation process, improper storing method (i.e. exposure to open-air which resulted in attracting flies and dust contamination), or caused by the vendors' lacks of hygiene awareness, such as by touching the food directly using unhygienic hands and talking while serving the customers. Most of the producers also did not pay much attention on hygienic and sanitary aspects during preparing their products so that the products they served potentially contained pathogenic bacteria, such as Escherichia coli, Salmonella sp. and Klebsiella sp. This phenomena was caused by their low educational level resulted in their ignorance on health awareness. This research was conducted to confirm the indicators composing educational level variable, health awareness variable, food preparation variable, and bacterial contamination variable. This cross-sectional research applied observational design aimed to examine and explain causal relationship among the variables by testing the hypotheses. Structural Equation Modeling (SEM) statistical analysis using Partial Least Square (PLS) software was used to confirm the indicators composing the variables and finding the best model of effect paths. The findings of this research proved that the variables were measurable through its indicators. The best testing model indicated that educational level affected bacterial contamination through health awareness. This research provided a new perspective on further researches, studies, and policies made in the future. Government needs to issue policies which are in accordance with changing environment and to formulate a system to guide the behavior of food vendor. The government

is also expected to be able to internalize the policies and system into an organizational practice. KEYWORDS: Educational Level, Health Awareness, Food Preparation, Bacterial Contamination TJIPTO RINI Department of Microbiology, School of Environmental Health, Health Polytechnic Institute Jakarta II, Indonesia *Corresponding author INTRODUCTION Food is one of fundamental needs for human beings. Food consumed by human beings is composed of different ingredients and prepared in many different ways1. It is likely that food will affect our health or making us ill. One way to maintain our health is by consuming healthy foods namely by assuring our foods are wholesome and hygienic, free from any pathogenic contaminations. There are many factors making our foods are unhealthy to consume. One of them is bacterial contamination2. Bacterial contamination may occur due to unhygienic preparation process, improper storing method (i.e. exposure to open-air which may attract flies and cause dust contamination), and the vendors' ignorance behaviors, such as touching the foods using unhygienic hands, or talking while serving the customers. Similarly, the producers do not fully concern about hygienic and sanitary aspects of their products so that their products are potentially contaminated by Escherichia coli. It is assumed that this phenomenon is caused by the vendors' low educational level resulting in their ignorance on health aspects of their products3. Escherichia coli are normal gut micro biota found on human intestines. However, if an excessive amount of Escherichia coli contaminates food, it may cause diarrhea to the consumers of the food. In Wiyung District was 31 % the rate of diarrhea cases on primary school students4 . In general, diarrhea is caused by bacteria from Enterobactericeae families, including Salmonella sp., Escherichia coli, and Klebsiella sp. These bacteria are categorized as gram negative bacteria5. Based on this phenomenon, further researches on bacterial contamination models on street foods sold around primary schools should be conducted. This research is intended to confirm the indicators composing educational level variable, health awareness variable, food preparation variable, and bacterial contamination variable and describing causal relationships among these variables and finding the best path effect model. MATERIALS AND METHODS This study is descriptive quantitative in nature, aiming to develop a better understanding of the educational level, health awareness and its relation to the preparation method from the point of view of the vendors' behaviors. The study is based on the primary data collected from food street vendors. Overall the primary school has 20 food street vendors. The study is total sampling of (20) food street vendors. In total (45) questionnaires were distributed to the said respondents. The questionnaire is in Bahasa Indonesia – an official language in Indonesia. This research applied explorative quantitative approach using a structured questionnaire referring to the situations and conditions of the respondents. This research utilized instruments designed by previous researchers which had been validated using SEM (Structural Equating Modeling) confirmatory factor analysis6. Measurements on educational level and health awareness of the food street vendors were conducted using an open questionnaire. Meanwhile, examination on street food bacterial contamination was conducted by isolating and identifying bacterial colonies. Quantitative method applying observational design conducted in cross sectional manner was intended to describe and identify causal relationships among the variables. Based on research problem proposed and the objective which were going to be achieved in this research namely to examine explain causal relationships occurred among the variables. This study was categorized as explanatory research (i.e. a research intended to explain causal relationships among defined variables). This research was conducted at public primary schools located in Wiyung District, Surabaya. This location was chosen by considering that the previous research on diarrhea cases found on primary school students was conducted in the same location. The population of this research consisted of all street food vendors at primary schools in Wiyung

