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Temephos Resistance in Prevention of Dengue Cases: Literature Review

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A B S T R A C T

Dengue is an acute disease caused by bites from the Aedes aegypti mosquito. The decrease in the rate of dengue cases is due to the control of larval vectors using larvicide intervention. But overuse can result in resistant vectors. Temephos is a larvicide that has been circulating and used by the community for a long time. Aedes aegypti larvae are reported to be resistant in many countries. This study determined the resistence level of Aedes aegypti larvae to temephos. Scientific article searches in several databases were using keywords from 2018-2022. This research used the literature review method by searching articles from indexed journals as a source of information. Results from the synthesis of literature review found that temephos has experienced resistance in several countries, including Indonesia. The WHO standard for temephos of about 0.02 mg/L has experienced death resistance to the larvae of the Aedes aegypti mosquito. Resistance occurred due to the concentration of temephos used by the community to control dengue larvae. The results of studies with a concentration of 1% temephos have occurred mortality larvae dengue resistance. So, concentration level of temephos use has had a resistance impact on controlling dengue cases in various countries.

INTRODUCTION

Dengue fever is the most vital vector-borne disease. Dengue fever is also a sickness that causes a big problem in the community. The primary strategy for controlling dengue fever is to reduce the population of vectors using insecticides. However, insecticide packages are a contributing issue in improving vector resistance (Morales et al., 2019). Acute ailment due to the virus is spread through the bite of Aedes mosquitoes, specifically Aedes albopictus and Aedes aegypti (Hasan et al., 2016; Candra, 2010; Kraemer et al., 2015). The disease is contagious in subtropical and tropical regions, especially Central America, Southeast Asia, America, and the Caribbean, including Indonesia. It puts the world's 3.9 billion people at risk for contracting it (Candra, 2010; Sarwar, 2014; Wowor, 2017).

According to WHO, the number of dengue cases is estimated to reach 390 million yearly, of which 96 million are severe. The regions are high dengue-endemic countries, especially the United States, Southeast Asia, and the Western Pacific, where two point five billion populations, or two-fifths of the world's society, are at high risk of dengue fever. Republic of Indonesia is one of the endemic regions of dengue fever in Southeast Asia. A calculated five-hundred thousand population with dengue fever are hospitalized each year, and about 2.5 of them die. Indonesia has the second largest dengue case rank among the 30 endemic region countries (Kemenkes, 2018). 90.08% of districts/cities in Indonesia were declared endemic in 2016. Incidence Rate (IR) of dengue in 2016 amounted to 78.85 per 100,000

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populations, and a drastic decrease in 2017 to 26.12 per 100,000 populations. The top three provinces with the highest dengue deaths in 2017 were East Java, Central Java, and West Java. All districts/cities in Central Java have contracted dengue (Kemenkes, 2018; Jateng, 2017).

Vector control remains the only intervention available to prevent and control dengue transmission (WHO, 2011). One of the causes of the decrease in cases is the intensive dengue vector control efforts, mainly routine flick monitoring and larvicides using temephos (Fenisenda, 2016). But unfortunately, insecticides used for long periods can result in resistance to mosquitoes and larvae of Aedes aegypti (Istiana et al., 2012). Resistance of Aedes larvae to temephos has been revealed in Sumbawa Regency, Tasikmalaya City, DKI Jakarta, and Surabaya City (Simbawara, 2017; Fuadzy & Hendri, 2015; Setiyani et al., 2016; Mulyatno et al., 2012). Resistance to larvae has occurred in various countries including, Brazil, Colombia, Thailand, and Malaysia (Braga et al., 2005; Grisales et al., 2013; Ponlawat et al., 2005; Chen et al., 2013).

Resistance happens when larvae cannot be eliminated with a standard dose, or the larvae manages to avoid exposure to insecticides (Prasetyowati et al., 2016). Temephos and malathion organophosphates have become Indonesia's main insecticides for mass larvicides and fogging, respectively (Organization et al., 2009). However, the long-term use of these chemicals has contributed to the development of resistance by Ae. Aegypti (Arslan et al., 2016). This condition allows resistance to Aedes larvae due to the utilization of insecticides in abate and fogging in the elimination of dengue larvae. This study aims to describe the resistance condition of Aedes larvae to temephos use.

METHOD

The method used in this article was a literature review. The mechanism according to this method was to search for international literature using the ScienceDirect, Pubmed, and Google Scholar databases. The search was designed based on PICO examples: patient, population & problem (P), intervention, prognosis & factor (I), comparison (C) & output (O). In the initial term of resistant search, insecticides, larvicides, and temephos it produced the output of 12 international journals according to 2017 to 2022 that meet the selection criteria. Research design was a literature review article. The data used in this study is secondary data. Secondary data sources were obtained from trusted national and international journal articles with certain topics. The selection criteria include all English research journals that review temephos resistance to prevent and control dengue vectors published between January 2017 and April 2022.

Research should also deliver results measuring resistance levels, including doses of temephos at the insecticide or larvicide step to reduce dengue vectors. Good research design uses quantitative, and qualitative analysis by examining the temephos resistence in an area. Exclusion criteria are non-original publications such as abstracts, but articles with ambiguous titles and abstracts from all selected

publications are reviewed and evaluated. Once the abstract inclusion criteria are met, the journal will be thoroughly re-screened to find the correct journal results.

RESULT

The results of the literature review can be explained as follows:

Table 1. Completeness of Important Reports

No	Author, Country, & Title	Methods & Locations	Results	Accreditation Journal
1	Diego Morales, Ecuador, *Resistance Status of Aedes Aegypti to Deltamethrin, Malathion, and Temephos in Ecuador*	A descriptive study & 14 locations on the Pacific coast and Amazon basin regions of Ecuador	MRA-734 Mosquitoes from all the places revealed resistance to deltamethrin & susceptibility to malathion. Then, the larvae of Aedes mosquitoes confirmed resistance to temephos in five of the fourteen places analyzed.	Scopus/ 3rd quartile
2	Sébastien Boyer, Cambodia, *Resistance of Aedes aegypti (Diptera: Culicidae) Populations to Deltamethrin, Permethrin, and Temephos in Cambodia*	This study characterized the insecticide resistance status of Ae aegypti from rural and urban locations in Cambodia	All the subject populations a decrease mortality charge to temephos in comparison with the touchy stress with Resistance ratio 50 (RR50) varying from 3.3 to 33.78 and RR90 from 4.2 to forty-seven as compared with the sensitive pressure, demonstrating a generalized resistance of larvae to the temephos in Cambodia	Web of Science Group and Scopus/ 2nd quartile
3	Hasanuddin Ishak, Indonesia, *Resistance Status in Aedes Aegypti Strain from North Toraja, Indonesia to Malathion and Temephos Insecticides*	This type of research is a quasi-experiment. Assays to determine resistance status was conducted using WHO standard method	Aedes aegypti mosquitoes (high-level endemic pressure) adults turned resistant to Malathion zero at eight percent, & which showed tolerance to Malathion five concentrations. It contrast, Aedes larvae were susceptible to Temephos at one percent. Aedes aegepti (non-endemic pressure) had been liable to Malation zero point eight percent, Malathion five percent & Temephos one percent.	Scopus in 2018/ 4th quartile
4	Dessy Triana, Indonesia, *Entomological Parameters and Characterization of Insecticide Resistance in Dengue Vector Aedes Aegypti Larvae from Bengkulu*	This study utilized experimental & cross-sectional with post-control only design	Mortality of larvae after twenty-four hours with more than one awareness of temephos indicatory of high resistance. Entomological indicators for house items, CI (container index), & box pupa index (CPI) in Gedang village Street & Lingkar Barat village were envisioned: seven percent, twelve percent for house items & one point ninety-seven percent, three-point forty three percent for CI, and five percent, two percent for CPI, respectively.	Scopus/ 4th quartile

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	City, Indonesia			
5	Sebastien Boyer, Cambodia, *Monitoring insecticide resistance of adult and larval Aedes aegypti (Diptera: Culicidae) in Phnom Penh, Cambodia*	We tested 14 adulticides belonging to the carbamate, organochlorine, organophosphate, and pyrethroid insecticide families and three larvicides	Excessive mortality charges had been observed with carbamate, organophosphate, and organochlorine (excluding dichlorodiphenyltrichloroethane) pesticides (i.e., among 87.6 and a hundred %). In contrast, low mortality quotes had been located with all of the tested pyrethroid insecticides (i.e. Among 1 and 35%). For larvae, no resistance towards Bti turned into detected [resistance ratio (RR90<1.6)]. However, moderate resistance changed into located for temephos and spinosad (RR90<five.6).	Scopus/ 1st quartile
6	Hafiz Azhar Ali Khan, Pakistan, *Resistance Status to Deltamethrin, Permethrin, and Temephos, Along with Preliminary Resistance Mechanism in Aedes aegypti (Diptera: Culicidae) From Punjab, Pakistan*	We evaluated 12 field strains of Ae. aegypti from Punjab for resistance against deltamethrin, permethrin, and temephos, along with underlying resistance mechanisms.	For temephos, five field strains, viz. Kasur, Faisalabad, Gujranwala, Lahore, & Rawalpindi showed a high stage of resistance; five strains, viz. Sahiwal, Sheikhupura, Pattoki, Okara, & Sialkot showed moderate resistance, & traces from Sargodha & Multan showed low resistance to temephos.	Scopus/ 1st quartile

DISCUSSION

Temephos resistance has occurred in various countries in the handling and controlling dengue cases. This has been proven from research that found the occurrence of temephos resistance. In Lao Country, PDR has been using temephos as a control of dengue vectors since 1987 and is suspected to be the leading cause of moderate to high resistance cases in Aedes aegypti and Aedes albopictus mosquitoes (Marcombe et al., 2018). The results found that temephos had experienced resistance in 5 regions of the 14 regions analyzed (Morales et al., 2019). This is in line with cases of insecticide resistance in Aedes aygypti mosquitoes that have also been reported from Pakistan (Mohsin et al., 2016). Then another study also said that all populations studied had shown low mortality from temephos with sensitive strain levels based on resistance ratio 50 (RR50) varying from 3.3 to 33.78 and RR90 from 4.2 to 47 compared to sensitive strains. A statement of high generalized resistance of dengue larvae death to temephos in Cambodia (Boyer et al., 2018). The results of this study are also in line with that in Brazil, similar cases of resistance were also reported for surveillance, with RR 50 ranging from 2.5 to 4.1 for mosquito populations that are highly resistant to temephos (Dos Santos Dias et al., 2017).

In addition, still in Cambodia, there has been a moderate resistance level of temephos of RR90<5.6 (30). While in Indonesia, some studies also deliver results that show resistance to temephos. Aedes aegypti mosquitoes in high endemic strains occur cool to temephos at a concentration of 1%, and Aedes aegypti (non-endemic strain) is also susceptible in the concentration range of 1% temephos (Ishak & Ponno, 2018). This condition has also been reported there are in at least four urban populations related to cases of Aedes aegypti mosquito resistance that have also been reported in Cambodia (Boyer et al., 2018).

From other studies, the mortality rate of Aedes aegypti larvae after 24 hours from multiple concentration temephos administration has indicated high resistance. This is based on entomological indicators for HI (House Index), CI (Container Index), and CPI (Container Pupa Index) calculated at 7%, 12% for HI, 1.97%, 3.43% for CI, and 5%, 2% for CPI (Triana et al., 2021). In Pakistan, there has also been found resistance to the use of temephos. There are five places in the region with high temephos resistance: Faisalabad, Gujranwala, Kasur, Lahore, and Rawalpindi. While with moderate resistance levels also occur in five regions, including Sahiwal, Sialkot, Okara, Pattoki, and Sheikhupura (Khan & Akram, 2019). Malaysia has also reported cases of temephos resistance in the Ae mosquito. Aegypti and Ae. albopictus in some locations (Elia-Amira et al., 2018).

CONCLUSION

Based on the literature review results from six research journals, there has been resistance to temephos in controlling dengue mosquito larvae. This study results can be the main consensus to determine more appropriate methods for handling dengue fever, especially in Indonesia. Standard levels are already resistant, so it may be necessary to raise levels of temephos to kill dengue mosquito larvae. However, we need good policies to prevent another resistance in the future.

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Utilization of Green Beans Vima 1 and Local as an Alternative Media Substitute Sabouraud Dextrose Agar (SDA) in the Growth of Trichophyton Rubrum

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A B S T R A C T

Green beans are cultivated plants and crops with nutrients from vegetable protein. Varieties of mung beans vary, including Vima 1 and local. The fungus *Trichophyton rubrum* generates dermatophytosis. This research explored green beans and local Vima 1 as an alternative medium in the growth of *Trichophyton rubrum* fungus. The type of research used by laboratory experiments was carried out at the STIKes Hutama Abdi Husada Tulungagung Microbiology Laboratory in March - April 2022. SDA media and alternative media green beans Vima 1 and local variations of the mass of 6 grams and 7 grams inoculated *Trichophyton rubrum* fungus using a single dot method with repetition as much as five times. The results showed that *Trichophyton rubrum* fungus grows optimally on alternative media green beans Vima 1 variation of 7 grams of mass that grows colonies on the fifth day with an average final diameter of 14 mm. While alternative media green beans Vima 1 variation mass 6 grams 11 mm, SDA media 11.65 mm, alternative media local green beans variation mass 6 grams 7.5 mm, and variation mass 7 grams 11.5 mm. The result of independent statistical tests was a p-value < 0.00, which shows significant differences in each type of media. This study result concluded that green beans Vima 1 and local could be used as an alternative medium to replace the SDA media in the growth of *Trichophyton rubrum* fungus.

INTRODUCTION

Indonesia has a tropical climate, so it has relatively high humidity. These climatic conditions can cause the spread of dermatophytosis. Dermatophytosis is an infection caused by fungi of the dermatophyte group (Khusnul, 2017). Fungi belonging to the dermatophyte group are divided into three genus: *Trichophyton*, *Epidermophyton* and *Microsporum* (Karyadini et al., 2018).

The fungus that most often causes the infection is *Trichophyton rubrum*. This fungus usually infects the toenail area, especially in people who need to maintain the cleanliness of the foot area, such as not wearing footwear when outside the home (Farihatun, 2018). The infectious process of dermatophytosis fungi occurs by attacking tissues that contain horny substances, such as the stratum corneum found in the epidermis, hair, and nails. Fungi use the Horn substance as a nutrient in forming colonization (Karyadini et al., 2018).

Laboratory tests can be carried out on samples to diagnose dermatophytosis infection by preparing using 10-20% KOH reagent directly and by culture. Breeding is the gold standard in examining fungi with the media Sabouraud Dextrose Agar (SDA). SDA Media belongs to the class of artificial media for the culture of dermatophyte fungi. Regarding economic Media, SDA includes media with a relatively high

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price, which becomes an obstacle in procuring media in the laboratory. In addition, SDA media has hygroscopic properties, which is easy to absorb water (Nur Aeni & Kurniawan, 2018).

Green bean plants are one of the cultivated crops widely known by people living in the tropics. This plant belongs to the tribe of legumes (*Fabaceae*) with benefits in everyday life as a food source containing high vegetable protein (Rajab, 2016). Green beans have wide varieties. These varieties include Vima 1, Vima 2, Vima 3, Vima 4, Vimil 2; Magpie, and local (Hijria & Syarni, 2019). The varieties used in this study are Vima 1 and local varieties.

Green beans have a relatively high nutritional content, mainly the content of carbohydrates and proteins. In comparison, 100 grams of green beans of the Vima 1 variety contains 67.22 grams of carbohydrates and 27.1 grams of protein. At the same time, the local varieties of green beans contain carbohydrates 67.62 grams and protein 28.02 grams (Balitkabi, 2016). Therefore, this study was conducted to determine whether Vima 1 and local green bean varieties can be used as an alternative medium for SDA in *Trichophyton rubrum*.

Previous research on green beans, showed that green bean media could be used as a growth medium for *Aspergillus flavus* fungi. The diameter of *Aspergillus flavus* fungal colonies that grow on mung bean media is 6.7 cm. It mentions that mung bean media can be an alternative to SDA media (Nuryati & Sujono, 2017).

This study was conducted to determine the ability of media made from green beans and whether the medium can be used to grow fungi, particularly the fungus Trichophyton rubrum. The gold standard media used to grow mushrooms is SDA media. Limitations that are overcome are natural resources media that have hygroscopic properties so that it is easy to absorb water and will cause damage to the media. The resulting contribution is to provide insight into where natural materials can be used as an alternative medium for the growth of fungi, so it is expected that research can be done on other natural materials to be used as an alternative medium.

METHOD

Fungal Isolates

Trichophyton rubrum fungal culture was prepared by rejuvenating pure isolates of Trichophyton rubrum fungi on SDA media that have been added with Chloramphenicol antibiotics. Fungi rejuvenated and incubated at room temperature for 14 days can then be used for research (Wantini & Octavia, 2018).

Experimental Design

Research conducted in this study is true-experimental laboratories conducted in vitro to determine the ability of green bean varieties Vima 1 and local as an alternative medium in the growth of the fungus

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Trichophyton rubrum. The trial was a post-test-only control to find the growth of *Trichophyton rubrum* fungus on mung bean media varieties Vima 1 and local mass variations of 6 grams and 7 grams.

Culture Media

1. Sabouraud Dextrose Agar

   SDA is a common medium that is often used for fungal growth. SDA Media contains nutrients needed by fungi, such as carbohydrates and proteins. The SDA media's content will regulate fungi's needs as in their natural habitat (Sophia & Yogica, 2021).

2. Green Beans Vima 1 and Local Media

   Green beans are cultivated plants and crops widely known by people living in the tropics. This plant belongs to the tribe of legumes (*Fabaceae*) with benefits in everyday life, namely as a food source containing high vegetable protein (Rajab, 2016).

