

Concept Of The Epidemiologic Triangle In The Workplace

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Abstract

The workplace is a potential source of hazards and risks for workers. Occupational Safety and Health (OSH) is a priority in efforts to reduce these risks through cooperation between employers and employees. Data from the International Labor Organization (ILO) shows a high number of deaths and injuries due to work accidents and work-related diseases. In Indonesia, reports from the Social Security Implementation Agency (BPJS) for employment reveal an increase in cases of work accidents from year to year. Occupational safety and health is an important factor in creating a proper working environment, with the concept of epidemiology helping to understand the host-agent-environment contribution. OHS protection efforts are crucial to reduce risks and improve well-being in the workplace.

Keywords: Epidemiologic Triangle, Workplace, OHS

INRODUCTIONN

The workplace is one location where there are many dangers and risks for workers. Occupational Safety and Health (K3) is an effort of cooperation, mutual understanding and participation of employers and employees in the company to carry out joint duties and obligations in the field of occupational safety, health and security in order to increase productivity. Through the implementation of K3, it is hoped that a safe, healthy workplace will be created which includes the personalities of employees, customers and visitors to a work location so as to reduce or be free from work accidents and occupational diseases. The implementation of OHS, among others, is based on PP No. 50 of 2012 concerning the Implementation of Occupational Safety and Health Management Systems, OHSAS 18001 international standard for the implementation of OHS Management Systems.

The mortality rate due to occupational accidents and occupational diseases is quite high. According to data from the International Labor Organization, every year around 380,000 workers or 13.7% of the 2.78 million workers die from

accidents at work or occupational diseases. Also, more than 374 million people are injured, wounded or fall ill every year due to accidents that occur with workers (ILO, 2018).

Based on accident data cases from the report of the Social Security Implementation Agency (BPJS) of employment, in Indonesia the number of work accidents reported increased in 2017 the number of work accidents reported was 123,041 cases, while throughout 2018 it reached 173,105 cases. Every year on average BPJS serves 130,000 cases of work-related accidents ranging from mild cases to cases of accidents with fatal impacts (BPJS, 2018).

According to (Ministry of Health, 2021), occupational safety and health is an important component of decent work. Physical conditions and mental demands in the workplace determine the condition of workers. Occupational accidents cause great human, social and economic losses, as well as occupational diseases and occupational diseases. So through the concept of epidemiology, it can be seen how the host-agent-environment contributes to the workplace environment.

METHODS

This research uses descriptive qualitative research methods. According to Sukmadinata (2016), this research aims to provide an overview and describe phenomena that occur both naturally and human engineering with a focus on the characteristics, quality and interrelationships between activities. The data source used in this research is secondary data. According to Sugiyono (2018) secondary data is a data source that does not directly provide data to data collectors. Secondary data in this study were obtained from reference books, journal documents, online news, archives and other literature reviews. The data collection method in this research is carried out through analysis, describing and explaining the condition of the data situation in the field based on the research problem being studied.

RESULT AND DISCUSSION

A. History of Epidemiology

a. Historical Figures of Epidemiology

Epidemiology has been known or introduced in the world of health and medicine for a long time. Some of the known people who have carved an important history in the development of epidemiology are :

1. Hippocrates (460-377 SM)

He is considered as The First Epidemiologist, the first epidemiologist in the world because he was the first person to propose the concept of rational analysis of disease incidence.

2. Galen (129-199 SM)

This Roman army surgeon is often considered the father of experimental physiology. He proposed the concept that health status is related to personality type and lifestyle factors.

3. Thomas Sydenham (1624-1689 SM)

This Englishman is often referred to as the English Hippocrates because of his statements that revived the Hippocrates on English soil and added the importance of detailing Hippocrates' concept of environmental (atmospheric) factors.

4. Antonie van Leeuwenhoek (1632-1723)

Leeuwenhoek was an amateur scientist who invented the microscope, discoverer of bacteria and parasites (1674), discoverer of the spermatozoa (1677).

5. Robert Koch

The name Robert Koch is familiar when associated with TB disease, he is the discoverer of TB disease in 1882, besides that Koch played a role in introducing tuberculin in 1890, which he considered as a way of treating TB disease.

b. Epidemiologic Historical Events

Cholera was a major global scourge in the 19th century with large-scale epidemics often occurring in European cities, especially those from the Indian subcontinent. John Snow conducted an early investigation into cholera epidemics in the UK and specifically in London in 1854. In that study he showed that contaminated water was the main source of the epidemic. His thorough investigation of the epidemic in the Soho district of London led to the conclusion that contaminated water from the Broad Street pump was the source of the disease and, consequently, the removal of the pump handle led to the halt of the epidemic.

