ABSTRACT

**Background:** Public Health Center is a workplace with the potential for occupational safety and health (K3) hazards to its officers, patients and visitors. The level of occupational safety and health risks can be significantly minimized by implementing safety behaviors. Increased safety behavior can be influenced by the practice of having interventions in the form of K3 training. Interventions are carried out based on risk assessments in the workplace.

**Objective:** This study aims to know the potential for hazards by conducting a risk assessment and assessing the effect of K3 training on actions based on operational procedures, use of personal
Potential hazards; safety behavior; health workers; K3 training.

1. INTRODUCTION

A workplace that has potential hazards is public health center of, both in terms of human resources, patients, patient companions, visitors, and the community around its environment [1]. Potential occupational safety and health hazards at public health center of include physical, chemical, biological and ergonomic hazards. Psychosocial hazards and occupational accidents. Health care facilities around the world employ more than 59 million workers who are exposed to a variety of complex health and safety hazards every day [2]. The results of a study conducted on 182 first-level health workers in the city of Bahar Iran, the prevalence of occupational injuries among staff was 57.7% where the highest exposure rate was attributed to needles (84.8%) [3]. This is strengthened with a research carried out by Fani et al. (2010) who stated that 74.4% dental poly in public health center throughout Banyumas regency did not manage properly (unsafe) sharp objects making them at risk of being pierced by a needle.

Unsafe behavior of public health center workers increases the risk of occupational accidents and occupational diseases. The risk of occupational accidents, among others, struck with a needle that has the potential to cause occupational diseases, namely hepatitis, HIV.

Safety behavior category that can be observed include operational procedures, use of personal protective equipment, work posture and tools and equipment (WSH Council, 2014). The occurrence of accidents, injuries and illnesses in the workplace is related to worker behavior. This is based on Heinrich's theory that 73% of workplace accidents are "human failures". Heinrich further categorized the matter, arriving at the claim that 88% of all accidents, injuries, and illnesses were caused by worker error, i.e. unsafe behavior [4]. Descriptive findings have shown that 21% of health professionals reported one or two injuries during the past 12 months where the injury was due to unsafe behavior [5].

Safety behavior is influenced by the practice of integrated safety interventions, where the first level is management intervention and the second level is technical and human intervention [6]. Training as an intervention is widely recognized as an essential component of occupational hazard control and risk management programs. Proper risk assessment is an essential prerequisite for focused intervention on safety behavior [7].

The number of public health center in South Konawe regency is 24 with a working area of 25 sub-districts. There are 19 public health center (79.2%) that have not been standardized with the Ministry of Health Regulation 75/2014 regarding public health center facilities and infrastructure that must meet K3 requirements. Then it is emphasized again by the regulation of the minister of health Number 52 of 2018 that the management of health service facilities and infrastructure must be based on the aspects of occupational safety and health. Facilities and infrastructure conditions that do not meet safety standards will create a risk of work accidents...
from minor to fatal (Ministry of Health of the Republic of Indonesia, 2018).

Data from South Konawe Regency Health Office (2019), as many as 487 health workers at the public health center who were screened, there were 19 (3.9) who were positive for Hepatitis. Health workers who experienced hepatitis at public health center of Wolasi were the largest cases in the South Konawe area. Based on the background that has been described, the problem of potential hazards is formulated in public health center of Wolasi and how the effects of K3 training on safety behavior based on implementation procedures, use of personal protective equipment, work posture, tools and equipment. Based on risk assessment devised a form of intervention. In addition, the purpose of this study is to assess the effect of K3 training on safety behavior based on implementation procedures, use of personal protective equipment, work posture and tools and equipment.

2. MATERIALS AND METHODS

2.1 Research Type

This research was conducted at public health center Wolasi South Konawe Regency, Southeast Sulawesi Province in February - April 2020. The type of research used was descriptive observation with a passive participatory design and quasi-experimental with a pre test post test one group design.

2.2 Population and Sample

The population consisted of all health workers at public health center Wolasi, namely 35 people. A sample of 20 people were selected by purposive sampling who met the inclusion criteria, namely hepatitis screening, direct contact with patients, using syringes / sharp objects, risk of exposure to patient substances and requiring personal protective equipment.