   In SDA media containing carbohydrates as much as 40 grams with Vima 1 varieties of green beans containing carbohydrates as much as 67.62 grams and local varieties as much as 67.22 grams, while the protein contained in SDA media as much as 10 grams with Vima 1 varieties of green beans containing protein as much as 28.02 g and local varieties as much as 27.1 grams (Nuryati & Sujono, 2017). The content of carbohydrates and proteins found in green beans is expected to replace carbohydrates and proteins found in SDA media.

Fungi Inoculation into Alternative Media Source

Inoculation of the fungus *Trichophyton rubrum* uses the single dot method. This method is done by inserting a needle nose in the middle of the surface so that the media SDA, green bean media varieties Vima 1 and local variations of the mass of 6 grams and 7 grams (Ahmad et al., 2019).

Statistical Analysis

The research Data obtained in the form of measuring the diameter of the growth of Trichophyton rubrum fungus for 14 days was then converted into a table. The Data was processed using the SPSS 25 for Windows statistics application program. The data obtained were a normality test using the Kolmogorov-Smirnov (K-S) test followed by homogeneity test using a homogeneity of Variances test. After that, parametric statistical tests were conducted using an independent t-test with a significance level of 5% (Novri et al., 2018).

RESULT

Based on Table 1 obtained data measuring the diameter of the growth of *Trichophyton rubrum* fungus with an average final diameter of growth in positive control media of 11.65 mm; green bean media varieties Vima 1 variation of 6 grams by 11 mm; green bean media varieties Vima 1 variation of 7 grams

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by 14 mm, green bean media local varieties variation of 6 grams by 7.5 mm; and green bean media local varieties variation of 7 grams by 11.5 mm.

Table 1. Average growth Diameter of the fungus *Trichophyton rubrum*

Media Replication	Colony Diameter (mm)				
	SDA	Vima 1		Local	
		6 g	7 g	6 g	7 g
I	12	10	13	7,5	12
II	11,5	11,5	15	6,5	12
III	12	11	13,25	7,5	11,5
IV	11	10,5	14,25	8,5	10
V	11,75	12	14,5	7,5	12
$\sum$	58,25	55	70	37,5	57,5
$\overline{X}$	11,65	11	14	7,5	11,5

The statistical analysis results using an independent t-test of the diameter of the growth of *Trichophyton rubrum* fungus in alternative media of green beans varieties Vima 1 and local variations in mass of 6 grams and 7 grams and positive control media SDA was described in table 2. The results result was Pvalue < α (0.05) on alternative media green bean varieties Vima 1 and local variations of the mass of 7 grams. It significantly influences the diameter of colony growth with positive control media SDA.

Table 2. Test results Independent T-test

Variable	P-*value*	Description
Media Vima 1 variation mass 6 g	0,143	There is no influence
Media Vima 1 variation mass 7 g	0,01	There is influence
Media Local variation mass 6 g	0,736	There is no influence
Media Local variation mass 7 g	0,00	There is influence

DISCUSSION

This study aims to determine the use of green beans as an alternative medium in the growth of trichophyron rubrum fungus, with varieties of green beans used are varieties of green beans Vima 1 and local. The study was compared the diameter of fungal growth colonies and the growth rate of *Trichophyton rubrum* fungi on SDA-positive control media and alternative media of Vima 1 and local mung bean varieties.

Based on Table 1 shows that the fungus *Trichophyton rubrum* can grow well on alternative media varieties of green beans Vima 1 mass variation of 7 grams and alternative media varieties of local green beans mass variation of 7 grams. In alternative media varieties of green beans Vima 1 and local, there is an increase in the diameter of the growth of fungal colonies Trichophyton rubrum along with an increase in the mass variation of green bean seed flour used as a base material in the manufacture of alternative media.

Trichophyton rubrum fungus can grow on each media on the fifth day, both on positive control media SDA and alternative green bean varieties Vima 1 and local. The content of nutrients contained in the

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alternative media of green beans is higher when compared with the content of nutrients contained in the media SDA. In 100 grams of green beans, local varieties contain carbohydrates 67.22 grams; protein 27.1 grams; fat 1.78 grams; fiber 8.88 grams; calcium 263.91 grams; vitamin C 11.83 grams; calories 345 kcal; and water 15.5 grams (Indonesia, 2013). While in 100 grams of green beans varieties, Vima 1 contains carbohydrates 67.62 grams of protein 28.02 grams and fat 0.40 grams (Balitkabi, 2016).

Each litre of SDA media is peptone 10.0 grams, dextrose 40.0 grams and agar 15.0 grams (Nuryati & Sujono, 2017). Fungi use dextrose as a source of carbon. At the same time, sugar and protein are used as a source of energy in the growth of fungs (Sophia & Yogica, 2021).

Trichophyton rubrum mushroom colonies grown on alternative media of green beans of Vima 1 and local varieties have a complete morphological structure of the fungus. The nutrients in green bean varieties Vima 1 and local were high enough, with carbohydrates and proteins in question. Carbohydrates have an essential function in the growth of fungi, and proteins function as structural molecules that are useful in forming cell layers, functional molecules, and enzymes and help the metabolic process (Wantini & Octavia, 2018). Mushrooms will use the carbohydrate content found in green beans in excreting enzymes α-amylase to convert amylum into glucose, whereas fungi will absorb glucose to assist in the growth process (Ahmad et al., 2019).

Table 2 shows the Independent T-test results obtained p-value significance value of $0.00 < \alpha$ (0.05) on alternative media green beans Vima 1 and local variations in the mass of 7 grams. These values indicate if there is a significant difference in the diameter of the growth of *Trichophyton rubrum* mushroom colonies on alternative media of green bean varieties Vima 1 and local variations in the mass of 7 grams with positive control media SDA.

Based on previous research on using green beans against the growth of the *Aspergillus flavus* fungi. Shows the diameter of *Aspergillus flavus* mushroom column that grows on mung bean media of 6.7 cm and mentions if the mung bean media can be used as an alternative media to replace SDA media (Nuryati & Sujono, 2017).

The growth of *Trichophyton rubrum* fungus on green bean media of Vima 1 variety with a mass variation of 7 grams has a final diameter of 14 mm colony. This is because the alternative media green beans varieties Vima 1 variation of 7 grams of mass has a high carbohydrate content, amounting to 4.73 grams. In addition, the growth of *Trichophyton rubrum* fungi can be influenced by other factors, including light intensity, temperature, pH, humidity, carbon, nitrogen, sulfur, phosphorus, and mineral (Yuniliani et al., 2018).

Subsequent studies are expected to conduct more research on the manufacture of alternative media using natural materials. So that natural products can be better utilized. The limitation of this study is the

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sampling of *Trichophyton rubrum* fungus that will be inoculated on growth media. It is feared that the small number of samples inoculated will affect the growth diameter of the fungal colony *Trichophyton rubrum*.

CONCLUSION

Based on the results of research on the use of Vima 1 and local green beans as an alternative media to SDA media in the growth of *Trichophyton rubrum* fungus showed that there was no significant difference in the growth of *Trichophyton rubrum* fungus on each media. The alternative media green beans Vima 1 and local mass variation of 6 grams and 7 grams can be used as an alternative media substitute for Natural Resources media. However, the same fungus's growth is not better or worse than the media SDA.

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Analysis Factors of Motivation Among Adolescents in 3M Behavior During the Covid-19 Pandemic

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A B S T R A C T

Confirmed cases of COVID-19 in the adolescent age group are currently still occurring. For maximum prevention efforts to be carried out, further research is needed to find out the factors related to the motivation of adolescents in implementing COVID-19 prevention behaviors such as 3M behavior (Washing hands, using masks, and maintaining distance) as an effort to prevent the transmission of COVID-19, especially in the adolescent. The purpose of this study was to identify the factors related to the motivation of adolescents in carrying out 3M behavior during the COVID-19 pandemic. This study was conducted with a cross-sectional design on 427 adolescents in Palembang City. The school sample was obtained by simple random sampling method, and the determination of respondents was carried out by purposive sampling in accordance with the research inclusion criteria are students aged 12-18 years. The analysis used in this research is univariate analysis, bivariate analysis, and multivariate analysis. The results showed that age, gender, education level, autonomy, policies, nurse support, and family support influenced the adolescents' motivation to implement 3M behavior during a pandemic. The family support factor is the factor that most influences the motivation of adolescents in carrying out 3M behavior during the COVID-19 pandemic after being controlled by other variables (age, gender, level of education, autonomy, policies, and nurse support). Knowing that family support is the most dominant factor, increasing family-based health promotion programs for adolescents during the COVID-19 pandemic is recommended.

INTRODUCTION

COVID-19 is a virus that was first found to infect humans in Wuhan City, China, in December 2019. Since then, COVID-19 has continued to spread and invade every country, so World Health Organization (WHO) has declared COVID-19 to be a pandemic and a global health problem (Sun et al., 2020). COVID-19 is caused by the SARS-CoV-2 virus, known as the coronavirus. This virus can infect humans quickly in the respiratory system, which can cause mild health problems and even death (Wardani et al., 2022). The coronavirus has an incubation period of 1-14 days. During this incubation period, individuals infected with the coronavirus can show symptoms and no symptoms or those without symptoms (Bistara et al., 2022). COVID-19 is a virus with fast transmission power. This virus can be transmitted through droplets or cough droplets from infected individuals and can quickly infect individuals around them up to 48 hours after exposure to the COVID-19 virus (Pranata et al., 2022). For this reason, it is important to implement health promotion behavior during the Covid-19 pandemic to prevent transmission of COVID-19.

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Based on WHO data, there were 970,000 cases of COVID-19 in the world in a month, which increased very rapidly in October 2020 to 44,351,506 cases in nearly 219 countries worldwide. The increase in COVID-19 cases is increasing day by day. In December 2020, there were 87,273,380 cases worldwide, with 1,899,440 deaths (Rossi et al., 2021). COVID-19 cases in Indonesia were first identified in February. Data on confirmed cases of COVID-19 in January 2021 recorded 818,386 confirmed cases of COVID-19 in 34 provinces in Indonesia (Warohmatulilla et al., 2021). COVID-19 can infect all age groups. Individuals with comorbid diseases such as hypertension, kidney failure, heart disease, asthma, and diabetes are more likely to be infected with COVID-19 (Bistara et al., 2022). COVID-19 cases in adolescents are currently an interesting focus in the world of health because adolescents are not only at risk of being infected with COVID-19 but also can spread the COVID-19 virus in their environment.

Based on data that there were 8 million confirmed cases of COVID-19 adolescents in December 2020 worldwide (Götzinger et al., 2020). In Indonesia, in January, 8.8% of COVID-19 cases occurred in the age range of 6-18 years, with 72,018 confirmed cases (Warohmatulilla et al., 2021). The fact that adolescents are also at risk of exposure to COVID-19 is a major threat to the community. This is because adolescents tend to be active outside the home. Studies show that adolescents aged 12-16 years old have a seven times higher chance of spreading COVID-19 than other ages (Oosterhoff et al., 2020). Interactions carried out by teenagers outside the home and without heeding health protocols can be a serious problem. The age group of adolescents who are exposed to COVID-19 tends to show no symptoms of infection at all. This causes adolescents who have been exposed and are asymptomatic to freely interact with their families, which allows for rapid transmission of COVID-19 due to close interactions (UNICEF, 2020).

The condition exacerbates this in that adolescents are an age group that is still vulnerable to responsiveness to their health conditions. The phenomenon of adolescents still having low in using access to health services and the use of health information can increase the risk of health threats in their teens during the current COVID-19 pandemic (UNICEF, 2020). Teenagers also tend to be more active outside the home and have difficulty controlling their activities as adults compared to the child age group (Schwartz et al., 2020). Therefore, it is important to understand 3M's health promotion behavior (Washing hands, using masks, Keeping distance) in the adolescent age group during the COVID-19 pandemic. This research aims to identify factors related to adolescent motivation in carrying out 3M behavior during the COVID-19 pandemic. This article can provide recommendations for further research on adolescent 3M’s health promotion behavior during the COVID-19 pandemic. Another hope is that this article can spur an increase in 3M's health promotion efforts in the adolescent age group during the COVID-19 pandemic as one of the efforts to deal with the COVID-19 pandemic.

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METHOD

This quantitative study uses a descriptive correlation method and a cross-sectional approach. This research was conducted in Palembang City in schools spread over three sub-districts: Ilir Barat I, Sukarame, and Ilir Timur II, starting September 2020 until July 2021. Based on the results of calculating the sample size using the Lemeshow formula, it was found that the number of respondents in this study was 427 adolescents. The inclusion criteria in this study were students aged 12-18 years, living in Ilir Barat I, Sukarame, and Ilir Timur II, and having a gadget also internet access. The instrument used in this study was a questionnaire that had been tested for validity and reliability with a Cronbach alpha value of 0.84 and a correlation coefficient of 0.73 with r table = 0.05. The procedure for collecting data in this study began with the administrative stage, namely the management of passing ethical reviews and research permits at assembled institutions, then the research implementation phase was carried out in three schools spread across 3 sub-districts with the highest number of COVID-19 cases in Palembang City. In this study, statistical tests for bivariate analysis used the Pearson product-moment test (r) and independent t-test and independent t-test and multivariate statistical tests using multiple linear regression tests. This research was conducted by prioritizing the principles of research ethics and having passed the ethical test on the FIK UI ethics committee with the test pass number SK121/UN2.F12D1.2.1/ETIK 2021.

RESULT

The results of this study focused on factors that influence adolescent motivation in carrying out 3M behavior, namely demographic factors (age, gender, and level of education), autonomy factors, policy factors, nurse support factors, and family support factors. Table 1 shows that the respondents in this study had an average age of 15.15 years in May 2021, with an age range of 12-18 years. The gender of respondents with male sex was 182 people (42.6%), and female sex was 245 people (57.4%), and the highest level of education was high school, with a total of 283 respondents (66, 3%) and junior high school as many as 144 people (33.7%).

Table 1 Characteristic of Respondents Based on Age, Gender and Education Level of Adolescent in Palembang City, May 2021 (N=427)

Characteristic of Respondents	n	%
Age	Mean ± SD: 15,15 ± 1,057 Min – Max: 12 - 18	
Gender		
1 = Man	182	42,6
2 = Woman	245	57,4
Amount	427	100
Education		
1 = JHS	144	33,7
2 = SHS	283	66,3
Amount	427	100

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Table 2 shows that all research variables, namely Age, Autonomy, Policy, Nurse Support, and Family Support, have a significant relationship with adolescent motivation in carrying out 3M behavior during the COVID-19 pandemic with a *p*-value <0.05. The variable with the most significant correlation coefficient is family support, with a value of $r = 0.545$ with a positive correlation direction and strong correlation strength. The autonomy variable is $r = 0.487$, with a positive correlation direction and moderate correlation strength. The policy variable is $r = 0.431$, with a positive correlation direction and moderate correlation strength. The nurse support variable is $r = 0.397$, with a positive correlation direction and moderate correlation strength. The age variable is $r = 0.156$, with a negative correlation direction and weak correlation strength.

Table 2 Analysis of the Relationship Variables Gender, Education Level, Age, Autonomy, Policy, Nurse Support, Family Support on Adolescents' Motivation in Implementing 3M Behavior during the COVID-19 Pandemic in Palembang City, May 2021 (n=427)

Variabel	*p*-value	
Gender	0,000	
Education Level	0,012	
Variabel	R	*p* value
Age	-0,156	0,001
Autonomy	0,487	0,000
Policy	0,431	0,000
Nurse Support	0,397	0,000
Family Support	0,545	0,000

Table 2 shows that the gender variable has a *p*-value <0.05. These results also show that statistically, there is a significant difference in motivation scores between male and female students in carrying out 3M behavior during the COVID-19 pandemic. The education level variable has a *p*-value <0.05. This also shows that statistically, there is a significant difference in motivation scores between students with high school and junior high school education levels in carrying out 3M behavior during the COVID-19 pandemic.

Table 3 Final Multiple Linear Regression Modeling of Factors Associated with Adolescents' Motivation in Implementing 3M Behavior during the COVID-19 Pandemic in Palembang City, May 2021 (n=427)

Variable	B coefficient	Correlation coefficient	*p*	R	Adjusted R^2	Std. error	*P*
Age	0,299	0,079	0,037				
Autonomy	0,289	0,238	0,000				
Policy	0,185	0,158	0,000				
Nurse Support	0,140	0,142	0,001	0,651	0,417	0,275	0,000
Family Suppot	0,360*	0,311	0,000				
Constant	20,483		0,000				

*The most related variable

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Based on table 3, it is known that the factor that is most related to the motivation of adolescents in carrying out 3M behavior during the COVID-19 pandemic in Palembang City is family support (β=0.360).

DISCUSSION

Age

Based on the bivariate analysis results between age and youth motivation in carrying out 3M behavior during the COVID-19 pandemic, it showed a negative relationship (r = -0.156) and a statistically significant relationship (p-value = 0.001), and a weak correlation strength. It can be concluded that the higher the adolescent age, the lower the adolescents' motivation in carrying out 3M behavior during the COVID-19 pandemic. Statistically, the relationship between these two variables is significant, but the correlation strength between age and adolescent motivation is weak. This shows that the age factor weakly influence on adolescents' motivation in carrying out 3M behavior. According to the theory of the Health Promotions Model, it is known that many personal factors other than age can influence individual motivation in carrying out health promotion behaviors, including body mass index, pubertal status, education, race, ethnicity, and socioeconomic status (Pender, 1987) so that the age factor cannot be fully linked to the motivation of teenagers in carrying out 3M behavior.