John Snow further studied cholera in London homes that received water from two water supply systems; one from a sewage-contaminated section of the River Thames and the other drawing water upstream from an uncontaminated section of the river. Infection rates among customers of the distribution system drawing contaminated water far exceeded infection rates among customers served by the company drawing water from above the contaminated section of the river. This demonstration reinforced the goals of the sanitation movement, which developed sewage drainage systems and water purification systems in cities and towns in the following decades, thus significantly reducing the threat of cholera, typhoid and many waterborne diseases (Tulchinsky, 2018).

c. Occupational Safety and Health Epidemiology

According to Fannya (2020), the concept of workplace epidemiology is related to the occupational safety and health of workers. It addresses the effects of workplace exposures on the frequency and distribution of illness and injury in a population. Occupational safety and health epidemiology is the study of health effects caused by exposure factors (hazards) in the work environment. In addition, lifestyle (smoking, drinking, diet, exercise habits) is a secondary factor that modifies the variables accompanying exposure to workplace factors.

The purpose of OSH epidemiology is to determine the exposures that cause occupational diseases or health problems and recommend prevention efforts and provide data for future projections, assess exposure standards involving disease induction mechanisms and predict dose-response relationships, and develop Occupational Safety and Health Standards. The benefits of this study are that it can identify factors that play a role in the risk of occupational accidents and the occurrence of occupational diseases in the workforce, provide data needed for management planning and / or decision making, help evaluate occupational safety and health programs that are being or have been carried out by companies, and develop methodologies to analyze the state of a disease and the risk of occupational accidents in an effort to prevent, overcome and overcome them.

B. Occupational Diseases

Work is a necessity for humans to earn income to fulfill their needs. However, in the work environment, there are potential risks that can interfere with workers' health, whether it comes from environmental factors, work methods, or equipment used. Health problems in workers are also related to the duration of exposure to these risks. According to information from RSUD dr Iskak Tulungagung (2022), the diagnosis of occupational diseases involves seven steps that include determining the clinical diagnosis, identifying workplace exposures, the relationship between exposure and clinical diagnosis, and determining occupational diagnosis. The causes of occupational diseases can be grouped into five categories, including physical, chemical, biological, ergonomic, and psychosocial factors. Occupational diagnosis can be done by general practitioners or occupational specialists, as needed. Occupational diseases are diseases that can be triggered, facilitated, or aggravated by work, and can be caused by various factors such as physical, chemical, biological, and psychosocial..

C. Epidemiologic Triangle OHS Aspects



Gambar 1 Epidemiologic Triangle

Agents, in this context, are essential factors that must be present for disease to occur. Agents can be a variety of entities, both living things such as metazoans, fungi, protozoans, bacteria, rickettsia, and viruses that are infectious in nature, as well as non-living things such as chemicals, physical substances such as temperature, humidity, noise, ionizing radiation, and mechanical or impact forces. In addition, energy, abstract elements, and social atmosphere can also be disease agents. In excessive or deficient amounts, these agents become the main or essential cause of disease. Meanwhile, host refers to the population or organism that is the subject of the study, which is susceptible or exposed to the disease agent.

The host, which is the focus of research in this study, involves various elements that can influence the response to a disease agent. These elements include age, gender, national background, immunity level, individual behavior, and other factors that have the potential to interact between the host and the disease-causing agent. Meanwhile, the environment is briefly the place where the subject under study is located or everything due to its interaction with all elements of the atmosphere, hydrosphere, lithosphere, geography (climate, altitude), geology, biosphere, sociosphere (population size and distribution, socio-politics, education, economic development, etc.) for example, the physical condition of the workplace, such as building design, machine layout, ventilation system, and other environmental factors that can affect the risk of accidents or diseases (Saleh and Yanti, 2021).

D. Occupational Health Surveillance

Occupational health surveillance is the ongoing process of systematically collecting, analyzing, interpreting and disseminating data for prevention

purposes. Occupational health surveillance is designed to detect potential hazards in the workplace before health impacts occur and also to provide or obtain data related to where, how and why workers get sick or injured at work (Lele, 2018).