2.3 Data Collection Technique

The data were collected using an observation checklist consisting of two parts, namely the first part consisting of data on the identification of potential hazards for training materials and the second part consisted of a checklist for the safety behavior of officers when carrying out an injection action.

2.4 Data Analysis

Hazard identification data was processed using hazard potential identification, risk assessment and risk control based on Regulation of the Minister of Health Number 52 regarding K3 in health care facilities.

2.5 Intervention

Training programs were designed and implemented by the researcher to improve safety behavior skills of health workers regarding occupational safety and health. The training materials and pocket books provided were based on the development results of the introduction of potential hazards carried out by the researcher and literature studies and revised by 2 experts in the field of K3 and public health. The training was carried out 1 day for 10 JPL with training materials focusing on K3 in health care facilities, potential hazards and control of potential hazards at public health center Wolasi. Meanwhile, to control the intervention for 30 days, a pocket book was given every week with book material focusing on implementation procedures, personal protective equipment, work positions and equipment and supplies when performing injection procedures.

3. RESULTS

Table 1 Assessment of the potential hazards of seven rooms at public health center Wolasi by identifying potential hazards, risk assessment, and risk control. All rooms were equipped with potential hazards. There were potential physical, chemical, biological, psychosocial, ergonomic, and occupational hazards at public health center Wolasi. It should be processed with details of 5 potential hazards in low risk category, 12 potential hazards in medium risk category and 18 potential hazards in high risk category.

Table 2 The distribution of public health center officers was dominated by the age group of 20-29 years, amounting to 13 people (65%), all respondents were 20 women (100%), the type of workforce were more than 13 midwives (65%) and the distribution of working years (<4 years) were more, namely 14 people (70%).

Table 3 The effects of K3 training on actions based on implementation procedures. The statistical test results obtained p value (0.000 <0.05), which means that there is a significant effect of occupational health and safety training.
The results showed that there was a significant effect on safety behavior in the aspect of action based on implementation procedures, use of personal protective equipment, tools and equipment. Safety behavior is influenced by antecedents and consequences [8]. Improving safety behavior requires self-awareness efforts by conducting socialization or training as an antecedent. Training is the main way to prevent injuries and keep health workers from carrying out health efforts [9]. The success of safety behavior interventions by providing educational programs in the form of training can also be seen in research conducted by Bijani et al. [10] where there is an effect of training on the safety behavior of nurses, namely 24 nurses (40%) were exposed to needle stick injuries before the intervention, and the number decreased to 9 nurses (15%) after the intervention.

Officer safety behavior in changes after intervention was action based on implementation procedures that focus on safe injection procedures. This research is in line with research Mamashli et al. [11] who stated that there is an effect of training (p <0.05) on safe injection procedures for nurses. Health care facilities require a standard operating procedure (SOP) for each step or procedure for injection procedures. Although there are standard operating procedures for safe injection in health care facilities, however Foda et al. [12] and Van et al. [13] found that only a small group of nurses performed the injection procedure safely. The results of the observations of the researcher were officers who after carrying out the injection would put the syringe indirectly into its disposal, therefore this could pose a risk of work accidents [14].

In this study, there was a significant effect of K3 training on actions based on the use of personal protective equipment (masks, gloves, and aprons) during injection. This is in line with research Sari et al. [15] who stated that there is an effect of training (p <0.05) on nurses' behavior in using personal protective equipment. However this research was not in line with Van et al. [16] who said that there was no effect of training on the behavior of using gloves and glasses over time (p> 0.05). The results of the researchers' observations were that officers did not feel comfortable wearing masks, as well as aprons, so this was also a risk factor for being exposed to aerosols in the workplace.
Table 1. Identification of potential hazards