Respondents in this study had an average age of 15.15 years, so they were included in the middle-aged adolescent category. It is known that early to mid-adolescent abilities are still immature thinking abilities. This happens because early and middle adolescents are still looking for new values and energy and compare them with peers of the same gender, while late adolescents have comprehensive thinking abilities compared to early to mid-adolescents (Steinberg, 2014). The habit of teenagers who still often compare their behavior with their peers can have bad consequences if these peers have bad health behaviors. The results of this study are supported by research conducted in Iran, namely, adolescents aged > 15 years tend to have maladaptive behavior towards efforts to implement COVID-19 prevention behaviors (Ezati Rad et al., 2021). The research stated that the behavior of preventing COVID-19 in the adolescent age group still needs to be improved. This relates to adolescents aged> 15 years more often doing outdoor activities.

The results of this study are also in line with the theory of the developmental stages of middle-aged adolescents, namely adolescents at that age tend to seek normality in their peers, especially those of the same gender. These results align with research conducted by researchers because in this study, the average age of respondents was > 15 years, so the results obtained have similarities because the same age characteristics support them. Based on the results of the analysis and supported by previous research, it can be concluded that the higher the adolescent's age, the lower the implementation of 3M behavior. This

can happen because adolescents are in a transitional age, so maturity in thinking is not yet comprehensive. Developing health promotion programs in adolescents is necessary by involving peers as role models in carrying out health behaviors. The formation of peer groups in which there are peer leaders with good health behavior can be an example for other adolescents in normalizing their health behavior.

Gender

The results of the data analysis on the gender variable showed that there were significant differences in the results or motivational scores between young girls and boys in carrying out 3M behavior during the COVID-19 pandemic. In this study, female students had a higher percentage than male students. This percentage difference can affect the statistical analysis of this variable so that it shows the significance of the relationship between gender and the implementation of 3M behavior in adolescents. Adolescent women dominated respondents in this study, which could affect the study's results.

A study discussing the dimensions of adolescent health promotion behavior based on gender shows differences in the dimensions of health promotion between male and female adolescents. It is known that the dimensions of health promotion in male adolescents tend to be physical activities such as sports, while female adolescents have health promotion dimensions in dietary habits, care, and safety issues (Sa'diyah, 2013). This research was conducted long before the COVID-19 pandemic occurred, but it can be understood that differences in motivation scores in carrying out 3M behavior during the COVID-19 pandemic between teenage girls and boys could occur of not fulfilling the dimensions of health promotion in adolescent boys. For this reason, it is necessary to have differences in providing health promotion to adolescents based on their gender. Differences in the provision of health promotion can be provided by the method of peer association with the same gender.

Education

The results of data analysis between education level and adolescents' motivation in carrying out 3M behavior during the COVID-19 pandemic showed differences in motivation scores between adolescents with high school education level and adolescents with junior high school education level. This difference could occur due to the number of high schools sampled in this study, more than junior high schools. This can affect statistical calculations so that there are differences in motivation scores between adolescents with a high school education and adolescents with a junior high school education level.

Adolescents with a high educational background tend to have positive motivation toward healthy behavior when compared to adolescents who do not have a good educational background (RIZQI, n.d., 2017). This is in line with the research results, which showed differences in motivation scores between adolescents with junior high and high school education levels which showed that educational level influenced adolescent motivation in carrying out 3M behavior during the COVID-19 pandemic. Based on these results, it is necessary to have health promotion that is adjusted to adolescents' education level.

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Autonomy

The bivariate analysis results between the autonomy factor and adolescents' motivation in carrying out 3M behavior during the COVID-19 pandemic show a positive relationship and have a statistically significant relationship with a moderate correlation strength. These results show that the autonomy possessed by adolescents is related to adolescents' motivation in carrying out 3M behavior during the COVID-19 pandemic. The results of this study are supported by research conducted by Wang et al., (2021) which shows that adolescents who are independent and have freedom in determining attitudes have better motivation to carry out COVID-19 prevention behaviors compared to adolescents who do not yet have independence and freedom of attitude.

These results are supported by studies conducted in America which show that adolescents with the freedom and independence to determine their attitudes think that implementing COVID-19 prevention behavior is a social responsibility they have as a form of preventing other people, especially their families, from being infected with COVID-19 (Oosterhoff et al., 2020). Based on these results, providing autonomy to adolescents during the COVID-19 pandemic is necessary. Teenagers are given independence to make choices in carrying out 3M behavior, but in making these choices, teenagers must also understand the consequences that will be obtained based on the choices made.

Policy

Based on the results of a bivariate analysis between policy factors and adolescents' motivation in carrying out 3M behavior during the COVID-19 pandemic shows a positive relationship and a statistically significant relationship. These results show a significant positive relationship between policy factors and adolescents' motivation to carry out 3M behavior during the COVID-19 pandemic. These results can be concluded that government policies to implement 3M behavior in the community environment can encourage the implementation of 3M behavior for adolescents during the COVID-19 pandemic.

The policy is part of the situational influence. Policies carried out by the government are not only supervisory but can also be in the form of providing education and facilities to the community. Policies regarding the obligation to wear masks and carried out together with education on the importance of using masks to prevent the transmission of COVID-19, have been proven to encourage the use of masks in public areas (Campbell et al., 2021). The results of this research can be used as a record for the government to improve policies in tackling the COVID-19 pandemic. Policies enforced massively and supported by strict supervision can encourage adolescents to carry out 3M behavior during the COVID-19 pandemic.

Nurse Support

Based on the results of a bivariate analysis between the factors of nurse support and adolescents' motivation in carrying out 3M behavior during the COVID-19 pandemic shows a positive relationship

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with a moderate correlation strength and a statistically significant relationship. The results of this study indicate that nurse support has a significant relationship to adolescent motivation in carrying out 3M behavior during the COVID-19 pandemic. The support provided by nurses is one part of the nurse's role, which aims to reduce the individual's risk of contracting a disease through health promotion by proactively involving individuals to reduce the potential for harm to health due to the individual's behavior (Pender, 1987).

This study's results align with previous research explaining that nurses have an important role during the COVID-19 pandemic. Nurses' support in services and professional nursing care is important in protecting the public to avoid COVID-19 infection (Alharbi et al., 2020). The importance of nurse support during a pandemic as an effort to improve health promotion behavior needs to be increased. Providing online counseling can be used as a solution to avoid face-to-face meetings so that the support provided by nurses during the pandemic can continue.

Family Support

The bivariate analysis of family support factors and adolescents' motivation to carry out 3M behavior during the COVID-19 pandemic showed a positive and statistically significant relationship. As the closest person, the family has a strong influence in shaping adolescent health promotion behavior. Other studies are also in line with the results of this study which show that family support has a very important impact on adolescents facing a pandemic because the support provided by the family can reduce the level of fear that adolescents may have, causing adolescent health problems during a pandemic (Halty et al., 2021).

This shows that good family relationships and support in motivating and providing supporting facilities for implementing COVID-19 prevention behavior effectively increase adolescents' motivation to carry out COVID-19 prevention behavior (3M) during the pandemic. For this reason, it can be concluded that the role of family support has an important influence in increasing adolescents' motivation in carrying out 3M behavior. Family support in providing facilities, health information, and space for mental health has proven influential in increasing adolescents' motivation to implement 3M behavior during the COVID-19 pandemic.

Factors Most Related to Adolescents' Motivation in Implementing 3M Behaviors.

Based on the results of data analysis using linear regression, it is known that the factor that influences adolescents' motivation in carrying out 3M behavior during the COVID-19 pandemic is family support, with the strongest correlation. The regression equation model can be explained as follows, once family support increases, then the motivation of adolescents in carrying out 3M behavior increases by 0.545 points. Family support is the most influential factor in adolescents' motivation to carry out 3M behavior. This can be seen from the coefficient B (0.360), which means that family support can increase 36% of adolescents' motivation in carrying out 3M behavior during the COVID-19 pandemic.

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The theory of the Health Promotion Model states that the family is an important source of interpersonal influence for individuals to increase commitment in engaging themselves to carry out healthy behaviors (Pender, 1987). Interpersonal influence given by the family can strengthen individual potential and abilities to achieve a good quality of life by carrying out health behaviors (A Nies, 2014). The analysis results in this study show that family support is the most dominant factor related to adolescent motivation in carrying out 3M behavior. This study's results align with previous research showing that adolescents tend to have good motivation to carry out COVID-19 prevention behaviors if they have positive family support (Oosterhoff et al., 2020).

Other research also shows that the motivation of adolescents to carry out preventive behavior during a pandemic is caused by fears that family members are infected with COVID-19 (Luo et al., 2020). These results show that family support factors directly influence adolescents to be responsible and motivated in carrying out 3M behavior during the COVID-19 pandemic. Family-based health promotion programs can be provided through online media and promoted through community activities such as *Posyandu* or *Pos Pelayanan Terpadu* (Integrated Healthcare Center) and other activities. Education for families is important because families are the closest individuals to adolescents before and during the pandemic.

CONCLUSION

It is known that the factors that influence adolescents' motivation in carrying out 3M behavior during a pandemic are age, gender, education level, autonomy, policy, nurse support and family support. Based on the analysis results, it is known that family support is the most dominant factor in influencing adolescents' motivation to behave 3M during the COVID-19 pandemic. For this reason, suggestions that researchers can give are that health promotion activities can be carried out in the adolescent age group during a pandemic by using the online method by utilizing online seminar application media. Health promotion activities can be carried out by focusing on gender and the level of education of adolescents and encouraging the autonomy that exists in adolescents.

There needs to be collaboration between stakeholders in regulation and supervision of 3M behavior involving community and nurses to expand the range of programs provided so that all adolescents in their work area can benefit from the program and encourage family involvement to increase adolescents' motivation in carrying out 3M behavior. The development of a nursing intervention model based on the theory of the Health Promotions Model can be carried out to facilitate health promotion activities for adolescents. Future research can develop qualitative and quasi-experimental research methods for a deeper study of the influence of demography, autonomy, policies, nurse, and family support in increasing adolescents' motivation towards 3M behavior during the COVID-19 pandemic.

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Quality Analysis Based on Organoleptic Properties, Water Content, and Total Reducing Sugars Content in the Raw Honey (Apis dorsata) and Processed Honey

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A B S T R A C T

Measuring honey quality standards aims to protect consumers from products not meeting the criteria and counterfeit honey. This paper compares differences in quality analysis based on organoleptic properties, water content, and total reducing sugars content between raw and processed honey. This study used a true experimental research design. The independent variables were raw and processed honey, while the dependent variables were organoleptic properties, water content, and total reducing sugars content. Instruments to determine water contents used a refractometer. In addition, we calculated the total reducing sugars in honey through the iodometry titration method. Data analysis in the water content and total reducing sugar used the independent T-Test with a 95% confidence level (p=0.05). In addition, we descriptively analyzed the colour, aroma, taste, and viscosity of raw and processed honey. Organoleptic analysis showed differences between the colour, taste, and viscosity of both kinds of honey. The mean water content was 19.01% in raw honey and 20.83% in processed honey, indicating that much water was used as a mixture when processing honey. The mean total reducing sugars in raw honey were 15.92% and 25.38% in processed honey, indicating that the processed honey contained a lot of sugar or additional sweeteners such as granulated sugar. The Independent Sample T-Test resulted in p=0.00 (p<0.05). Thus, there was a significant difference between water content and total reducing sugars in raw and mixed honey. Overall, the quality of raw honey is better than processed honey.

INTRODUCTION

Honey is natural product bees produce for consumption because it contains essential nutrients. It is not only a sweetener or food flavoring but is often used to relieve fatigue, smooth skin, and grow hair (Cianciosi *et al.*, 2018). Measuring honey quality standards aims to protect consumers from products not meeting the criteria and counterfeit honey. Each country has different honey quality standards. The National Standardization Agency of Indonesia regulates honey quality standards in Indonesian National Standards (INSs) (Sahlan *et al.*, 2019). Quality is crucial for honey consumers, both in industry and importers. Therefore, quality control in honey-producing countries is essential, especially for exporters (Rupilu, Pattiselanno and Papilaya, 2022).

Honey has a unique chemical composition. However, the elements of carbohydrates (sugars) are the most dominant. Honey contains 70-80% sugar. The honey contains sucrose, maltose, and dextrin. In addition, there are vitamin C, vitamin B1, vitamin B2, vitamin B6, pantothenic acid, folic acid, and minerals (Na, K, Ca, Fe, Cu, P, S). Furthermore, honey has hormones, enzymes, bactericidal substances, and fungicides. Honey also contains aromatic substances, waxes, proteins, essential oils, formic acid, and flower pollen. Researchers at the Department of Biological Sciences, University of Waikato, also proved that honey had

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active antibiotic substances against various pathogenic bacteria that cause disease. In addition, it can potentially cure and prevent several infectious diseases, such as cough, fever, heart, liver, and lung disease. Honey is also effective for illnesses that can interfere with the function of the eyes, nerves, ears, and respiratory tract infections.

Total water content is one of the quality standards of honey, which is a maximum of 22%. The honey production process by the bees is complex, so there will likely be differences in water content and composition between types of honey (Chen, 2019) (Otmani *et al.*, 2019). In addition, the water content in honey may affect its efficacy, especially in the treatment process (Nuraini, Hastuti and Husnaeni, 2021).

Based on the organoleptic analysis, pure honey has characteristics. The organoleptic analysis includes honey's taste, colour, aroma, and viscosity. The taste is something that the sense of taste can feel, and the colour is visible and can be observed in honey. Aroma is the result of sensing through smell. The smell is also an indicator of damage to the product. For example, a foul odor indicates the product has been damaged (Prabowo *et al.*, 2019). In honey products, the quality standard for the aroma and colour of honey depends on the origin and type of flower. In addition, the colour varies, white, yellow, brown, red, and black. The colour variation depends on the nectar of the flower. The plant pigments are xanthophyll, carotin, and chlorophyll. The colour of honey can be divided into white, light, and dark honey (Prabowo, Prayitno and Yuliani, 2020). Red honey is usually dark honey, which was previously yellow, then brownish yellow, and then becomes slightly reddish. White honey is not much different from red honey. The only difference is the flower nectar that is sucked by the worker bees. White honey is mainly obtained from citrus, kapok, and durian trees, while dark honey is from daisies and insect fluids.

Honey is hygroscopic and easy to absorb water from the surrounding environment. It will undergo fermentation when the water content increases. Furthermore, fermentation will decrease its qualities and damage its properties. Many types of honey come from various regions. The different types of honey are based on the food source and the type of bee. There are differences between raw and processed honey. Raw honey is pure honey that has not been processed and mixed with additives. Meanwhile, regular honey is processed honey and has been mixed with certain additives.

A preliminary study indicated that processed honey in the community often found several problems related to its authenticity. There were honey deposits at the bottom of the bottle. In addition, processed honey freezes when stored in the refrigerator due to the increased water content. At the same time, previous research revealed that high water content in honey could reduce its durability and affect its effectiveness in the treatment. Unfortunately, reducing the water content in honey is challenging and requires relatively expensive costs. This paper compares differences in quality analysis based on

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organoleptic properties, water content, and total reducing sugars content between raw and processed honey.

METHOD

This study used a true experimental research design conducted in the laboratory to discover specific treatments' symptoms or effects. The researchers examined the possible causes and effects between processed honey (experimental group) and raw honey (control group) and then compared both. The research was conducted at the Chemical Laboratory of the Health Analyst Study Program, Mataram Health Polytechnic of the Health Ministry, from January to May 2022. On the first day, reagents were prepared and manufactured and then continued with the organoleptic analysis (colour, smell, taste, and viscosity) in raw and processed honey. Then, we analyzed water content and total reducing sugars on the second day.

This study used several treatments as follows:

t_1 = water content of raw honey

t2 = water content of processed honey

t3 = total reducing sugars content of raw honey

t_4 = total reducing sugars content of processed honey

The steps in determining the layout of the experimental units were:

1. Determine the number of replications.

   $(t-1).(r-1) \geq 15$

   $(4-1).(r-1) \geq 15$

   $(3).(r-1) \geq 15$

   $3r - \geq 15$

   $3r \geq 15 + 3$

   $3r \geq 18$

   $r \geq \frac{18}{3} = 6$

   $r \geq 6$

2. Determine the number of experimental units.

   N= t x r

   4 x 6

   24 trial units

   Note: n = number of experimental units

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t = Treatment

r = Replication/replication

We weighed 0.1 grams of a sample obtained from 24 experimental units from each of 12 raw and 12 processed honey with twice the replication for each. This research used purposive sampling or based on considerations according to the population characteristics. The samples were raw honey collected from giant honeybees (*Apis dorsata*) and processed honey sold in the market. Both samples were taken in Lantung Village, Lantung District, Sumbawa Besar Regency, West Nusa Tenggara. The independent variables were raw and processed honey, while the dependent variables were organoleptic properties, water content, and total reducing sugars content. The operational definitions of the variables were:

1. Raw honey was pure honey without additives produced by bees (*Apis dorsata*) obtained from forest bee honey collectors assisted by the Forestry Service of West Nusa Tenggara Province in Lantung Village, Lantung District, Sumbawa Besar Regency.
2. Processed honey was natural honey with certain additives, such as traditional medicinal concoctions or concentrated fruit juice.
3. The organoleptic properties of honey were the standard for purity of honey quality, namely taste, colour, smell, and texture.
4. Total reducing sugars content was the properties of honey as a standard for the purity of honey quality, namely glucose in honey.
5. The water content was the amount of water contained in honey.

Instruments to determine water contents used a refractometer through the refractive index. In addition, we calculated the total reducing sugars in honey through the iodometry titration method. Some tools and materials used in the data collection technique were a glass beaker, dropper pipette, petri dish, drying oven, cup clamp, desiccator, electrical analytical balance, burette, Erlenmeyer pumpkin, measuring flask, and blank. At the same time, the materials used are pure honey and mixed honey, aqua dest, KIO_3 0.1N, KI 10%, Sulfuric acid 4N, Sodium thiosulfate 0.1N, Pb Acetate 10%, K_4FeCN_6 10%, Luff Schrool, and Amilum.