District, Surabaya. RESULTS The result of educational level examination of street food vendors at primary schools in Wiyung District indicated that most of them graduated from secondary schools or at the same level as secondary schools. The result of street food vendors' health awareness indicated that most of them did not have adequate knowledge about health issues while some of them simply ignored or pretended to did not concern about health issues at all as long as they could make profits from their products. Although not all of their products were contaminated by bacteria, these vendors did not much concern about the way they served their products. The products contaminated by Salmonella sp. were graded 4; the products contaminated by Escherichia coli were graded 3; the products contaminated by Klebsiella sp. were graded 2; and the products which did not undergo bacterial contamination were graded 1. PLS Outer Model Examination Confirmatory analyses on street food vendors' educational level, health awareness, and product preparation method indicated that outer loadings of these variables were higher than 0.50 with t-statistic value higher than 1.96. These results were indicated that all indicators of food preparation method variable had met significance condition. These results also suggested that the latent variables were composed of manifest variables. PLS Inner Model Examination Table 1 Results of Inner Model Examination on Bacterial Contamination of Street Food Sold at Primary Schools in Wiyung District, Surabaya No. Inter-variable Correlations Inner weight t-statistic values Result 1 Educational Level Health Awareness 0.429 4.292 Significant 2 Educational Level Food Preparation Method 0.167 1.764 Insignificant 3 Educational Level Bacterial Contamination 0.289 1.863 Insignificant 4 Health Awareness Food Preparation Method 0.416 3.876 Significant 5 Health Awareness Bacterial Contamination -0.507 5.456 Significant 6 Food Preparation Method Bacterial Contamination 0.035 0.405 Insignificant Graph 1 Graphically, the examination results could be presented in Figure 1 below Figure 1 Results of Direct Inner Model Examination Meanwhile, path model of bacterial contamination in general could be described in Figure 2 below: Figure 2 Bacterial Contamination Path Model Figure 2 above suggested that Health Awareness did affect bacterial contamination. Based on inner model examination results, it can be concluded that the results of hypotheses examination were • Thesis 1: The vendors' educational level directly affected health awareness • Thesis 2: The vendors' educational level did not directly affect food preparation method • Thesis 3: The vendors' educational level did not directly affect bacterial contamination • Thesis 4: The vendors' health awareness directly affected food preparation method • Thesis 5: The vendors' health awareness affected bacterial contamination • Thesis 6: Food preparation method did not affect bacterial contamination DISCUSSION The result of educational level examination of street food vendors at primary schools in Wiyung District, Surabaya indicated that most of the vendors were graduated from secondary schools or equal to secondary schools. This finding confirmed previous data released by Badan Pusat Statistik (2010). Badan Pusat Statistik stated that despite Indonesian government had launched nine-year compulsory education program for all Indonesians for a long time, the education level of Indonesians was relatively low7. This condition might be caused by relatively low social and economical condition and uneven distribution of educational institutions which most of these educational institutions could not cover the rural areas. The findings of this study also suggested that many street food vendors did not understand health aspects, such as personal hygiene and sanitary aspect. Although there were several street food vendors who understood health issues, they simply ignored the issues. These findings showed conformity with previous research regarding health awareness of street food vendors in Jakarta. She concluded that personal hygiene of street food vendors were low8. Most foods sold by street vendors in Wiyung-Surabaya primary school are kept inside a traditional container called "wakul" which is made of bamboo. The use of

this special container made of bamboo could stunt the growth of E.coli bacteria even without the street vendors themselves realizing it9. Most of street food vendors at primary schools in Wiyung District only concerned about hygienic containers. They assumed that as long as the foods were stored in hygienic containers, bacterial contamination would be impossible. They ignored several factors of bacterial contamination. This finding confirmed a previous research. She found that about 43% of street food vendors did not wash their hands before touching their products and serving their customers1. This habit significantly caused bacterial contamination and affected their products' hygiene. Indonesian Ministry of Health stated that hygienic hands were very important for every human especially for those who were touching or holding foods. The habit of washing hands would be very important in preventing bacterial contamination from hands to foods. This statement showed conformity with the findings of previous research. In her research, she stated that 64% of street food vendors did not use food clamps while serving their customers. Direct contacts between hands and food were the most common factor of bacterial contamination. During the touch, bacteria would be transferred from hands to the foods and eventually the bacteria would grow and multiply more easily in the foods, especially processed foods[1]. The findings of this research proved that the educational level of street food vendors affected their health awareness. This finding showed conformity with previous research. He found that education could affect health in different ways on different phases of life. It had been proven that educational level could provide more significant impact on mental health among the youths. This is somewhat similar to the finding that educated women tend to provide better healthcare, hygiene and are more likely to seek help when a child is ill10. In her study majority of the parents had education below the higher secondary and they were from the low socioeconomic groups10. Furthermore, Higgins (2008) explained that continuous health education taught through school curriculum, mass media, and by health institutions could relevantly affect the fresh graduates' knowledge about health and their behaviors[11]. Other finding reached by this research correlated to the effect of the vendors' health awareness on the way they prepare their products. There was a significant correlation between these variables. This finding confirmed previous research. In his research, he proposed that several technologies and health knowledge were identified as the factors affecting food preparation methods, either indoor preparation or outdoor preparation12. The findings of this research also indicated the impact of health awareness on bacterial contamination. Most of the vendors did not have sufficient health knowledge. Higgins is stating that the better health knowledge owned by a person, the more likely he/she could avoid infectious diseases. He also stated that health knowledge was vital in survivability11. This research suggested that educational level of the vendors did not directly affect food preparation methods and bacterial contamination because the questions about educational level were more focused on formal education. Proposed that health knowledge should be integrated to educational curriculum and taught to primary school students, secondary school students, high school students, high school students, and university/college students11. Meanwhile in The US, a special institution named Centers for Disease Control and Prevention (CDC) was established in 1994. This institution was intended to control and prevent food borne pathogens caused by foods sold at restaurants13. Escherichia coli was a micro biota normally found on human intestines. However, accumulated population of the bacteria might cause diarrhea. Diarrhea might also be caused by Klebsiella sp. Contamination14. The findings of this research indicated that there was no significant correlation between food preparation method and bacterial contamination. Based on observation results, it found out that the vendors always covered their products although several food vendors might cover their products using unhygienic covers. The covers might be contaminated