| Room           | Potential Hazard Factors                | Impact                      | Risk Probability | Risk Consequence | Risk Level | Priority |
|----------------|-----------------------------------------|-----------------------------|------------------|------------------|------------|----------|
| Emergency Room | Physical - Hot temperature - Lighting   | Tired easily                | Possible         | Light            | Low        | Priority 3 |
|                | Chemical - Antiseptic - Disinfectant    | Respiratory Diseases Irritation | Possible         | Intermediate    | Intermediate | Priority 2 |
|                | Biological - Body fluids - Blood splash - Virus - Bacteria - Fungi - Vector animals | Contract the disease from patient | Very Possible    | Intermediate    | High       | Priority 1 |
|                | Psychosocial - Shift work - Relationship with the patient / patient's family - An emergency | Tired Work stress | Very Possible    | High             | High       | Priority 1 |
|                | Ergonomics - Manual lift - Work posture is not ergonomic - Occupational accidents - Needled - Cut by a sharp tool - Explosions | Muscle Disorders and order | Possible         | Intermediate    | Intermediate | Priority 2 |
|                | - Trauma - Wounds - Contracting the patient's disease - Dead | Trauma | Very Possible    | Severe           | High       | Priority 1 |
| Genal Poly     | Physical - Hot temperature | Get tired quickly | Possible         | Light            | Low        | Priority 3 |
|                | Chemical - Disinfectant - Antiseptic   | Respiratory disease Skin disorders | Possible         | Intermediate    | Intermediate | Priority 2 |
| Room            | Potential Hazard Factors                                                                 | Impact                                      | Probability | Consequence | Risk Level | Priority |
|-----------------|-----------------------------------------------------------------------------------------|---------------------------------------------|-------------|-------------|------------|----------|
| Biological      | - Virus                                                                                 | Contracting from patient's disease          | Very Possible | High        | High       | Priority 1 |
|                 | - Bacteria                                                                              |                                             |             |             |            |          |
|                 | - Fungi                                                                                 |                                             |             |             |            |          |
|                 | - Splash of body fluids                                                                  |                                             |             |             |            |          |
|                 | - Blood fluid                                                                           |                                             |             |             |            |          |
| Psychosocial    | - Monotonous work                                                                       | Boredom                                    | Very Possible | Light      | Intermediate | Priority 2 |
|                 | - Workload                                                                              | Tired                                      |             |             |            |          |
|                 | - Relationship between staff and patient / patient's family                             | Work stress                                |             |             |            |          |
| Ergonomics      | - Awkward posture                                                                       | Muscles disorders                          | Possible    | Intermediate | Intermediate | Priority 2 |
| Occupational Accident | - Needled                           | Wounds                                     | Very Possible | High       | High       | Priority 1 |
|                 | - Cut by a sharp object                                                                 | Contracting from patient's disease         |             |             |            |          |
| Dental Clinic   | Physical                                                                               | Get tired quickly                          | Possible    | Light       | Low        | Priority 3 |
|                 | - Hot temperature                                                                       |                                             |             |             |            |          |
|                 | - Vibration                                                                             |                                             |             |             |            |          |
| Chemical        | - Disinfectant                                                                          | Respiratory disorders                      | Possible    | Intermediate | Intermediate | Priority 2 |
|                 | - Antiseptic                                                                            | Skin disorders                             |             |             |            |          |
| Biological      | - Virus                                                                                 | Contracting from patient's disease          | Very Possible | Intermediate | High       | Priority 1 |
|                 | - Bakteria                                                                              |                                             |             |             |            |          |
|                 | - Fungi                                                                                 |                                             |             |             |            |          |
|                 | - Splash of body fluids                                                                  |                                             |             |             |            |          |
|                 | - Blood splash                                                                          |                                             |             |             |            |          |
| Psychosocial    | - Workload                                                                              | Tired                                      | Very Possible | Intermediate | High       | Priority 1 |
|                 | - Work stress                                                                           | Work stress                                |             |             |            |          |
| Ergonomics      | - Awkward posture                                                                       | Muscle disorders                           | Very Possible | Intermediate | High       | Priority 1 |