Work procedures

Sample Preparation

We poured both samples into a 20 ml glass beaker with a volume of 5 ml from the packaging container. The sample used must be in ready-to-use or liquid form. To prevent damage, the temperature of the honey should not exceed 40°C. If the honey sample did not contain lumps, then the sample was shaken or stirred well. The measurement of water content in honey did not undergo special treatment.

Determination of Water Content

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1. The empty cup was placed in an oven at 105°C for 1 hour, cooled in a desiccator, and then weighed, repeated until there was a constant weight.
2. We carefully weighed the 2-5 g sample into the cup, and the sample's surface was made evenly in the cup and heated in the oven at 100°C for 1 hour.
3. We cooled it in a desiccator for ± 15 minutes, then weighed it.
4. This treatment was repeated (30 min heating briefly) until there was a constant weight. Then, we calculated the water content percentage.

Formula : $\%H_2O = \frac{W1 - W2}{W1 - Wo}$

Note: Wo = Empty Container

W_1 = Empty container + sample before heating

W_2 = Empty container + sample after heating

Determination of total reducing sugar content through iodometry titration method

1. 0.1N. KIO_3
   a. We pipetted 10.0 ml KIO_3 0.1N and added 15 -25 ml of distilled water
   b. We added 7.5 ml of 10% KI and 10 ml of 4N. sulfuric acid
   c. We titrated with 0.1N sodium thiosulfate until pale yellow
   d. We added a starch indicator
   e. We titrated with 0.1N Sodium thiosulfate to an endpoint

   Formula: $N_1 . V_1 = N_2 . V_2$

   Note: N_1 = KIO Normality $_3$

   V1 = KIO $_{\text{Volume 3}}$

   N2 = Normality of Natrium thiosulfate

   V2 = Average titration volume
2. Determination of total reducing sugars content.
   a. We weighed 0.1 grams of the sample and put it into a 250 ml volumetric flask.
   b. We added 5 ml of Pb Acetate 10% + 5 ml K_4FeCN_6 10%
   c. We added aqua dest up to the marked line
   d. We filtered with filter paper (as much as ± 30 ml)
   e. We pipetted 25.0 ml of this solution and added 25.0 ml of the Luff-Schoorl solution
   f. We heated 10 minutes after boiling and let it cool
   g. We added 15 ml of 10% KI + 25 ml of 6 N sulfuric acid (acid)
   h. We titrated with 0.1 N sodium thiosulfate until pale yellow
   i. We added an amylum indicator

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j. We titrated with 0.1 N sodium thiosulfate to an endpoint

k. We calculated the total reducing sugars in honey.

l. A blank titration was carried out simultaneously with aqua dest as a substitute for the sample.

Formula : F= $\frac{Ns}{Nf} x\ (VtBlkxVtspl)$ x ~

Note: N_s = True Normality Sodium Thiosulfate

N_f = Normality factor = 0.1N

Formula to find the value of F

$$\%\ Gula\ Reduksi = \frac{F\ X\ P}{W\ (mg)}\ x\ 100\ \%$$

Note: F = sugar equivalence factor

P = Dilution

W = Mass of sample

Data analysis in the water content and total reducing sugar used the independent T-Test with a 95% confidence level (p=0.05) using the IBM Statistical Product and Service Solutions (SPSS) 20.0 analysis software program. When p<0.05, it means that there was a difference in water content and total reducing sugar in raw and processed honey. Meanwhile, p≥0.05 means there was no difference in water content and total reducing sugar content in both independent variables. In addition, we descriptively analysed the colour, aroma, taste, and viscosity of raw and processed honey.

RESULT

Raw honey had red brown, a caramel-like aroma, tasted sweet, and had high viscosity. Meanwhile, processed honey had a light yellow colour, caramel aroma, sour taste, and watery consistency. Thus, raw and processed honey differed in colour, taste, and viscosity (table 1).

Table 1 Organoleptic Test on Raw and Processed Honey

Variable	Parameters			
	Colour	Smell	Flavour	Viscosity
Raw Honey	RB	C	Sw	T
Processed Honey	LY	C	S	W

Note: RB: Red Brown; S: Sour; LY: Light Yellow; T: Thick; C: Caramel; W: Watery and Sw: Sweet

In addition, the mean water content was 19.01% in raw honey and 20.83% in processed honey, indicating that much water was used as a mixture when processing honey (table 2).

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Table 2 Water Content Test on Raw and Processed Honey

Sample number	Raw honey (%)	Processed honey (%)
1	18.46	20.53
2	19.76	21.53
3	19.12	20.56
4	18.80	20.87
5	18.64	21.78
6	19.10	20.39
7	18,50	20.45
8	18.78	21.06
9	18.64	20.27
10	18,80	20.68
11	19.02	20.87
12	18.75	21.04
Total	228.17	250.03
Mean	19.01	20.83

Furthermore, the mean total reducing sugars in raw honey was 15.92% and 25.38% in processed honey, indicating that the processed honey contained a lot of sugar or additional sweeteners such as granulated sugar (table 3).

Table 3 Total reducing Sugars Test in Raw and Processed Honey

Sample number	Raw honey (%)	Processed honey (%)
1	15.83	26.54
2	15.90	24.33
3	16.05	25.45
4	15.85	24.60
5	15.90	25.54
6	16.00	26.25
7	15.83	24.75
8	15.95	25.25
9	16.02	25,40
10	15.85	25.56
11	15.95	26.05
12	16.02	24.86
Total	191.15	304.51
Mean	15.92	25.38

The normality and homogeneity tests of water content and total reducing sugars obtained $p > 0.05$. Thus, the data was normally distributed. Furthermore, both dependent variables were analysed using the independent sample T-test (table 4).

Table 4 Normality and homogeneity tests

Normality test		Kolmogorov-Smirnov [a]	
		Statistics	df
Water content (%)	Raw Honey	0.239	12
	Processed Honey	0.146	12
Reducing Sugar Content (%)	Raw Honey	0.171	12
	Processed Honey	0.146	12

Homogeneity test	Mean Median	Levene statistics	df_1	df_2	Sig
Water content (%)	Mean	0.924	1	22	0.347
	Median	1.169	1	22	0.291
Reducing Sugar Content (%)	Median and with adjusted df	1.169	1	21,943	0.291
	Trimmed mean	1.050	1	22	0.317

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The Independent Sample T-Test resulted in p=0.00 (p<0.05). Thus, there was a significant difference between water content and total reducing sugars in raw and mixed honey (Table 5).

Table 5 Results of Statistical Analysis Using the Sample T-Test

Variable	Assumption	t-test for Equality of Means		
		df	Sig. (2-tailed)	Mean Difference
Water content (%)	Equal variances assumed	22	0.000	-1.97167
	Equal variances not assumed	20,623	0.000	-1.97167
Reducing Sugars Content (%)	Equal variances assumed	22	0.000	-9.45250
	Equal variances not assumed	11,311	0.000	-9.45250

DISCUSSION

The organoleptic properties of honey are the properties of honey as a standard for purity of honey quality. This research found that raw honey had red brown, a caramel-like aroma, tasted sweet, and had a high viscosity. Meanwhile, processed honey had a light yellow colour, caramel aroma, sour taste, and watery consistency. So, the quality of raw and processed honey was dissimilar. The honey harvesting time, when the honey is ripe and the honey cells begin to be closed by the bees, influences the quality of honey.

Based on the Indonesian National Standard, high-quality honey has a high viscosity. Processed honey in this research had a runny consistency, so there was fermentation in the honey. Good quality honey has a high viscosity and low water content. So, the honey will not penetrate the newsprint. The viscosity of honey depends on its water content. The maximum water content in good honey is 22%. Foamy honey could be because it has been left in an open container for a long time and has undergone fermentation (Palilati et al., 2021).

In addition, our study indicated that the taste of both kinds of honey was different. Raw honey had a sweet taste, while processed honey had a sour taste. A previous study also showed that raw honey had a sweet taste compared to processed honey, which has a slightly sour taste (Kornienko et al., 2020). The type of flower the bees visit to collect the nectar as a raw material for honey can influence the taste of honey. Currently, there are various types of honey, such as Randu honey, longan honey, sour honey, mango honey, apple honey, cherry honey, orange honey, peer honey, etc. Honey has a sweet and slightly sour taste due to its high acid content. The sour taste is because the pH in honey is acid (pH: 3.4-6.1). Several organic acids, namely gluconic, acetic, butyric, citric, formic, lactic, malic, pyroglutamic, and succinic acids cause low pH in the honey. The honey's pH analysis can use pH indicator paper. The procedure is dipping the pH paper and comparing the results with the existing colour standard (Chen, 2019).

Furthermore, the colour of raw honey differed from processed honey. Raw honey had red-brown, while processed honey had a light yellow colour. Colour is one of the criteria for the quality of honey. Usually,

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the honey colour tends to follow the nectar-producing plants. For example, honey from radish plants will be white like water, honey from acacia and apple plants will be bright yellow, and honey from lime plants will be bright green. In addition, honey that has been stored for a relatively long period will tend to experience a darker colour change (Groposila-Constantinescu et al., 2020). Based on the colour, honey can be divided into white or light honey and dark honey. Red honey is usually dark honey, which was previously yellow, then brownish yellow became slightly reddish. White honey is not much different from red honey. What distinguishes it is the flower nectar sucked by the bees as workers. White honey is mainly obtained from citrus, kapok, and durian plants, while dark honey is from daisies and insect fluids.

Meanwhile, both kinds of honey in this research had a similar smell. The honey smell correlates with its colour. The darker the colour, the stronger or sharper the aroma. But its scent evaporates quickly. Therefore, honey must be stored and closed tightly. Heating can remove smells, and the extraction process decreases the aroma (Nicewicz et al., 2021).

This study showed that processed honey's water content was significantly higher than raw honeys. The mixing process in the processed honey used too much water. The second largest composition after carbohydrates in honey is water, with a percentage of 15%-25%. Air humidity, type of nectar, and production and storage processes cause variations in the water content. The water content in honey determines its durability. Honey with a high-water content will quickly ferment. Fermentation occurs because the fungi contained in honey grow actively because of the high-water content. In addition, the water content in honey will affect its shelf life because it is closely correlated with the metabolic activity that occurs while the honey is stored. Water content in foodstuffs is also critical because water can affect appearance, texture, and taste. In addition, it determines the freshness and durability of the food. The high-water content will cause bacteria, moulds, and yeasts to breed, so there will be changes in food ingredients. The role of water in food is one factor that affects metabolic activities such as enzyme activity, microbial activity, and enzymatic reactions, causing changes in organoleptic properties and quality values (Majid et al., 2019).

Honey results from bee secretion but does not its poop. Bees have two stomachs - one for eating and the other for storing nectar. The nectar contains 60% water, so bees must reduce it to 20% or lower to make honey. The decrease in water content is through physical and chemical processes. Decreasing water content begins when the bee sticks out its tongue (proboscis) to move honey from the honey stomach to the beehive. In the hive, the water content continues to be lowered through the rotation of the bee's wings, which circulates warm air into the beehive. Meanwhile, the chemical process occurs in the bee's stomach. The invertase enzyme in its stomach converts sucrose (disaccharide) into glucose and fructose (monosaccharides) (Chen, 2019).

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Our findings found that the total reducing sugars in processed honey were significantly higher than in raw honey. Total reducing sugars is one of the quality standards of honey, at least 60%. The total reducing sugars in honey contain glucose, fructose, maltose, and dextrin. The honey production process by bees is complex, so there will likely be differences in the levels and composition of reducing sugars between various types of honey (Dzugan *et al.*, 2018).

Honey is nectar or sugar exudate from plants collected by honeybees, processed, and stored in a beehive. The main components of honey are fructose, glucose, a little saccharose, minerals, vitamins, and enzymes. It Contents high nutrition, so honey consumption by adults, children, and babies is beneficial. The main sugar of nectar is sucrose. During the honey production process, sucrose was broken down by the enzyme invertase into simple sugars (glucose and fructose). The higher demand and limited availability of honey led to different forms of honey adulteration. Honey adulteration is by adding various syrups to natural honey or feeding honeybees with sugar syrups.

Honey also contains antibiotic substances against various disease-causing pathogenic bacteria. A study revealed that high honey sugar content, hydrogen peroxide radical compounds, a high acidity of honey, and organic antimicrobial agents were responsible for antibacterial activity in honey (Johnston *et al.*, 2018). High sugar levels inhibited the growth of bacteria so that bacteria could not live and reproduce. Hydrogen peroxide radicals were responsible for killing pathogenic microorganisms. The high acidity of honey reduced the growth and viability of bacteria. In addition, organic antimicrobial agents in honey were polyphenols, flavonoids, and glycosides (Johnston *et al.*, 2018).

CONCLUSION

In conclusion, raw honey has different organoleptic properties (colour, flavour, and viscosity) than processed honey. In addition, water content and total reducing sugars in processed honey were significantly higher than in raw honey. Overall, the quality of raw honey is better than processed honey. In addition, raw honey has met the quality standard for consumption.

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Opioids in Pain Management for Acute Gout: Friend or Foe?

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A B S T R A C T

Intense and severe pain is the most common symptom of acute gout arthritis (GA) flare. A recent study revealed that opioids were commonly prescribed for 28% of acute GA flare cases. This paper aims to explain current evidence on opioid use in managing acute gout. This literature review was constructed based on a literature search on PubMed and Google Scholar in June 2022. We included all relevant studies, cohorts, and randomized controlled trial articles published in the last ten years. Meanwhile, pre-print or non-English articles were excluded. The evidence regarding opioid use for acute gout pain was rare. No guidelines recommend opioids as an initial analgesic choice in managing pain for acute gout. Opioids are indicated in acute gout patients with severe kidney dysfunction if oral and intra-articular corticosteroids are ineffective in reducing pain. Opioids should be the last choice in selected cases of acute gout.

INTRODUCTION

Gout arthritis (GA) is inflammatory arthritis caused by uric acid deposit-induced inflammation. It is most common in adults. The estimated global prevalence of GA is 1-4%, with an incidence rate of 0.1-0.3%. Subsequently, each decade of life increased its prevalence (more than 10%) and incidence (more than 0.4%). In addition, males have a higher risk of GA than females, with a comparison of 10:1 (Singh and Gaffo, 2020).

Gout has four clinical spectrums, asymptomatic hyperuricemia, acute gout, Intercritical period, and chronic tophaceous gout. Intense and severe pain is the most prominent symptom of acute gout, followed by cardinal signs of inflammation (Stewart *et al.*, 2020). The flare usually affects the lower extremities in 73% of the cases at the first metatarsophalangeal joints (Stewart *et al.*, 2016). Pain management is essential in acute flare. Current guidelines recommend colchicine, NSAIDs, or corticosteroids as initial pain treatment (Perhimpunan Reumatologi Indonesia, 2018).

Opioids are drugs that regulate opioid receptors, commonly in pain modulation. They frequently manage pain in postoperative, cancer, and chronic disease, especially in moderate to severe pain (Mikosz *et al.*, 2020). A recent study revealed that opioids were commonly prescribed for 28% of acute GA flare cases (Dalal *et al.*, 2020). Therefore, this paper aims to explain current evidence on opioid use in managing acute gout.

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METHOD

This literature review was constructed based on a literature search on PubMed and Google Scholar in June 2022. Keywords were acute gout, pain management, opioid, and analgesic, and its synonym to identify relevant articles. In addition, Boolean operators were used to specify the search. We included all relevant reviews, cohorts, and randomized controlled trial articles published in the last ten years to describe and explain the risk-benefit of opioid usage in managing acute gout flare. Meanwhile, pre-print or non-English articles were excluded.

RESULT AND DISCUSSION

URIC ACID, HYPERURICEMIA, AND GOUT ARTHRITIS

Uric acid (UA) is the end-product of purine metabolism with a molecular weight of 168 Da. Animal proteins are the exogenous source of purine, while nucleic acid from damaged or viable cells is the endogenous source. Adenine and guanine from purine undergo a deamination and dephosphorylation process. Then, both transform into inosine and guanosine. Subsequently, the phosphorylation process by nucleoside phosphorylase converts inosine to hypoxanthine and guanosine to guanine. Finally, a key enzyme, xanthine oxidase, takes the final step by converting hypoxanthine to xanthine, followed by xanthine to UA. In addition, guanine deaminase produces xanthine from guanine and, followed by oxidation by xanthine oxidase, produces UA (El Ridi and Tallima, 2017).

Physiologically, the majority form of UA is urate which is distributed in serum and excreted through the urinary system. The normal level of serum UA is 1.5-6.0 mg/dL in male and 2.5-7.0 mg/dL in female. The regulation of UA concentration is dependent on its production and elimination. Overproduction due to a purine-rich diet or reduced elimination due to kidney diseases leads to increased UA concentration. Despite numerous laboratory definitions, hyperuricemia commonly defines as a serum UA level above 7 mg/dL (Jin *et al.*, 2012; Skoczyńska *et al.*, 2020).

Uric acid has limited solubility in the blood. Serum levels above 6.8 mg/dL would induce UA crystallization in the kidney, soft tissue, and joints. The most common crystal form is monosodium urate (MSU) (Skoczyńska *et al.*, 2020). MSU accumulation in the joints potentially initiates a sterile-inflammatory process and causes arthritis or gout arthritis (GA). However, prior studies hypothesized that MSU accumulation alone could not induce GA (Desai, Steiger, and Anders, 2017; Zhang, 2021). The activation of the immune system also plays a significant role in GA development. The MSU-coated serum protein induces NOD-like receptor P3 (NLRP3) inflammasome activation followed by cleavage of pro-interleukin (IL)-1β maturation and activation. The IL-1 β initiates neutrophil-macrophage recruitment, reactive oxygen species (ROS) production, and other inflammatory substances. The crosstalk between

MSU with these inflammation processes is the leading cause of acute GA (Desai, Steiger, and Anders, 2017; El Ridi and Tallima, 2017).