Occupational Health Surveillance is conducted by collecting data related to the health of workers, then identifying and focusing on how to manage exposure to hazards in the workplace with appropriate prevention activities and control or elimination of hazards. Occupational health surveillance programs are conducted by a number of public health programs to identify occupational diseases and then develop outreach and prevention services. According to Lele (2018), the steps to conduct occupational health surveillance are :

1. Risk assessment, which involves assessing exposure and assessing the risk of target organ damage. Identify hazardous agents, materials and processes, find out what the health risks are, review work processes and toxicity of materials and prepare a risk matrix, identify who may be at risk of exposure to the hazard and how, screenable health effects are those that can be detected at the pre-clinical stage and interventions at this stage are more beneficial than at later stages of disease.
2. Selection of objectives and target population, by identifying groups of workers who require surveillance or screening activities, periodic health checks at scheduled intervals.
3. Selection of testing and control procedures, by selecting standardized testing and quality control procedures for each health effect that can be screened depending on the target organ, such as whether certain workers require special tests, etc.
4. Data collection reconfirmation of analysis results.

E. Control Strategy

Host-agent-environment or epidemiological triangle control strategies in the workplace environment involve a deep understanding of the epidemiology, clinical features, sources, transmission routes, incubation period, and contagious period of

the infection. To prevent and control the spread of infection, measures need to be taken to eliminate the source of infection and transmission routes. Susceptible workers can be protected by using antibiotics or through immunization. Infection control in the workplace requires comprehensive knowledge of these aspects. Prevention and control measures include controlling sources of infection, transmission routes, and protection for vulnerable workers. This involves the use of personal protective equipment (PPE), implementation of standard precautions, and routine immunization of workers at risk (Aw and Blair, 2010).

Other strategies in controlling the epidemiological triangle in the workplace can also include strengthening regulations and harmonization, strengthening occupational health services, controlling health risk factors in the workplace, fostering human resources and occupational health professionals, integrated data and information, occupational health supervision and research development in an effort to support Occupational Safety and Health programs. Management in the workplace must carry out health protocol measures, implement hygiene and sanitation, workplace arrangements such as distance between seats, ventilation and maximum capacity in the room. Then for workers or laborers must implement K3 protocols and health protocols according to workplace rules (Widyawati, 2021).

F. Overview of the Host-Agent-Environment Concept in the Workplace

Research conducted by Wisudawati and Patradhiani (2020), a case study on a housing development project (PT. Grand Anugerah Wisata). PT Grand Anugerah Wisata is a housing development company in Palembang City, South Sumatra. As a construction project developer, the risk of work accidents can occur due to two things, namely humans who do not fulfill work safety and an unsafe environment. The Host-Agent-Environment concept in the context of the workplace refers to an approach to analyzing factors that affect occupational health and safety.

The main problem in this case is the identification and assessment of risks associated with work accidents that may occur during the process of building houses at PT Grand Anugerah Wijaya. From the research results, there are 27 potential risks with varying levels of risk, ranging from low to high. These risks include various hazards such as buried soil, tripping, injuries from hoes, slipping,

inhaling dust, being hit by building walls, falling from stairs, falling materials, being hit by wooden formwork, being hit by hammers, skin irritation from cement, and various other risks associated with the construction process. In addition, the main problem is also related to the risk control that needs to be done to reduce occupational hazards to building employees. Suggested mitigation efforts include substitution, administration, and the use of Personal Protective Equipment (PPE) to reduce the risk of work accidents.

In the context of the case, the Host-Agent-Environment concept is used to analyze the factors affecting occupational health and safety in the construction environment. Host refers to the workers or labor force involved in a housing construction project. Agent refers to risk-causing factors, such as chemicals, ergonomics, biology, and psychological factors that can affect workers' health and safety. Environment refers to the work environment where workers perform construction activities, including the physical condition of the workplace, equipment, and work processes.

By understanding the role of each element in the HostAgent-Environment concept, they can identify potential hazards and risks associated with work accidents, and plan appropriate risk controls to ensure the health and safety of workers in the construction environment.

CONCLUSIONS

Potential hazards or exposure to workers can come from the work environment, work methods and tools used at work. Health problems for workers are also closely related to the amount of exposure time, the longer the exposure, the greater the risk of health problems that will be obtained by workers. Therefore, Occupational Safety and Health is needed, which is a cooperative effort and participation of employers and employees to carry out joint duties and obligations in the field of occupational safety, health and security in order to increase productivity. As for the epidemiologic triangle in the workplace environment which involves an in-depth understanding of the epidemiology, clinical features, sources, transmission routes, incubation period and contagious period of the infection.

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