|                 | - Grasping                                                                              |                                             |             |             |            |          |
| Room                     | Potential Hazard Factors                                                                 | Impact                  | Risk | Risk Level | Priority |
|--------------------------|----------------------------------------------------------------------------------------|-------------------------|------|------------|----------|
|                          |                                                                                       |                         | Probability | Consequence |          |
|                          | - Repeated movements                                                                   |                         | Very Possible | Severe      | High     |
|                          | - Standing for long                                                                    |                         |                |             |          |
|                          | **Occupational Accidents**                                                              | Wounds                  |                |             |          |
|                          | - Needled                                                                               | Injury                  |                |             |          |
|                          | - Cut by a sharp tool                                                                   | Dead                    |                |             |          |
|                          | - Finger bitten by a patient                                                           |                         |                |             |          |
|                          | - Explosions                                                                           |                         |                |             |          |
|                          | **KIA & MTBS Rooms**                                                                   | Respiratory disease     | Possible       | Intermediate | Intermediate | Priority 2 |
|                          |                                                                                       | Skin disorders          |                |             |          |
| KIA & MTBS Rooms         | **Chemical**                                                                           | Contracting from patient’s disease | Very Possible | Intermediate | High     |
|                          | - Antiseptic                                                                           |                         |                |             |          |
|                          | - Disinfectant                                                                         |                         |                |             |          |
|                          | - Mercury                                                                              |                         |                |             |          |
|                          | - Medicines and chemical solutions                                                      |                         |                |             |          |
|                          | **Biological**                                                                         | Work stress             | Possible       | Intermediate | Intermediate | Priority 2 |
|                          | - Virus                                                                                |                         |                |             |          |
|                          | - Bakteria                                                                             |                         |                |             |          |
|                          | - Fungi                                                                                |                         |                |             |          |
|                          | - Body fluids                                                                          |                         |                |             |          |
|                          | - Blood fluid                                                                          |                         |                |             |          |
|                          | **Psychosocial**                                                                       |                         |                |             |          |
|                          | - Work shifts                                                                          |                         |                |             |          |
|                          | **Ergonomics**                                                                         | Work stress             | Possible       | Intermediate | Intermediate | Priority 2 |
|                          | - Awkward posture                                                                      |                         |                |             |          |
|                          | **Occupational Accidents**                                                             | Wounds                  | Possible       | Severe      | High     |
|                          | - Needled                                                                              |                         |                |             |          |
|                          | - Cut by a sharp tool                                                                   |                         |                |             |          |
|                          | **Immunization Room**                                                                  | Work stress             | Possible       | Light       | Low      |
|                          | **Physical**                                                                           |                         |                |             |          |
|                          | - Hot temperature                                                                       |                         |                |             |          |
|                          | - Lack of lighting                                                                      |                         |                |             |          |
|                          | **Chemical**                                                                           | Respiratory Disease     | Possible       | Intermediate | Intermediate | Priority 2 |
|                          |                                                                                       | Skin disorders          |                |             |          |
|                          |                                                                                       | Irritation              |                |             |          |