Gout has four clinical spectrums, asymptomatic hyperuricemia, acute gout, Intercritical period, and chronic tophaceous gout. Intense joint pain is the most prominent symptom during acute gout. A previous study showed pain intensity of acute gout was 6.9-7.1 using a 0-10 scale numeric rating scale (Roddy *et al.*, 2020). In addition, other inflammation signs such as a tumor, rubor, and color were also present in the joint. The flare involved a single joint, and about 73% of cases involving metatarsophalangeal joint or podagra (Stewart *et al.*, 2016; Ragab, Elshahaly, and Bardin, 2017).

CURRENT PAIN MANAGEMENT FOR ACUTE GOUT

The principles in acute gout treatment are pain management and urate-lowering therapy. The Indonesian Rheumatology Association (IRA), American College of Rheumatology (ACR), and European League Against Rheumatism (EULAR) strongly recommend three medications for acute GA flare. The therapies are colchicine, non-steroidal anti-inflammatory drugs (NSAIDs), and steroids (Richette *et al.*, 2017; Perhimpunan Reumatologi Indonesia, 2018; FitzGerald *et al.*, 2020).

Colchicine is a drug of choice in managing flares that occur in less than 12 hours. Colchicine binds to tubulin and inhibits microtubule formation. The microtubule disruption leads to less inflammatory activation by leukocytes (Leung, Yao Hui, and Kraus, 2015). An initial dose of colchicine 1 mg is administered during the acute phase, followed by an additional 0,5 mg in the next hour. Subsequently, colchicine is recommended with NSAIDs or steroids (Perhimpunan Reumatologi Indonesia, 2018).

NSAIDs are also effective in managing pain during acute flares independent of its onset. The CONTACT trial is a multicenter study comparing naproxen as an NSAID with low-dose colchicine as the first-line treatment of acute flares in primary care (Roddy *et al.*, 2020). The naproxen was administered by an initial loading dose of 3x250 mg, followed by 250 mg/8 hours for seven days, while colchicine was administered at 0.5 mg/8 hours for four days. The results showed that naproxen and colchicine exhibited similar analgesic effects (adjusted mean difference: -0.18, 95%CI: -0.53─0.17, p=0.32). Interestingly, the study recommended naproxen as the first-line treatment since naproxen was cost-effective and had fewer additional analgesic usage and side effects. In addition, non-selective NSAIDs such as Indomethacin, Meloxicam, Mefenamic Acid, Diclofenac Sodium, and selective NSAIDs such as Etoricoxib and Celecoxib could be prescribed in primary care settings (Low *et al.*, 2022).

The last medication option for acute gout is an oral corticosteroid (OCS). Ideally, OCS is administered when there is a contraindication for Colchicine and NSAIDs, such as kidney disease. The recommended OCS is Prednisolone 30-35 mg/day or equivalent for 3-5 days (Richette *et al.*, 2017).

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OPIOIDS

Opioids are a type of analgesic derived from *Papaver somniferum*. Generally, there were two classifications of opioids based on synthetic processes and the effect on opioid receptors. There are three classes of opioids based on the process: natural extract (Morphine, Codeine, and Papaverine); semi-synthetic (Heroine, Buprenorphine, and Oxycodone); and synthetic (Pethidine, Fentanyl, and Methadone). Meanwhile, the classifications based on its effect on opioid receptors are agonists, partial agonists, and antagonists. The agonist opioids bind to the receptor, resulting in an analgesic effect. There are three different opioid receptors: μ, δ, and κ opioid peptide receptors (Pathan and Williams, 2012; Trang *et al.*, 2015).

Opioids have multiple routes of administration, including oral, intravenous, and intramuscular. In addition, there are subcutaneous, subdermal, transdermal, transmucosal, rectal, epidural, intrathecal, and nasal sprays. After administration, opioids are rapidly distributed to skeletal muscle, the nervous system, the kidney, the lungs, and the placenta. Most opioids are metabolized in the liver and excreted through the kidney as unchanged substances or metabolites (Nafziger and Barkin, 2018).

Opioids are indicated in limited cases because of severe adverse effects and causing drug tolerance and dependence. The general indications of opioids are postoperative pain, cancer-related pain, chronic pain, or moderate-severe pain (Mikosz *et al.*, 2020). The WHO analgesic ladder is widely acceptable pain management, divided into three strategies based on pain intensity (mild, moderate, and severe). Less potent opioids (Codeine, Tramadol, and Hydrocodone) are recommended for moderate pain, while potent opioids (Morphine, Fentanyl, and Buprenorphine) are for severe pain (Anekar and Cascella, 2022).

OPIOIDS IN PAIN MANAGEMENT FOR ACUTE GOUT ARTHRITIS

No guidelines recommend opioids as an initial analgesic choice in managing acute gout (Richette *et al.*, 2017; Perhimpunan Reumatologi Indonesia, 2018; FitzGerald *et al.*, 2020). Opioid use is limited. However, a recent study showed that about 28.3% of flare cases in the emergency department received opioids at discharge, and 80% were new patients. These prescriptions were twice as common in patients with diabetes mellitus, polyarticular joint flare, and opioids use at hospital admissions. The most commonly used opioid was oxycodone, with a mean dose of 37.9 ± 17.2 mg morphine equivalent (Dalal *et al.*, 2020).

The evidence regarding opioid use for acute gout pain was rare. Both ACR nor EULAR does not mention any opioid use in managing GA. However, IRA says opioid use is for limited cases only. Opioids are indicated in acute GA flare with severe kidney dysfunction if oral and intra-articular corticosteroids are ineffective in reducing pain (Perhimpunan Reumatologi Indonesia, 2018). However, the guideline does not mention any specific types of opioids. Based on the *Formularium Nasional*, the only opioids available in primary healthcare is Codeine 10 and 20 mg (Kementerian Kesehatan RI, 2022).

Despite only limited evidence regarding opioid use in managing gout, evidence regarding opioid use in other inflammatory arthritis (rheumatoid arthritis) showed a contrary result. One Cochrane systematic review that analyzed 11 heterogeneous studies showed weak evidence supporting opioid analgesia in treating rheumatoid arthritis (Whittle *et al.*, 2012). Thus, the adverse effect of opioids that act as analgesics outweighed the benefits.

Another study compared a single dose of oral opioids with a non-opioid analgesic in treating acute extremity pain in the emergency department. The study was a randomized controlled trial at two emergency departments and included 416 patients divided into four groups. The first group received 400 mg of Ibuprofen and 1000 mg of Acetaminophen; the second group received 5 mg of oxycodone and 325 mg of Acetaminophen; the third group received 5 mg of Hydrocodone and 300 mg of Acetaminophen, while the fourth group received 30 mg of Codeine and 300 mg of Acetaminophen. Surprisingly, those groups had no clinical or statistical difference in pain reduction (Chang *et al.*, 2017). Based on this evidence, opioids should be used cautiously in acute gout patients.

CONCLUSION

The evidence of opioids in managing acute gout pain was rare. Opioids should be the last choice in selected cases of acute gout. *Formularium Nasional* (n): a list of drugs compiled based on the latest scientific evidence and stipulated by the Ministry of Health Republic of Indonesia.

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Implementation of the 5S Work Attitude Using the Lean Six Sigma Method to the Performance Productivity of Medical Records Unit Officers of Arifin Achmad Hospital, Riau Province

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A B S T R A C T

5S (Simplify, Straighten, Scrub, Stabilize, Sustain) is a simple system that can increase employee productivity. The application of the 5S work attitude in the storage unit of the Arifin Achmad Hospital medical record unit has not been implemented properly. The general purpose of this study is to determine the application and relationship of 5S work attitudes using the lean six sigma method to the productivity of the medical record unit officer. This study uses a qualitative approach with other data analysis models according to the type and purpose of the study. Data analysis in this study used the DMAIC (Define, Measure, Analyze, Improve, and Control) cycle which was adapted to the 5S work attitude method. DMAIC is a performance improvement cycle process based on data collected. The results of the problem analysis using the FMEA (Failure Mode & Effect Analysis) method show that there were 3 problems / defects that frequently occur, namely incorrect stacking with an RPN (Risk Priority Number) value of 147 (17%), delays in returning medical record documents from inpatients ward with an RPN (Risk Priority Number) value of 112 (30%), and distribution errors of medical records to another outpatient department with an RPN value of 70 (38%). The results of observations and in-depth interviews showed that the overall 5S work attitude has not been applied properly to the officer of medical record unit storage section. The application of 5S work attitudes related to 3 priority problems that occur in the storage section has a relationship with employee productivity.

INTRODUCTION

The healthcare sector is the largest and fastest growing industry in the world (Bhat et al., 2020). The situation of health services in Indonesia, especially during this pandemic, shows an assessment of the capacity of health services, especially from 4 important elements, namely staff or human resources, goods (such as supplies), structure (hospital beds and medical waste treatment) and systems (such as referrals and essential health services) are in an inadequate condition (Mahendradhata et al., 2021). In addition, problems of efficiency and effectiveness are found in hospitals in Indonesia (Iswanto, 2019).

Hospitals act as a health service subsystem that organizes two types of services for the community, which is health administration services and health services. Those included medical services, medical support services, medical rehabilitation and nursing services. These services carried out through emergency department, inpatient ward and outpatient department (Suhartina & Fransiskus, 2018). Integral to the hospital services is the medical record unit. The medical record unit is support the service evaluation, operational financing with stationery types is quite high, so it plays a very important role in hospital quality control (Suhartina & Fransiskus, 2018).

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According to information from one of the officers in the medical record unit at Arifin Achmad Hospital, Riau Province, the most problematic is the storage section. The problem is related to the shortage of workers, especially the medical record graduates. This finding is in line with research from Suhartina & Fransiskus (2018), the lack of human resources who have educational backgrounds that are appropriate or not suitable for work, for example a lack of special personnel to carry out retention, media transfer and destruction. Observation for the preliminary study showed that the condition of the medical record storage room was not clean and quite messy. In addition, there are quite a lot of document folders that are located on the floor and under the document shelves.

The storage section for the medical record unit at Arifin Achmad Hospital has a shortage of facilities and infrastructure, such as the Inactive file which is only tied and placed on a shelf. These findings are also in accordance with the problems encountered in previous studies such as items or documents that are not needed on the officer's desk which can interfere with the officer's activities, there is food waste on the officer's desk which makes the room dirty, there is a discrepancy in the return of medical record files with the SOP (Standard Operating Procedure) for discharge which can be causing difficulties in borrowing and searching for the required medical record files (Natasha, 2020). 5S activities have been routinely applied to medical record file processing activities unintentionally, or this 5S method has not been formally applied as the quality standard. 5S is originating from Japanese abbreviation, namely: Seiri (Sorting), Seiton (Organization), Seiso (Cleanliness), Seiketsu (Standardization), and Shitsuke (Discipline). 5S is a system that aims to reduce waste and optimize productivity through routine maintenance of workspaces and implementing the use of visual instructions to obtain more consistent operational results (Iswanto, 2019). The purpose of this study is to determine the application of the 5S work attitude using the lean six sigma method to the productivity of medical record unit officers at the Arifin Achmad Regional General Hospital.

METHOD

This research was a qualitative research using other data analysis models that depend on the type and purpose of the research (Nursalam, 2016). Data analysis used the DMAIC (Define, Measure, Analyze, Improve and Control) cycle which adapted to the 5S work attitude method (Furterer, 2014). Qualitative analysis consisted of few stages, sorting and organizing data collected from field notes (document study), observation, in-depth interviews, and documentation for constructive analysis (Nursalam, 2016). The selection of informants used purposive sampling technique. The selection of sampling techniques based on the main topic of research on 5S work attitudes and work productivity. The subject was the officers involved either directly or indirectly in the storage unit of the medical record unit. The informants were 8

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officers, consisted of the head of the medical record room, the coordinator of the storage and destruction of medical records, and the officers of medical record storage unit. The selection of informants determined from the informant's knowledge and work experience in the medical record unit, especially in the storage section. Data collection used several techniques starting from document studies, observations, interviews, and documentation. Below were the questions asked during the interview process:

Table 1. List of Main Interview Questions

No	Question
1.	Has the 5S / 5R Work Attitude Method (Brief, Neat, Diligent, Clean, Treat) been applied or performed in the medical record unit storage section at RSUD Arifin Achmad?
2.	Is the performance appraisal for the officers in the medical record unit routinely performed?
3.	How is the 5S / 5R work attitude implemented in the medical record storage management activities?
4.	How to evaluate the performance of medical record unit officers? (What method is used as well as the results of the officer's performance appraisal)
5.	What problems do you often encounter (related to medical record file management) in the medical record unit storage section?
6.	Are there problems with the medical record unit, especially in the storage section that cannot be resolved?
7.	How do you solve problems that occur in the medical record unit, especially in the storage section? (For example: labor shortage problem)
8.	Are there regulations or policies from the hospital that help to increase the productivity of medical record unit officers?
9.	What is your role as Head of Installation / Head of Room / Coordinator in helping to increase the work productivity of medical record unit officers?
10.	What is the Cleanliness Condition of the work area of the medical record unit storage section?

RESULT

Based on the results of the interviews, a total of 16 types of problems grouped in the medical record unit storage section at Arifin Achmad Hospital. The problems analyzed using the FMEA (Failure Mode and Effect Analysis) method. This method was a structured methodology for identifying and analyzing failures that have occurred or may occur, with the aim of preventing these failures from having a negative impact on the results of a process (Soemohadiwidjojo, 2017).

(Failure Mode & Effect Analysis) method show that there are 3 problems/defects that most often occur, namely stacking errors of 18%, delays in returning medical record documents from hospitalization of 31% and errors in distributing medical record documents to other outpatient department by 39%. The results of measurement and analysis of the 3 dominant problems in the medical record unit storage section using the FMEA method are based on the largest number of RPN values described in the following table.

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Table 2. Problem Priority Table

No	Mode of Failure (Defect)	Potential Cause of Failure Potential Effect of Failure	Potential Cause of Failure Potential Effect of Failure	RPN
1.	Wrong stack	The clerk misplaced it when compiling the document	Documents could not be found and could not be delivered to the outpatient department and resulted in longer patient waiting times	147
2.	Delay in returning medical record documents	The doctor has not filled out the medical record status, the room attendant/nurse is late in returning the document, the treatment process for inpatients ward is longer than for outpatients	Delays in delivery of medical record documents to department	112
3.	Error in distributing medical record documents to department	Lack of accuracy by officers, there are still old tracers that are no longer used/ have passed the patient's treatment date in the documents	Extend patient waiting time	70

DISCUSSION

The results of in-depth observations and interviews showed that the application of the 5S work attitude had not been implemented properly by the staff in the medical record unit storage section. Especially in the 3 aspects with the lowest level of implementation, namely aspects: Standardize / Seiketsu / Treat (Strengthening), Shine / Seiso / Neat and Straighten / Seiton / Neat (Organization) aspects. Among these three aspects, the aspect with the lowest level of implementation is the Standardize / Seiketsu / Treat (Strengthening) aspect. The officer productivity section there are several problems in the aspects of personal factors and system factors. The problem with the personal factor aspect is that the average officer has never received a 5S work attitude briefing even though the storage room has visual media for the 5S work attitude. While on the aspect of system factors (procedures implemented by the hospital / SOP) and leadership: there are no specific regulations and implementation regarding the awarding of rewards or awards for the best performance of officers in the medical record unit. The regulations applied in the hospital are in the form of awards for services.

Based on the problem analysis using the FMEA method, there are 3 problems that are top priority to be addressed immediately. These three priorities directly become factors causing the implementation of the 5S work attitude not to be implemented properly.

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The description of the problem is assisted by using a root diagram as shown below:

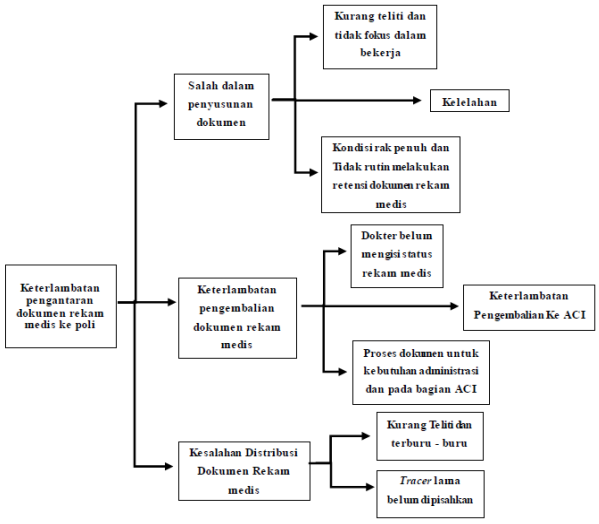

Figure 1. Root Diagram: Priority Problems in the medical record unit storage section

The priority problem is the arrangement of documents on storage shelves, then followed by the problem of returning documents from the inpatient ward.

1. Error in preparing documents.

   This error often occurs when staff return a document and made stacking error in the shelves, the error found out when officers performed Searching for documents on shelves to be delivered to outpatient department. This stacking error is a form of people-type waste that is generated from the activities of officers. The impact of the wrong arrangement of documents can be seen when the Officer searches for medical record documents on the storage shelves. There are 3 factors that cause the wrong problem in preparing medical record documents on the shelves, namely, Inaccurate, and unfocused at work, Fatigue, the shelf is full, and officers have not preformed routine document retention.

2. The condition of the shelves is full, and the officers have performed routine document retention.

   The problem that often occurs in the storage department and disrupts the process of distributing medical records to the outpatient department is the delay in returning documents from the inpatient ward. Information from interviewed the room coordinator that the medical record documents took 3-4 days to return to the storage department from the inpatient ward. Delays in returning medical record documents from inpatient ward caused by several factors as follows: The doctor has not completed the medical record status, Delay in returning to ACI and Processing documents for administration and at the ACI section.

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3. Mistakes in the distribution of medical record documents.