by fungi rather than being contaminated by bacteria. This finding showed conformity with previous research in two provinces, Central Java and Yogyakarta15. In this research, he found that most of covers used by street food vendors selling their products at primary schools in the two provinces had been contaminated by opportunistic fungi. A similar research he conducted found out that most of traditional street food vendors had been equipped with basin to wash their hands and waste bin. CONCLUSION Educational level has a direct and significant impact on health awareness with inner weight of 0.429. This means the higher educational level of vendors, the higher their health awareness levels. Health awareness has a direct and significant impact on food preparation method with inner weight of 0.416. This means the higher the vendor's health awareness, the better food preparation method. Health awareness has a direct and significant impact on bacterial contamination with inner weight -0.507. This means the higher the vendors' health awareness, the reduce bacterial contamination. RECOMMENDATIONS For Further Researchers 1. The further researchers should apply in-depth interview method in order to obtain more accurate and more reliable data. 2. The further researchers should also involve more respondents in order to obtain more reliable data. 3. The further researchers are expected to be able to identify the opportunistic and pathogenic fungi which may contaminate street food. REFERENCES 1. Susanna, D., Hartono B. Pemantauan Kualitas Makanan Ketoprak dan Gado-Gado di Lingkungan Kampus Universitas Indonesia Depok Melalui Pemeriksaan Bakteriologis. Makara Seri Kesehatan, 7(1) : 1 - 9, (2013) 2. Nanuwasa, Franklin, Munir. "Tata Laksana Higiene Hidangan, Keracunan Hidangan, Jenis Bakteria", Accessed on 29 November 2008. http://www.ihasmakassar.com 3. Mutiarawati D.T. Hubungan Tingkat Pendidikan Dengan Pengetahuan Kesehatan. Jurnal Analis Science Surabaya Indonesia, 1: 10 – 16, (2012) 4. Rini T. Model Kejadian Diare Pada Anak Sekolah Dasar Negeri Kecamatan Wiyung Surabaya. Jurnal Analis Science Surabaya Indonesia, 2: 9 – 14, (2013) 5. Brooks G.F., Carroll KC, Butel J.S., Morse S.A. Enteric Gram-Negative Rods (Enterobacteriaceae). In: Jawetz, Melnick and Adelbergs (eds), Medical Microbiology, (26th ed), McGraw-Hill, New York, 2007, pp. 229 - 243 6. Bambang O, Ed. Structural Equation Modeling, Institut Teknologi Sepuluh November's publisher: Indonesia, 63 – 83, (2009) 7. Badan Pusat Statistik. Tingkat Pendidikan Penduduk Indonesia, Badan Pusat Statistik's publisher: Indonesia, 23 – 27, (2010) 8. Marsaulina, Irnawati. Study Tentang Pengetahuan Perilaku Dan Kebersihan Penjamah Makanan Pada Tempat Umum Pariwisata Di DKI Jakarta (TMII, TIJA, TMR). Jurnal Fakultas Kesehatan Masyarakat Universitas Sumatera Utara, 3: 8 – 16, (2004) For Educational Institutions and Health Institutions 1. The findings of this research indicated that most of street food vendors did not understand health issues related to foods although most of them were graduated from secondary schools and even some of them were graduated from high schools. Based on this situation, the writers suggest that health knowledge should be integrated into educational curriculum or taught as local contents. 2. Health institutions, such as Community Health Centers or Puskesmas and Integrated Service Posts or Posyandu should provide counseling for the community. The counseling should be followed by monitoring on street food vendors held by Indonesia National Agency for Drugs and Food Control or BPOM in provinces. 9. Vijay kumar Singh, Rahul Shukla, Satish V, Shankul Kumar, Sumit Gupta and Ashutosh Mishra. Antibacterial Activity of Leaves of Bamboo. International Journal of Pharma and Bio Sciences, 1(2): 1 – 5, (2010) 10. Jayshree S. Dawane, Kanchan D, Borole, Vijaya A. Pandit And Sonali D. Salunkhe, Parents' Knowledge, Attitude And Perception About The Commonly Used Drugs And Their Adverse Drug Reactions in Children, International Journal of Pharma and Bio Sciences, 4(3): 461 – 468, (2013) 11. Higgins C., Lavin T., Metcalfe O, Ed. Health Impacts of Education: a review, Institute of Public Health's publisher: Ireland, 1 – 38, (2008) 12.

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