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| Room             | Potential Hazard Factors            | Impact                                      | Risk Probability | Risk Consequence | Risk Level | Priority |
|------------------|------------------------------------|---------------------------------------------|------------------|------------------|------------|----------|
| Biological       | - Virus                            | Contracting drom                            | Very Possible    | Intermediate     | High       | Priority 1|
|                  | - Bakteria                         | Patient’s disease                           |                   |                  |            |          |
|                  | - Fungi                            |                                              |                   |                  |            |          |
|                  | - Blood splash                     |                                              |                   |                  |            |          |
| Occupational     | - Needled                          | - Wounds                                    | Very Possible    | Severe           | High       | Priority 1|
| Accidents        | - Slipped                          | - Injury                                    |                   |                  |            |          |
|                  | - Struck by something              | - Dead                                      |                   |                  |            |          |
| Laboratory       | Chemical                           | Respiratory disease                         | Possible         | Intermediate     | Intermediate| Priority 2|
|                  | - Disinfectant                     | Skin disorders                              |                   |                  |            |          |
|                  | - Antiseptic                       |                                              |                   |                  |            |          |
| Biological       | - Splash of body fluids            | Contracting from                            | Very Possible    | Intermediate     | High       | Priority 1|
|                  | - Blood fluid                      | patient’s disease                           |                   |                  |            |          |
|                  | - Virus                            |                                              |                   |                  |            |          |
|                  | - Bacteria                         |                                              |                   |                  |            |          |
|                  | - Fungi                            |                                              |                   |                  |            |          |
|                  | - Vector animal                    |                                              |                   |                  |            |          |
| Occupational     | - Needled                          | Wounds                                      | Very Possible    | Severe           | High       | Priority 1|
| Accidents        | - Cut by a sharp object            | Injury                                      |                   |                  |            |          |
|                  | - Slipped                          |                                              |                   |                  |            |          |
| Delivery         | Physical                           | Get tired quickly                           | Possible         | Light            | Low        | Priority 3|
| Room             | - Hot temperature                  |                                              |                   |                  |            |          |
| Chemical         | - Disinfectant                     | Respiratory diseases                        | Possible         | Intermediate     | Intermediate| Priority 2|
|                  | - Antiseptic                       | Skin disorders                              |                   |                  |            |          |
| Biological       | - Splash of body fluids            | Contracting from                            | Very Possible    | Intermediate     | High       | Priority 1|
|                  | - Blood fluid                      | patient’s disease                           |                   |                  |            |          |
|                  | - Virus                            |                                              |                   |                  |            |          |
| Room          | Potential Hazard Factors                              | Impact                | Risk Probability | Risk Consequence | Risk Level | Priority |
|--------------|------------------------------------------------------|-----------------------|-----------------|------------------|------------|----------|
|              | - Bacteria                                           | Tired                 | Very Possible   | Intermediate     | High       | Priority 1 |
|              | - Fungi                                              | Work stress           |                 |                  |            |          |
|              | - Vector animals                                     |                       |                 |                  |            |          |
|              | Psychosocial                                         |                       |                 |                  |            |          |
|              | - Workload                                           |                       |                 |                  |            |          |
|              | - Work shifts                                        |                       |                 |                  |            |          |
|              | - Relationship between staff and patient / patient's family |                       |                 |                  |            |          |
|              | - An emergency                                       |                       |                 |                  |            |          |
|              | Ergonomics                                           | Muscle Disorders and order | Very Possible | Intermediate     | High       | Priority 1 |
|              | - Manual lift                                        |                       |                 |                  |            |          |
|              | - Awkward posture                                    |                       |                 |                  |            |          |
|              | Occupational Accidents                               | Wounds Injury         | Very Possible   | Severe           | High       | Priority 1 |
|              | - Needled                                            |                       |                 |                  |            |          |
|              | - Cut by a sharp object                              |                       |                 |                  |            |          |
|              | - Slipped                                            |                       |                 |                  |            |          |
Table 2. Distribution of characteristics of officers at public health center Wolasi