   Errors in the distribution of medical records occur when officers deliver medical records to the outpatient department, but the patient was absent. The factors that lead to errors in the distribution of medical records are as follows: Inaccurate and in a hurry and the old tracers have not been disposed of or separated.

The application of the 5S work attitude has a relationship to the results of employee performance. For example, there is no selection between items that are used and those that are not used (sort aspect) where this has an impact in the form of full shelf conditions, there are still items that are not used in the work area which can take up space, as well as other problems such as the cleanliness of the work area and the placement of medical record documents. Enviro results factors in the Standardized/Seiketsu aspect have problems in the form of damaged air-conditioning facilities which result in the room temperature becoming a bit hot and disturbing the work comfort of storage staff, besides that the medical record storage room does not have ventilation for air circulation (especially in active storage areas).

Improvement strategy design is made using the 5W + 2H method. Based on the design of the improvement strategy using the 5W + 2H method, there is an implementation of an action plan that can be carried out as follows:

1. Provide guidance on how to apply the 5S work attitude to medical record unit officers, especially in the storage section.
2. Rearrange the way medical record documents are arranged on the shelves so that they are arranged vertically and parallel to the standard order system for medical record numbers in hospitals and improve the way work equipment items are organized as shown in the picture below.

Figure 3. Example of preparing documents and organizing work equipment properly

3. Develop visual management in the work area by inspecting schedule, compiling medical record documents on shelves, and determining the rotation of officers who carry out inspection activities (for example: the work schedule for officers for the morning shift is from Monday to Friday, so that on Saturday and Sunday inspection activities this can be done by the officer on duty that day.

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4. Actively develop two-way communication with all related parties.
5. Make a list of factors that trigger delays in returning medical records and carry out analysis and evaluation of previous events.
6. Improving the control and supervision stage. One way that can be used is to make a checklist sheet for the implementation of each activity.

The application for the implementation of the corrective action plan can be done by using a checklist sheet to assess the implementation of the corrective action as follows:

Table 2. Checklist of control stages

Control Stages Checklist			
No	Statement	Yes	No
For this project we have:			
1.	Make a recap of records when returning medical record documents from the outpatient department/inpatient room		
2.	Make a schedule for examining medical record documents on the shelf		
3.	Examination of the preparation of medical record documents and old tracers in the medical record documents		
4.	Compile process control sheets and develop control stages together		
5.	Make a record of evaluating issues that cannot be handled by the team of storage officers to the head of the room		
*Furthermore, it can be adjusted to the conditions and related service policy systems.			

CONCLUSION

Based on the results of observations and interviews conducted from 02 June - 05 August 2022 in the medical record unit storage section, the conclusions are: (1) the 5S work attitude has not been properly implemented by the medical record unit storage section officers. This is shown from the results of the problem analysis using the FMEA method that there are 3 problems/defects that most often occur, namely stacking errors with an RPN value of 147 (17%), delays in returning medical record documents from hospitalization with an RPN value of 112 (30%) and Errors in distributing medical record documents to other polyclinics with an RPN value of 70 (38%). (2) There is a relationship between the implementation of the 5S work attitude related to the 3 priority issues that occur in the storage section on the productivity of priority officers that occur in the storage section on employee productivity. (3) According to the observations, the 5S Work Attitude has not been formally implemented or does not yet have regulatory standards for its implementation, but the officers in the storage department have implemented the 5S work attitude indirectly in their daily work activities.

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Knowledge and Behavior as Risk Factors for Intestinal Worm Contamination on Raw Vegetables Food Traders in Pakusari District Jember Regency

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A B S T R A C T

Intestinal parasites are one of the leading public health problems worldwide, with an incidence of 24% worldwide and 45-65% in Indonesia. Intestinal parasites, especially intestinal worms, or soil-transmitted helminths (STH), significantly contribute to gastrointestinal diseases worldwide. Intestinal worm infections occur in rural and urban populations, especially in people who have the habit of eating with dirty hands, using unhygienic toilets, and consuming contaminated food, water, or soil. Fresh vegetables are a means that support parasitic intestinal infections, especially for traders who must be able to prevent intestinal worm contamination in fresh vegetables. Consumption of raw vegetables can be a source of intestinal worm infection, thereby increasing the prevalence of foodborne diseases. This type of research is analytic observational with a cross-sectional study design. Samples in the form of fresh vegetables were taken from fresh vegetable traders in Pakusari District, Jember Regency and then processed by the sedimentation method and then observed using a microscope to identify intestinal protozoa. Food safety knowledge was assessed using a questionnaire, and the behavior of food traders was assessed by researchers using observation sheets. The bivariate analysis showed that proper handwashing behavior was related to intestinal worms in fresh vegetables ($p<0,05$). Other knowledge and behavior variables were unrelated to intestinal worms' presence. The intestinal worm species found is a type of Hookworm.

INTRODUCTION

Intestinal parasites are one of the leading public health problems worldwide, with an incidence of 24% worldwide and 45-65% in Indonesia (Nasution et al., 2019). Fresh vegetables are a means that support the occurrence of parasitic intestinal infections, especially for traders who must be able to prevent intestinal worm contamination in fresh vegetables supported by contamination as much as intestinal worms have contaminated 61.2% of fresh vegetables in 128 samples (Karuppiah, 2017).

Intestinal worms, especially the Soil Transmitted Helminths (STH) group, are highly infectious microbes that can cause disease, especially in developing countries. Roundworms (Ascaris lumbricoides), hookworms (Necator americanus and Ancylostoma duodenale), and whipworms (Trichuris trichiura) are worms that cause infections in the human intestine. Infections due to intestinal worms seriously impact health problems, especially in Indonesia. Intestinal worm contamination in fresh vegetables can occur due to traders' lack of food safety knowledge regarding intestinal worm contamination in fresh vegetables sold and traders' need for hygiene behavior in cleaning fresh vegetables, handling unhealthy food, and unclean food equipment (Alfiani & Ginandjar, 2018).

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Research result (Alfiani and Ginandjar, 2018) 22 samples were examined, and there were 12 positive samples contaminated with parasites in fresh vegetable. Prior research (Wantini et al., 2019) found that there were 12 samples, and there were (58.3%) parasites in all samples tested on cabbage and (91.7%) on basil in this study. (Adrianto, 2018) there are four samples with a parasitic contamination level of (61.9%). Based on statistical data from Pakusari District, Jember Regency, the number of residents who work as the second largest trader in Jember Regency and the geographical location of Pakusari Subdistrict, which is the main road between Jember Regency and Banyuwangi Regency makes Pakusari Subdistrict widely traversed by vehicles and stop by to buy food containing fresh vegetable. The lack of research on food safety knowledge and clean and healthy hygiene behavior among traders in Pakusari District, Jember Regency, makes researchers want to discuss knowledge and behavior as risk factors for intestinal worm contamination in fresh vegetable in Pakusari District, Jember Regency.

METHOD

This research is an observational analytic study with a cross-sectional approach. The population in this study were food sellers who contained fresh vegetables in Pakusari District, Jember Regency. Sampling in this study used a simple random sampling technique. Calculation of the sample size in this study using the Dahlan formula obtained a sample size of 30 samples. In this study, a questionnaire sheet was used to interview the respondents' food safety knowledge, and an observation sheet was used to observe the individual behavior of the respondents. The data used in this study consists of the results of the inspection of fresh vegetable samples related to soil-transmitted helminth (STH) contamination in Pakusari District, Jember Regency. The results of STH contamination were obtained from laboratory examinations using the sedimentation method. Data analysis used IBM SPSS Statistics 25 with the univariate test, bivariate test with chi-square and multivariate test with logistic regression.

RESULT

STH contamination in fresh vegetable is enforced by examining vegetable using the sedimentation method. The distribution of vegetables contaminated by STH is 10% or three samples. STH species that contaminate vegetable sold are Hookworms. The results of the distribution of STH contamination are in table 1.

The food safety knowledge was obtained through questionnaire interviews. The interview included the use of gloves when cooking; the use of jewellery on the hands, such as rings or bracelets; the use of different cooking utensils; the presence of animals in the cooking area, such as flies or rats; placing unprocessed food in the kitchen refrigerator, and raw vegetables are more likely to transmit disease. Food handler who

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suffers from diseases such as diarrhea, sore throat, syphilis and flu, healthy food vendors can also be carriers of the disease. The table of food safety knowledge factors is in table 2.

Factors of food safety knowledge in fresh vegetable traders with the most yes answers were the components of the presence of animals and the risk of food contamination through disease (n=29; 96.7%). The statement with the most no answers, namely the components of healthy food sellers, can also be carriers of disease 21 (70%), and those who answered yes were only nine respondents (30%).

Individual behavioral factors of research subjects were obtained through observations which included food sellers wearing clean clothes/aprons or head coverings, food sellers washing their hands properly every time they wanted to touch food, traders keeping their nails clean (not dirty and long nails), traders not using jewelry (rings)/bracelet), the food seller has no wounds or ulcers on his hands. The table of individual behavioral factors is in table 3.

Individual behavioral factors in fresh vegetable traders with the best behavior were in the food seller component; there were no wounds or ulcers on the hands (n=29; 96.7%). Traders mostly did the behavior that was not carried out, namely the clothing component of traders wearing clean clothes or head coverings as many as 25 (83.3%) and only 5 respondents (16.7%) did.

The Chi-Square test was used to Analyze the data related to the relationship between the risk factors of food safety knowledge of fresh vegetable sellers and the presence of STH in the fresh vegetable. The inspection of fresh vegetables is taken from fresh vegetables sold by traders. The results of the analysis showed that there was no relationship between knowledge of food safety and the presence of STH, which consisted of the use of gloves (p=0.626), the use of jewelry (p=1,000), the use of different cooking utensils (p=0.626), the presence of animals (p=0.753), food storage (p=0.474), the potential for disease transmission from vegetables (p=0.414), risk of food contamination through traders' disease (p=0.753), and disease transmission from healthy traders (p=0.894).

Table 1. Distribution of STH Contamination on fresh vegetables

STH type	Total (n)	Percentage (%)
Ascaris lumbricoides	0	0
hookworm	3	10
Trichuris trichiura	0	0
None	27	90

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Table 2. Food Safety Knowledge Factors

Rated components	Assessment results (n)		Percentage (%)	
	Yes	Not	Yes	Not
Use gloves when cooking	28	2	93.3	6.7
The use of jewelry on the hands, such as rings or bracelets	20	10	66.7	33.3
Use of different cooking utensils	28	2	93.3	6.7
Presence of animals in the cooking area such as flies or mice	29	1	96.7	3.3
Putting unprocessed food in the refrigerator	26	4	86.7	13.3
Raw vegetables are more likely to transmit disease	25	5	83.3	16.7
A food handler who suffers from illnesses such as diarrhea, sore throat, syphilis and flu	29	1	96.7	3.3
Healthy food vendors can also be carriers of disease	9	21	30	70

Table 3. Individual Behavior Factors

Rated components	Assessment Results (n)		Percentage (%)	
	Yes	Not	Yes	Not
Food vendors wear clean clothes/aprons, or head coverings	14	16	46.7	53.3
Food vendors wash their hands properly every time they touch food	21	9	70.0	30.0
Traders keep nails clean (nails are not dirty and long)	23	7	76.7	23.3
Traders do not use jewelry (rings/bracelets)	20	10	66.7	33.3
The food seller has no wounds or ulcers on his hands	29	1	96.7	3.3

Table 4. Bivariate Test Results of Food Safety Knowledge with STH Contamination on Fresh Vegetables

Rated components	Negative STH contamination		Positive STH Contamination		Odds Ratio	p-value
	n	%	n	%		
Use gloves when cooking						
Not	2	7.4	0	0	-	0.626
Yes	25	92.6	3	100		
Use jewelry such as rings or bracelets						
Not	9	33.3	1	33.3	1,000	1,000
Yes	18	66.7	2	66.7		
Use different cooking utensils						
Not	2	7.4	0	0	-	0.626
Yes	25	92.6	3	100		
Presence of animals such as flies or mice in the cooking area						
Not	1	3.7	0	0	-	0.753
Yes	26	96.3	3	100		
Putting unprocessed food in the refrigerator						
Not	4	14.8	0	0	-	0.474
Yes	23	85.2	3	100		
Raw vegetables are more likely to transmit disease						
Not	5	18.5	0	0	-	0.414
Yes	22	81.5	3	100		
A food handler who suffers from illnesses such as diarrhea, sore throat, syphilis, and flu						
Not	1	3.7	0	0	-	0.735
Yes	26	96.3	3	100		
Healthy food vendors can also be carriers of disease						
Not	19	70.4	2	66.7	1,188	0.894
Yes	8	29.6	1	33.3		

Table 5. Results of Bivariate Test of Individual Behavior with STH Contamination on Fresh Vegetables

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Rated components	Negative STH contamination		Positive STH Contamination		Odds Ratio	p value
	n	%	n	%		
Food vendors wear clean clothes/aprons or head coverings						
Not	14	51.9	2	66.7	0.538	0.626
Yes	13	48.1	1	33.3		
Food vendors wash their hands properly every time they touch food						
Not	6	22.2	3	100	-	0.005
Yes	21	77.8	0	0		
Traders keep nails clean (nails are not dirty and long)						
Not	6	22.2	1	33.3	0.571	0.666
Yes	21	77.8	2	66.7		
Traders do not use jewelry (rings/bracelets)						
Not	9	33.3	1	33.3	1,000	1,000
Yes	18	66.7	2	66.7		
The food seller has no wounds or ulcers on his hands						
Not	1	3.7	0	0	-	0.735
Yes	26	96.3	3	100		

The Chi-Square test was used to analyze the relationship between risk factors for the behavior of fresh vegetables sellers and STH in the fresh vegetable. The inspection of fresh vegetables is taken from fresh vegetables sold by traders. The analysis showed a relationship between knowledge of food safety and the presence of STH on the handwashing behavior factor (p = 0.005). Details of the risk factors for the behavior of fresh vegetable sellers with STH contamination can be seen in table 5.

A multivariate test was performed on variables that met the requirements of the bivariate test (p<0.25). This study shows that there is only one variable with a significance value of <0.25, so the data in this study cannot be tested with multivariate.

DISCUSSION

Factors of Food Safety Knowledge and Individual Behavior

The knowledge factor of using gloves when cooking can reduce the risk of food contamination in this study was dominated by respondents who agreed with the statement, namely 28 respondents (93.3%) and two respondents (6.7%). The percentage is the same as the research conducted by Irianti (2022), which is equal to (93.3%) who agree and (6.7%) who disagree. The understanding of fresh vegetable sellers regarding the use of gloves when processing food, of course, can prevent the transmission of STH from humans to vegetables and vice versa.

The knowledge factor about the use of jewellery on the hands can increase the risk of food contamination in this study; most of them agree with the 20 respondents (66.7%), and those who do not agree with as many as 10 respondents (33.3%). These results align with Sitepu's research (2015), with 62.5% agreeing we should not use jewellery such as rings when touching food. Vegetable sellers regarding the use of

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jewellery when touching food can lead to cross-contamination between jewellery and food. The skin under jewellery is a good place for microbes to breed (Triandini, 2015).

The knowledge factor of respondents in using different cooking utensils in handling raw and cooked food can minimize the risk of food contamination. In this study, 28 respondents (93.3%) agree, and 2 respondents (6.7%) disagree. This study aligns with research conducted by Ncube (2020), in which as many as 81.2% of respondents agree to use different tools when handling food. Using the same utensils when handling food can contaminate raw food with cooked food and vice versa (Abdul-Mutalib et al., 2012).

The knowledge factor regarding the presence of animals in the cooking area can increase the risk of food contamination. In this study, 29 respondents (96.7%) agreed, and only 1 (3.3%) disagreed. This study is in line with the Ncube research, (2020) with the percentage of respondents who agree that animals can cause food contamination as much as 85.1%. Food contamination can be in the form of microbes, especially parasites that can come from dirty places that can be carried by animals such as flies, cockroaches, to rats (Restianida, 2018).

The knowledge factor about putting unprocessed food in the refrigerator can prevent food poisoning in this study. Most respondents agreed with 26 (86.7%) respondents, and 4 disagreed (13.3%). These results are slightly different from the research conducted by Khotimah (2015), with results with all respondents agreeing to all respondents (100%). The difference in results can be caused by the number of respondents being much less than in this study, and the respondents in this study were under the supervision of certain agencies.

The knowledge about raw vegetable is more potentially infectious than as many as 25 respondents answered cooked vegetables agreed (83.3%), and 5 respondents disagreed (16.7%). This study result is more than the research conducted by Akabanda (2017), in which only 40.9% agree. Vegetables served cooked will eliminate the benefits of these vegetables than served raw. Raw and fresh vegetables can potentially transmit the disease; therefore, raw vegetables must be washed using running water to avoid the transmission (Adrianto, 2017).

The knowledge factor about a food handler who suffers from diseases such as diarrhea, sore throat, syphilis and flu poses a risk of food contamination in this study, almost all respondents agreed with a total of 29 respondents (96.7%), and only one disagreed (3,3%). This study is the same as the research conducted by Ncube (2020), with 99% of respondents agreeing. Pathogens in traders who suffer from infectious diseases can contaminate the food these traders are processing. These pathogens can transfer to food consumers from processing traders with infectious diseases (Okarini, 2017).

The sellers' knowledge that healthy food can be a carrier of diseases was disagreed with by most respondents (70%), and only 9 respondents agreed (30%). This research is in line with research conducted

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by Ncube (2020), with the percentage of respondents who agree as much as 78.2%. Food handlers who carry pathogens can contaminate the products or foodstuffs they process and endanger consumers' health. The habit of smoking, whistling, coughing, sneezing, and not wearing PPE when touching food can contaminate food even though the food handler is in good health (Tappes et al., 2019).

The behavioural factors of food sellers who wear clean clothes/aprons or head coverings in this study were 14 respondents (46.7%), and more respondents who did not do so were 16 respondents (53.3%). The results of this study are less than the research conducted by Suryani (2019), with as many as 60% of respondents wearing clean clothes or head coverings. Food handlers are recommended to use clean clothes/aprons when processing food so that no remnants of dirt attached to the clothes do not transfer to the processed food and the use of head coverings for traders, can avoid the risk of dirt on the head hair being transferred to the processed food (Nurhayati, 2020).

The results of the observation of the behavior of food sellers who wash their hands properly each time they want to touch food in this study are as many as 21 respondents washing their hands properly (70%) and respondents who still have not washed their hands properly and correctly, as many as 9 respondents (30%). The behavior of the respondents in this study was more than the research conducted by Mulyani (2020); as many as 41.9% of the respondents had clean and healthy handwashing behavior. Proper handwashing behavior is significant for traders before and after processing food. Because proper handwashing can eliminate microorganisms on hands, prevent cross-infection, and maintain sterile conditions (Kurniawati et al., 2022).

The behavior of traders who keep their nails clean when processing food in this study, 23 respondents (76%), and those who have not kept their nails clean are 7 respondents (23.3%). This study aligns with research conducted by Augustin (2015), which is as much as 80% of traders' behavior in maintaining nail hygiene. Traders with long nails can make it easier for microbes to stick to and increase the risk of transferring these microbes to processed foods, so keeping nails clean by trimming them regularly can prevent and reduce the risk of contamination of food (Retno Hestiningsih et al., 2019).

The behavior of traders who do not use jewelry in this study 20 respondents (66.7%) and traders who use jewelry are 10 respondents (33.3%). Fewer respondents in this study do not use jewelry than in research conducted by Maywat (2019); as many as 83.1% of respondents do not use jewelry. Food contamination can be caused by traders who use jewelry such as rings or bracelets because jewelry can become a breeding ground for microbes through rings and bracelets. The importance of not wearing rings or bracelets, can reduce the risk of cross-contamination (Ardhayanti et al., 2018).

The results of observations on food vendors who did not have wounds or ulcers on their hands showed that 29 respondents did not have sores or ulcers on their hands (96.7%) and only 1 respondent had sores or ulcers on their hands (3.3%). This research is in line with the research conducted by Zakuan (2019), with

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100% percentage results in 27 respondents. The cleanliness of traders, especially those with wounds such as boils on their hands, can contaminate the food processed by these traders. Wounds are a source of pathogens and a source in the chain of pathogen transfer into food (Rambe, 2021).

STH Contamination in Vegetables

Based on the examination conducted on 30 samples of fresh vegetable sold by fresh vegetables traders in Pakusari District, Jember Regency, positive results were obtained in 3 samples and negative in 27 samples, with a positive percentage of 10% and a negative sample of 90%. The results of STH findings in this study were relatively less compared to research conducted by Lobo (2019) which showed 26.7% of the fresh vegetable samples studied were contaminated with STH.

Natural factors and food sanitation hygiene can affect the presence of STH in fresh vegetables. Natural factors include soil, climate, and humidity (Safitri et al., 2019). The development of STH through soil media directly makes STH easily contaminate cabbage and basil which are planted directly in the soil. STH can enter between the leaves of cabbage vegetables and also stick to the basil leaves (Lobo, 2019). Climate factors and high humidity are suitable for developing STH eggs and larvae into infective forms (Nugraheni et al., 2018).

Sanitary hygiene also affects the presence of STH in food. The selection of good food ingredients, such as choosing clean and fresh vegetables, makes the possibility of finding STH in vegetables relatively low. Maintaining food hygiene and reducing the risk of food contamination can be done by suitable food processing methods, such as removing damaged parts of vegetables and washing fresh vegetables using running water before serving. Worm eggs on the ground or dust will reach the food if blown away by the wind. Serving fresh vegetables to fresh vegetable traders in an open place and next to the road can be exposed them to dust (Safitri et al., 2019). The finding of STH in this study was relatively less because most traders store food in closed containers/containers making the risk of food being exposed to dust less.

Another study conducted by Mutianigsih (2016) and Safitri (2019) regarding STH identification obtained negative results; namely, no STH contamination was found in fresh vegetables. These results are also inconsistent when compared with this study. The absence of STH contamination in fresh vegetables could be due to the better sanitation of the research respondents and the smaller number of samples than in this study.

All STH species found in fresh vegetables in this study were hookworms. This research is in line with the research conducted by Amin (2021) conducted in Medan City, with all positive results of hookworm-type STH or hookworm.

The Relationship of Food Safety Knowledge and Individual Behavior with STH Contamination in Fresh Vegetables

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This study found that the knowledge factor of using gloves when cooking showed that there was no significant relationship (p=0.626) to the presence of STH. Most respondents agreed that using gloves when cooking can reduce the risk of food contamination. Only 2 respondents disagreed, and 28 other respondents agreed. This study differs from Ulfa (2016) research which has significant results regarding the relationship between the use of PPE with gloves on and the incidence of worm disease. The factor absence of a relationship between knowledge of the use of gloves and the presence of STH in this study, which could be caused by respondents who did not know about the use of gloves, had a negative result of STH on the observation of fresh vegetable samples. This result can be caused during observation; respondents wash their hands properly before touching food. This study aligns with research conducted by Yamin (2021) regarding the relationship between handwashing behavior and STH contamination, which showed significant results.

The study's results regarding the knowledge factor about the use of jewelry on the hands with an increased risk of food contamination showed no significant relationship (p=1,000) to the presence of STH. Most respondents know that using jewelry on the hands can increase the risk of food contamination. Twenty respondents agree, and ten other respondents do not agree. This study is in line with research conducted by Sihombing (2017) with insignificant results (p = 0.331) regarding the relationship between the waiter's knowledge about hygiene, which contains the use of jewelry and the presence of STH in fresh vegetables. There is no significant relationship between knowledge of the use of jewelry on the hands and the presence of STH in this study,

The study's results regarding the knowledge factor of using different cooking utensils in handling raw food and cooked food can minimize the risk of food contamination, showing no significant relationship (p = 0.626) to the presence of STH. Most of the respondents knew about the use of different cooking utensils in handling raw and cooked food. Only 2 respondents did not know, and the other 28 respondents did. This study must align with Alfiani's research (2018) with significant results regarding the cleanliness of cooking utensils with STH contamination. Factors that cause no relationship between this study and their differences in results; can be because, in this study, as many as 92.6% of respondents had better knowledge of using cooking utensils.

The study's results regarding the knowledge factor about the presence of animals in the cooking area can increase the risk of food contamination in this study, which showed no significant relationship (p = 0.753) to the presence of STH. Twenty-nine respondents agree, and only one respondent does not agree. This study is in line with Yasmin (2011) with insignificant results (p = 0.203) on the incidence of STH infection with the habit of buying food served openly and then infested with flies. The absence of a significant relationship between knowledge about the presence of animals in the cooking area and the presence of STH in this study could be caused by 1 respondent who did not agree to have a negative result of STH

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contamination in fresh vegetable samples. Covering food can reduce exposure to food in the form of dust, flies, or cockroaches that act as STH mechanical vectors. These eggs can then enter the human body through food or drink contaminated with worm eggs through the intermediary of flies or dust from soil contaminated with worm eggs (Pratama and Sudarmaja, 2018).

The study's results regarding the knowledge factor regarding placing unprocessed food in the refrigerator to prevent food poisoning showed no significant relationship (p = 0.474) to the presence of STH. Most of the respondents agreed about the knowledge that putting unprocessed food in the refrigerator can prevent food poisoning. 4 respondents disagree and 26 other respondents agree. This study is not in line with research conducted by Aristin (2014) with the results that there is a significant relationship (p = 0.000) in food storage with the presence of microbes. The absence of a relationship and differences between knowledge of putting raw materials in the refrigerator and the presence of STH in this study can be caused by four respondents who disagree with having a negative STH result on the observation of fresh vegetables samples. Traders already know that storing foodstuffs such as vegetables in a state of 10-15 degrees Celsius to avoid microbial contamination. In contrast, meat and fish types of food are stored in closed, frozen storage (Jiastuti, 2018).

The study's results regarding the knowledge factor about raw vegetables being more potentially infectious than cooked vegetables in this study showed no significant relationship (p = 0.414) to the presence of STH. Twenty-five respondents agree, and five other respondents do not agree. The absence of a significant relationship between knowledge about raw vegetables being more potentially infectious than cooked vegetables and the presence of STH in this study could be caused by five respondents who disagreed and did not have a positive result of STH contamination in fresh vegetable samples. Raw vegetables are more likely to spread food-borne diseases than vegetables processed at high temperatures (Adrianto, 2017).

The results of the study regarding the knowledge factor about a food handler suffering from diseases such as diarrhea, sore throat, syphilis and flu that can pose a risk of food contamination showed that there was no significant relationship (p=0.735) to the presence of STH. Most respondents know that a food handler who suffers from an illness can pose a risk of food contamination. Twenty-nine respondents agree, and only one respondent does not agree. The absence of a significant relationship in this study could be due to the absence of STH in the vegetable samples of respondents who disagreed. Food handlers who suffer from diseases that do not maintain personal hygiene, such as not washing their hands or wearing masks, can transmit the disease through faecal-oral (Jiastuti, 2018). Food contamination can occur due to pathogens in traders, which can be transferred to consumers who consume food (Okarini, 2017).

The research results on the knowledge factor about healthy food vendors can also be carriers of diseases caused by food, showing no significant relationship (p = 0.894) to the presence of STH. Most respondents disagreed that the seller of healthy food could also be a carrier of disease caused by food. There are only

nine respondents agree, and 21 other respondents do not agree. The absence of a significant relationship in this study could be caused by eight respondents who knew about disease carriers from healthy food vendors; only 1 was positive for STH in the observed fresh vegetable samples. Food handlers who carry pathogens can contaminate the products or foodstuffs they process. Unhygienic habits such as not washing hands (Tappes et al., 2019).

The study results of the relationship between the behavior of food sellers wearing clean clothes/aprons or head coverings on the presence of STH in the fresh vegetable sample showed no significant relationship (p=0.626). Fourteen respondents have the behavior of using clean clothes or head coverings, and 16 respondents do not have this behavior. This study aligns with research conducted by Ardhayanti (2018), which discusses the relationship between the use of PPE and STH contamination in food traders with insignificant results (p = 0.464). Factors that cause no significant relationship can be caused by respondents who do not use aprons or head coverings and continue to use other PPE such as masks and gloves. Although the use of masks by respondents when touching food can be caused by the government's obligation to use masks anywhere during the COVID-19 pandemic, this is in line with the completeness of PPE that must be used for food handlers. Based on Suryansyah's research (2018), the completeness of PPE food handlers must use is headgear, masks, aprons, gloves, and safety shoes to prevent microbial cross-contamination in food and the safety of traders when working as food traders.

The research results on the behavioral factor of washing hands properly every time touching food to STH contamination show a significant relationship (p = 0.005). A total of 21 respondents did it, and nine others did not. These results align with research conducted by Yamin (2021) with significant results on the relationship between proper hand washing and STH contamination. Hand washing behavior affects STH contamination can be caused by 21 traders who apply good hand washing behavior, namely using running water and soap. There is no STH contamination in the samples of fresh vegetables examined and from 9 other respondents who did not apply handwashing behavior properly. Excellent and correct, 3 of them had positive results of STH contamination in the vegetables examined. This result can be a means of transmitting contamination of STH worm eggs from hands that may be contaminated with STH to fresh vegetables. Research conducted by Anita (2013) also states that the habit of washing hands using running water and soap has an essential role in preventing worm infections, by washing hands using water and soap is more effective in removing dirt and STH worm eggs that stick to both hands.

The results of the study regarding the behavior of traders who kept their nails clean with the presence of STH in fresh vegetables did not have a significant relationship (p = 0.666). Twenty-three respondents keep their nails clean, and seven respondents still do not keep their nails clean. This study is in line with Alfiani (2018) research with the results that there is no significant relationship (p = 0.195) between the behavior of food traders who maintain nail hygiene and the presence of STH in fresh vegetables. Most of the

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respondents in this study maintained good nail hygiene by 77.8%, which could be an insignificant relationship factor to STH contamination in fresh vegetables. Food handlers have a massive role in processing food and preventing food contamination by microbes (Pasanda, 2016).

The study's results on the behavioral factors of traders who did not use jewelry on their hands, there was no significant relationship (p=1,000) to STH contamination in fresh vegetables. Twenty respondents do not use jewelry on their hands, and ten respondents use it. Research conducted by Fitria (2018), which contains the use of jewelry on the hands of food handlers, shows that knowledge of food hygiene and poor food hygiene behavior can increase the risk of disease transmission from food. The insignificant results in this study can be caused by ten respondents using jewelry while maintaining good hygiene behavior such as washing hands (Anita et al., 2013).

The study's results on the behavior of traders who did not have wounds or ulcers on their hands, there was no significant relationship with the presence of STH in the sample of fresh vegetables (p = 0.735). Twenty-nine respondents do not have injuries, and only 1 respondent has wounds on his hands. These results are in line with research conducted by Efelieni (2022) with results in this study that there was no significant relationship between personal hygiene and the presence of STH in vegetables containing traders treating or closing wounds on their hands. The insignificant result in this study can be caused by respondents who have wounds on their hands and cover the wound using gloves. Wounds are a source of pathogens and a source in the chain of pathogen transfer into food (Rambe, 2021). The presence of wounds on the hands of food handlers can increase the risk of food contamination. Food handlers who have wounds on their hands must treat and cover the wounds to prevent cross-contamination.

CONCLUSION

The conclusion of this study based on the results and discussion related to factors of food safety knowledge and behavior of fresh vegetable traders with the presence of STH on fresh vegetable in Pakusari District, Jember Regency, namely the characteristics of fresh vegetables traders in Pakusari District, Jember Regency in this study dominated by women, aged 46-55 years, selling 6-10 years old, and most of them have higher education (SMA/equivalent), the distribution of STH species in fresh vegetables sold by traders in Pakusari District, Jember Regency, namely Hookworm, all factors of knowledge of food safety of fresh vegetables traders are not related to the presence STH, a behavioral risk factor associated with the presence of STH, is found in the behavioral factor of washing hands before touching food.

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The Correlation Between Food Hygiene and Sanitation in Food Vendors of *Lalapan* with *Enterobacteriaceae* Contamination in Fresh Vegetables

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A B S T R A C T

Lalapan is a fresh vegetable usually eat up with rice and other Indonesian dishes. However, fresh vegetables can potentially be contaminated with pathogenic bacteria, such as *Enterobacteriaceae*, harming consumers if not appropriately processed and cleaned. This study analyzes the correlation between food hygiene and sanitation in food vendors of *Lalapan* with *Enterobacteriaceae* contamination in fresh vegetables. It used an analytic observational design with a cross-sectional approach. In addition, the population was food vendors of *lalapan* in the Sumbersari District, Jember Regency. There were 30 respondents with a consecutive sampling method. Food hygiene and sanitation instrument was an observation sheet according to 16 points stipulated in the Regulation of the Minister of Health of the Republic of Indonesia number 1096/MENKES/PER/VI of 2011. In addition, we tested fresh vegetable samples to analyze *Enterobacteriaceae* contamination with a microbiological test using Salmonella Chromogenic Agar (SCA) media. Then, data analysis used Fisher's exact test with α=0.05. The observation showed that most respondents had good food sanitation hygiene (76.7%). The microbiological examination indicated 23 vegetable samples (76.7%) were contaminated with *Enterobacteriaceae*. Statistical analysis using Fisher's exact test Exact obtained p=1.000 (p>0.05). Thus, there was no significant correlation between food hygiene and sanitation in food vendors of *lalapan* with *Enterobacteriaceae* contamination in fresh vegetables. In conclusion, hygiene, and sanitation food among food vendors of *lalapan* do not correlate with *Enterobacteriaceae* contamination in fresh vegetables. Further research could analyze the vegetable's planting, harvesting, and distribution processes as risk factors for Enterobacteriaceae contamination in fresh vegetables.

INTRODUCTION

Indonesian people, especially in Java, widely consume *Lalapan*. *Lalapan* is a fresh vegetable usually eat up with rice and other Indonesian dishes. It is in great demand because it is affordable, practical, and has many benefits. Nutrients from fresh vegetables do not change due to no processing or raw presentation. However, fresh vegetables can potentially be contaminated with pathogenic bacteria, harming consumers if not appropriately processed and cleaned (Purba, Chahaya, and Marsaulina, 2014).

The characteristics of safe food are fresh ingredients, good quality, and the absence of contamination from pathogens or harmful substances (Badan Pengawas Obat dan Makanan, 2015). Unmet requirements for safe food can occur health problems, especially foodborne diseases. Foodborne disease is a disease occurring due to food contamination by contaminating agents such as bacteria (66%), chemicals (26%), viruses (4%), and parasites (4%) (Al-Seghayer and Al-Sarraj, 2021). Several bacteria from members of the

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Enterobacteriaceae family are pathogens that often contaminate food and beverages. *Enterobacteriaceae* bacteria, which are pathogenic, including the genus *Salmonella, Shigella, and Escherichia,* can cause diarrhea and diseases outside the digestive tract (Woh *et al.*, 2017).

Unsafe food is a crucial global public health issue (Sari, Marsaulina, and Chahaya, 2013). Over 200 diseases and 420,000 deaths are caused yearly by consuming food contaminated with bacteria, viruses, parasites, and harmful chemicals (World Health Organization, 2022). The Indonesian Basic Health Research (2018) found an increased diarrhea incidence in all age groups, from 4,274,790 in 2017 to 4,504,524 in 2018. *Salmonella* species contribute to 25 million incidences of foodborne disease, with around 200,000 deaths annually globally. The number of cases caused by *Shigella* species is estimated at 165 million (Mardu *et al.*, 2020). *E. coli* O157:H7 also causes about 20% of foodborne disease outbreaks (Getaneh *et al.*, 2021).