| Variable                | Type of Respondents |
|-------------------------|---------------------|
| Age Group               | n   | %   |
| 20 – 29 yrs             | 13  | 65  |
| 30 – 39 yrs             | 4   | 25  |
| 40 – 49 yrs             | 2   | 10  |
| ≥ 50 yrs                | 1   | 5   |
| Sex                     |      |     |
| Male                    | 0   | 0   |
| Female                  | 20  | 100 |
| Type of Workforce       |      |     |
| Doctor                  | 2   | 10  |
| Nurse                   | 4   | 20  |
| Midwive                 | 13  | 65  |
| Health Analysis         | 1   | 5   |
| Work period             |      |     |
| < 4 yrs                 | 14  | 70  |
| ≥ 4 yrs                 | 6   | 30  |

Table 3. The effect of occupational safety and health (K3) training on actions based on the officer implementation procedure at public health center of Wolasi

| Implementation Procedures | Statistical value |
|---------------------------|-------------------|
|                           | n  | Mean | SD  | Min | Max | P Value |
| Pre test                  | 20 | 49,2 | 16,3| 28,5| 85,7| 0,000   |
| Post test                 | 20 | 78,5 | 17,6| 28,5| 100 |         |

Source: Primary Data 2019; Test: Wilcoxon Signed Ranks Test

Table 4. The effect of occupational health and safety training (K3) on actions based on the use of personal protective equipment (PPE) for officers at public health center of Wolasi

| Personal protective equipment | Statistical value |
|------------------------------|-------------------|
|                              | n  | Mean | SD  | Min | Max | P Value |
| Pre test                     | 20 | 40,0 | 22,0| 25,0| 100 | 0,000   |
| Post test                    | 20 | 90,0 | 12,5| 75,0| 100 |         |

Source: Data primer 2019; Test: Wilcoxon Signed Ranks Test

The statistical test results of the effect of K3 training on actions based on work posture showed (p = 0.164> 0.05), meaning that there is no significant effect of K3 training on actions based on work posture. The results of observations and interviews with the researcher, there were officers who felt that the current position was fine and felt comfortable thus the presence of K3 training within a month had no significant effect on actions based on work posture.

Ergonomics training plays a big role in creating safety behaviors. Training makes workers to possess the correct skills to work ergonomically, therefore workers feel comfortable doing their jobs. However, [17] after the training, the health workers at public health center Wolasi still often perform non-ergonomic work positions when providing services to patients. Manual lifting, awkward positions and slouching increase the risk of back problems for health workers [18]. However, this study was not in line with Salah et al. [19] which showed that the implementation of body mechanics training (p <0.05) increased safety behavior, thus it was positively correlated with the intensity of back pain in nurses.
Table 5. The effects of occupational safety and health (K3) training on the work posture of officers at public health center of Wolasi

| Work Posture | Statistical value |
|--------------|-------------------|
|              | n  | Mean | SD | Min | Max | P Value |
| Pre test     | 20 | 58.2 | 23.8 | 33.3 | 100 | 0.164 |
| Post test    | 20 | 68.2 | 25.3 | 33.3 | 100 |         |

Source: Primary Data 2019; Test: Wilcoxon Signed Ranks Test

Table 6. The effects of occupational safety and health (K3) training on the use of tools and equipment for officers at public health center of Wolasi

| Tools and Equipment | Statistical value |
|---------------------|-------------------|
|                     | n  | Mean | SD | Min | Max | P Value |
| Pre test            | 20 | 54.9 | 19.5 | 33.3 | 100 | 0.003 |
| Post test           | 20 | 79.9 | 19.9 | 33.3 | 100 |         |

Source: Primary Data 2019; Test: Wilcoxon Signed Ranks Test

Training is the main way to prevent injuries and keep health workers from carrying out health efforts (Republik Indonesia, 2014). Not performing recapping techniques when injecting is a safety behavior that has increased after intervention. In line with Miner et al. [20] who stated that there is an effect of training (p <0.05) on recapping techniques among health workers in Nigeria. Swe et al. [21] explained that as much as 50.3% of health workers in Malaka use the syringe recapping technique.

The availability of an adequate supply of equipment and disposable supplies at the health care facility is a must and also the provider ensures that staffs use new equipment for each procedure. The statistical test results of the effect of K3 training on the action of work tools and equipment (p = 0.03 <0.05) means that there is a significant effect on the actions and tools and equipment. The tools and equipment assessed here checks the condition of the tool before working, wears footwear, and does not recapping syringes. The results of the researchers' observations were that there were officers who wore ordinary footwear / sandals. After K3 training, there was a change in the use of proper footwear. This is also in line with research which states that as much as 20.1% of officers wear safety shoes when carrying sharp objects [22].

5. CONCLUSION AND SUGGESTION

The results of the study can be concluded that there are 5 potential hazards in the low risk category, 12 potential hazards of medium risk and 18 potential hazards of high risk categories. There is a significant effect of occupational safety and health training (K3) on safety behavior based on implementation procedures, use of personal protective equipment and use of tools and equipment. There is no significant influence on health behavior based on work posture. It is recommended for officers to always be disciplined in carrying out their duties according to the SOP at respective public health center. In addition, it is recommended to form a K3 team at respective public health center that oversees the implementation of occupational safety and health and socializes the importance of implementing the Minister of Health regulation Number 52 year 2018.

CONSENT

As per international standard or university standard, patients' written consent has been collected and preserved by the author(s).

ETHICAL APPROVAL

As per international standard or university standard written ethical approval has been collected and preserved by the author(s).

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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