Several studies showed a correlation between food contamination and poor food processing behavior. Food sellers' knowledge, attitudes, and practices related to food safety affect food contamination. Food vendors have the potential to be the media to spread pathogens causing foodborne diseases. Food vendors not washing their hands can transmit pathogens, especially from fecal-oral routes. Pathogens can also spread through unclean cooking utensils and cutlery. An investigation by Tóth *et al.* (2018) swabbed the cooking utensils and cutlery that come in contact with food. It found the contamination of aerobic mesophilic bacteria in most of those samples. In addition, a study in Jember Regency showed there was contamination of *E. coli* bacteria in 90% of the long bean vegetables sold in traditional markets (Shodikin *et al.*, 2022).

Foodborne diseases such as diarrhea and typhoid fever remain relatively high in JemberDistrict. The diarrhea incidence among the Subdistricts in the Jember Districts was 2,767 in Sumbersari, 2,541 in Kaliwates, 2,496 in Bangsalsari, 2,070 in Patrang, and 1,631 in Ajung. Further, the population density was correlated with many cases in urban areas, such as Sumbersari, Kaliwates, Bangsalsari, and Sumbersari (Dinas Kesehatan Kabupaten Jember, 2015). Several previous studies revealed that food hygiene and sanitation in food vendors were one of the risk factors for foodborne disease. However, no previous studies have examined the correlation between food sanitation and hygiene with *Enterobacteriaceae* contamination on fresh vegetables. This study analyzes the correlation between food hygiene and sanitation in food vendors of *Lalapan* with *Enterobacteriaceae* contamination in fresh vegetables in the Jember Regency.

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METHOD

This research used an analytic observational design with a cross-sectional approach. The population was food vendors of *lalapan* in the Sumbersari Subdistrict, Jember District. In addition, there were 30 respondents with a consecutive sampling method. The study was carried out from November 2021 to April 2022. Before the research, the authors gave informed consent to the respondents. The inclusion criteria were (1) a food vendor of *lalapan* in the Sumbersari Subdistrict, Jember District, (2) respondents selected cooking ingredients, did ingredients storage, ingredients preparation, food processing, food transportation, and food serving, and (3) being willing to be the respondent. The exclusion criteria were food vendors of *lalapan* with incomplete observation data related to food hygiene and sanitation.

The authors directly observed food hygiene and sanitation behavior in food vendors of *lalapan* with observation sheets during food-selling activities without intervention from researchers to avoid bias if the seller knew their actions were being observed. Food hygiene and sanitation instrument was an observation sheet according to 16 points stipulated in the Regulation of the Minister of Health of the Republic of Indonesia number 1096/MENKES/PER/VI of 2011 (Meteri Kesehatan Republik Indonesia, 2011). The instrument was also used in the previous studies conducted by Tarigan (2019), Ismail *et al.* (2016), Khotimah (2015), and Stratev *et al.* (2017). There were 16 items in the observation sheet. Respondents with ≥ eight items' activities on the observation sheet were scored as good, while < eight points were categorized as poor food sanitation hygiene.

In addition, we tested fresh vegetables at the Microbiology Laboratory, Faculty of Medicine, Jember University, to analyze bacterial contamination with a microbiological test using Salmonella Chromogenic Agar (SCA) media. We put vegetable samples into an Erlenmeyer tube with sterile distilled water and homogenized them with a vortex mixer. The liquid fresh vegetable sample that has been homogeneous was taken using an Ose needle, then planted on the SCA media in laminar airflow. After that, the media was incubated at 36-37°C for 24 hours. After 24 hours, we observed the incubation to see the color of the colonies growing on SCA media. Blue-green colonies contained the contamination of *E. coli*, purple colonies were *Salmonella*, and clear/colorless colonies were *Proteus* bacteria. Then, data analysis used Fisher's exact test with α=0.05.

RESULT

Most respondents in this paper were female (83.3%) and adults (76.7%). In addition, almost half of them had low education (Table 1).

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Table 1. The characteristics of respondents by sex, age, and level of education

Characteristics of respondents	Frequency (n)	Percentage (%)
Sex		
Male	5	16.7
Female	25	83.3
Age		
Adolescents (12-25 years old)	4	13.3
Adults (26-59 years old)	23	76.7
Older people (>60 years old)	3	10
The levels of education		
Under senior high school	12	40
Senior high school	10	30.3
University	8	26.6

The food hygiene observation included the stages of cooking ingredients selection, ingredients storage, ingredients preparation, food processing, food transportation, and food serving. In addition, food sanitation assessed the use of closed and clean containers, personal hygiene, and the hygienic handling of food (Table 2).

Table 2 The observation of food hygiene and sanitation in the respondents

Food hygiene and sanitation	Observation			
	Yes		No	
	n	%	n	%
Food vendors kept the food in clean and safe containers for health.	28	93.3	2	6.7
Food vendors stored food in separate containers for each type of food.	24	80	6	20
Food vendors stored the food in closed containers.	6	20	24	80
Food vendors washed fresh vegetables using soap and running water.	19	63.3	11	36.7
Food vendors touched food using gloves.	1	3.33	29	96.7
Food vendors touched food using spoons or ladles.	27	90	3	10
Food packaging was clean and did not contaminate food.	30	100	0	0
Food vendors served food in clean containers.	29	96.7	1	3.3
Food vendors served food in sealed containers.	11	36.7	19	63.3
Food vendors washed the cutlery with running water and soap.	21	70	9	30
Food vendors immediately served the food after the cooking process.	25	83.4	5	16.6
Food vendors wore clean clothes, aprons, or head coverings.	6	20	24	80
Food vendors washed their hands properly every time they touched food.	11	36.7	19	63.3
Food vendors keep nails clean (nails are not long and not dirty)	13	43.3	17	56.7
Food vendors did not use jewelry (rings or bracelets).	18	60	12	40
The food vendor had no wounds or ulcers on his hands.	26	86.6	4	13.4

Furthermore, most respondents had good food sanitation hygiene (76.7%), and only seven respondents (23.3%) were in the poor category (Table 3).

Table 3 Food hygiene and sanitation scoring

Food hygiene and sanitation scoring	Frequency (n)	Percentage (%)
Good	23	76.7
Poor	7	23.3

The microbiological test showed that 23 (76.7%) vegetable samples were contaminated with *Enterobacteriaceae*. Furthermore, of the 23 samples contaminated with *Enterobacteriaceae*, 22 were contaminated with *E. coli*, indicating bluish-green colonies on SCA media. In addition, 19 contained

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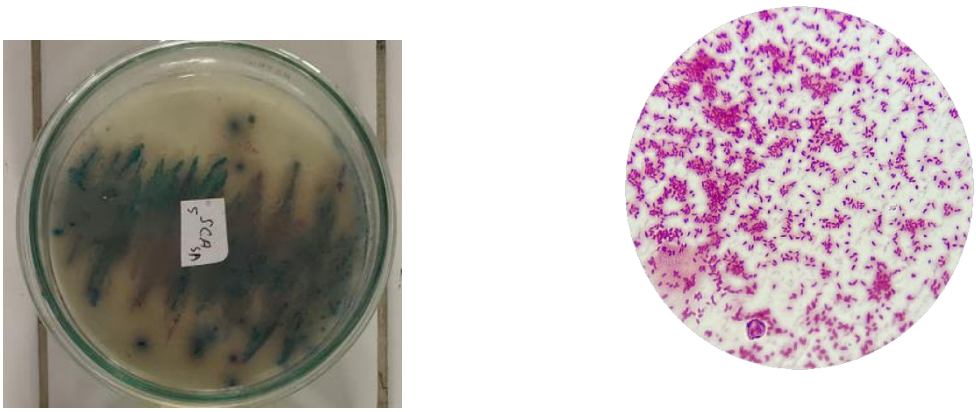
Salmonella showing purple colonies on the media. Furthermore, three samples found colorless colonies on the media, indicating *Proteus* bacteria contamination.

Table 4 Microbiological tests using Salmonella Chromogenic Agar Media

Microbiological tests using *Salmonella Chromogenic Agar*	Frequency	
	n	%
Contaminated with *Enterobacteriaceae*	23	76.7
Uncontaminated with *Enterobacteriaceae*	7	23.3



(a) (b)

Figure 1. (a) Microbiological test results with SCA media (b) Microscopic image

Of the respondents with good food hygiene and sanitation, 60% had samples contaminated with *Enterobacteriaceae* and 16.7% uncontaminated with *Enterobacteriaceae*. Meanwhile, of respondents with poor food hygiene and sanitation, 16.7% had samples contaminated with *Enterobacteriaceae* and 6.6% uncontaminated with *Enterobacteriaceae*. Statistical analysis using Fisher's exact test Exact obtained p=1.000 (p>0.05). Thus, there was no significant correlation between food hygiene and sanitation in food vendors of *lalapan* with *Enterobacteriaceae* contamination in fresh vegetables (Table 5).

Table 5. The correlation between food hygiene and sanitation with *Enterobacteriaceae contamination*

Variable	*Enterobacteriaceae* contamination				Total		Fisher's Exact Test
	Positive		Negative				
Food hygiene and sanitation	n	%	n	%	n	%	
Good	18	60	5	16.7	23	76.7	p=1.000
Poor	5	16.7	2	6.6	7	23.3	
Total	23	76.7	7	23.3	30	100	

DISCUSSION

There were more female respondents than males in this paper, with a ratio of 5:1. It is because women process food more often and will carry out good food hygiene and sanitation more often than men. Therefore, consumers had more trust in women food sellers regarding food safety (Salamandane *et al.*,

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2020). In addition, a study by Nee and Sani (2011) showed that women had better food hygiene and sanitation than men.

Adult respondents were also more dominant in this research than adolescents and older adults. It is because the age factor can affect a person's work productivity. Adults tend to be more productive and have increasing economic demands. It aligns with Lihu, Warouw, and Akili's study. The study found that adult sellers were the most dominant in all age groups.

Another factor that can influence behavior is the level of education. The results showed that most respondents had a low level of education. Only nine graduated from junior high school, two graduated from elementary school, and one did not attend school. Education is a predisposing factor in changing health behavior in individuals. An education level affects knowledge and attitude that will impact decision-making (Rachmawati, 2019). The higher the education among food sellers, the better food hygiene and sanitation behavior (Aspiani and Rustiawan, 2020).

The author's observations among food vendors of *lalapan* in the Sumbersari Subdistrict showed that most had good food hygiene and sanitation. In the food storing process, most respondents stored the food in clean and separate containers. In addition, all the respondents used clean and safe food packaging. Most also washed fresh vegetables (63,7%) and cutlery (70%) using soap and running water. Fresh vegetables can be contaminated with microorganisms or chemical substances. Therefore, fresh vegetables must be washed properly. Eryando, Susanna, and Kusuma (2014) research also found that most sellers washed food ingredients and cutlery before preparing the food.

However, the behavior of washing hands properly and using running water before and after handling food among respondents still needed improvement. Dirty hands can transfer microorganisms and other harmful materials to food. Therefore, The Ministry of Health of the Republic of Indonesia gives guidance on six steps of washing hands. In addition, the percentage of respondents who did not keep their nails clean was more (56.7%) than respondents who kept their nails clean. It is similar to Rahmadhani and Sumarmi's (2017) research. That research found that most food handlers did not keep their nails clean or had long and dirty nails. Dirty nails and hands can be a source of contaminants or result in cross-contamination.

Most respondents in this paper did not cover food containers to store fresh vegetables, although they kept most foods separately for each type. It can risk the spread of pathogens through vectors such as flies, mice, and cockroaches (Morestavia and Sulistyorini, 2014). Moreover, almost all food vendors did not use gloves when handling food, but most used spoons or ladles. Using utensils in food processing can reduce the risk of contamination in processed food rather than touching it directly by hand. Furthermore, 80% of respondents did not use personal protective equipment such as aprons, head coverings, and masks. Thus, it did not meet the requirements for food handlers according to the Regulation of the Minister of Health of

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the Republic of Indonesia, Number 1096/MENKES/PER/VI of 2011, concerning food hygiene and sanitation (Meteri Kesehatan Republik Indonesia, 2011).

The microbiological test on fresh vegetable samples showed that most were contaminated with *Enterobacteriaceae* (76.7%). Furthermore, Salmonella Chromogenic Agar media showed contaminations of *E. coli* (green-blue colonies), *Salmonella* (purple colonies), and *Proteus* (clear/white colonies) bacteria. Thus, the fresh vegetable samples in this paper did not meet the Regulation of the Minister of Health of the Republic of Indonesia number 1096/MENKES/PER/VI of 2011 concerning Food Hygiene and Sanitation, which states that the microbiological test in food must be 0/gr of food.

Enterobacteriaceae contamination in fresh vegetables can be caused by several factors, starting from the vegetables' planting, harvesting, distribution, and processing stages. *Enterobacteriaceae* are Gram-negative bacteria that are part of the normal flora of the lower digestive tract but can also be found in the environment, such as in soil, water, and object with feces contamination (Ncube *et al.*, 2020). *Enterobacteriaceae* contamination in the planting process can occur due to bacterial contamination of the soil, irrigation water contaminated with sewage, and farmer activities when growing vegetables (Warsyidah, 2017). In addition, vegetable farmers use organic fertilizers made from livestock manure to improve the quality of plantation soil fertility. It is because organic fertilizers contain ingredients that support bacterial growth. When those vegetables are unwashed and eaten raw, microorganisms can enter the body and infect humans (Purba, Chahaya, and Marsaulina, 2014).

In addition, groundwater as a source of field irrigation can also be contaminated by indiscriminate waste disposal, such as household waste being dumped into ditches until it ends up in plantation irrigation. Vegetable farmers can potentially use that contaminated irrigation water, causing *Enterobacteriaceae* contamination in vegetables (Rianti, Buana, and Kiyat, 2018). *Enterobacteriaceae* contamination can also occur during the harvest process. It is due to poor sanitation during harvest, such as not using clean gloves to store vegetables also uncleaned and ground-contact containers. In addition, contamination can occur from uncleaned or incorrectly washed vegetables in the distribution process. Most distributors only water the vegetables with inadequate water to make them look fresh when sold. Thus, good packaging to store vegetables sold in the market will reduce *Enterobacteriaceae* contamination. In addition, markets sanitation where vegetables are sold is also critical.

Clean water meeting the requirements also plays a vital role in food processing. The biological parameters of clean water for sanitation hygiene purposes were guided by the Regulation of the Minister of Health of the Republic of Indonesia Number 32 of 2017 concerning Environmental Health Quality Standards and Water Health Requirements for Sanitary Hygiene, Swimming Pools, Solus Per Aqua, and Public Baths (Menteri Kesehatan Republik Indonesia, 2017). Clean water must have maximum *Coliform* bacteria

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content of 50 CFU /100 ml and 0 CFU/100 ml for *E. coli* bacteria. It is essential in washing materials and equipment, food processing, to food serving. Microorganisms contamination can occur if the water used is not by established health standards. One way to reduce the risk of contamination is to wash raw vegetables in clean, running water. If not washed properly, bacteria will still be present on vegetables when served as fresh vegetables (Eryando, Susanna, and Kusuma, 2014). However, a prior study revealed that food handlers often used water that did not meet the requirements or even did not wash vegetables. Thus, there would be potential fecal transmission through the vegetables served, especially if the vegetables are served raw (Nuryani, Adiputra, and Sudana, 2016).

This research indicated no significant correlation between food hygiene and sanitation in food vendors of *lalapan* with *Enterobacteriaceae* contamination in fresh vegetables (p=1.000). However, previous research showed a significant correlation between food hygiene and sanitation with *Enterobacteriaceae* contamination. A study conducted by Ratna and M. M. Simatupang (2019) indicated a significant correlation between food hygiene and sanitation among food handlers with bacterial contamination in snacks. In addition, there was a relationship between food hygiene and sanitation with *E.coli* contamination in street food with a p=0.015 (Syafriyani and Djaja, 2019).

Thus, this paper showed different results from previous studies. It might be due to the unhygienic behavior of vegetable farmers (from planting to harvesting), vegetable distributors, and sellers. In addition, not using clean water and poor market sanitation are risk factors for Enterobacteriaceae contamination in fresh vegetables. *Enterobacteriaceae* contamination in vegetables indicates fecal transmission. It can occur from the planting stage to the vegetable processing stage.

Several other predisposing factors for bacterial contamination in vegetables are the water quality used to wash vegetables and cutlery, poor environmental conditions, and inadequate knowledge and attitude in food vendors. Using unclean water to clean vegetables and cutlery can cause contamination in fresh vegetables. Bedadung River is a raw water supplier for Local Government-Owned Water Utilities (Perusahaan Daerah Air Minum, PDAM) in Jember Regency, especially in Sumbersari District (Pradana *et al.*, 2019). Unfortunately, 25% of toilet waste produced by residents living around the Bedadung River is disposed of directly into the river (Puspitasari, Novita, and Pradana, 2021). Thus, it can lead to the contamination of river water by *Coliform* bacteria found in human feces, such as *E. coli*. In addition, respondents might use water sourced from dug wells. The well's walls made of soil can cause contamination of water through the soil pores, affecting water quality. Furthermore, the close distance between the septic tank and the water well can pollute the water (Kurniasih, Nurjazuli, and Hanani D., 2015).

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Thus, training on food safety, especially in food hygiene and sanitation, is essential. A study conducted by Nik Husain *et al.* (2016) revealed that food safety training enhanced food handlers' knowledge, attitudes, and practices. So, it can reduce the potential for foodborne disease incidence. In addition, good water management in PDAM and public understanding regarding using water sources to clean vegetables and cutlery can prevent *Enterobacteriaceae* contamination in fresh vegetables.

CONCLUSION

In conclusion, hygiene, and sanitation food among food vendors of *lalapan* do not correlate with *Enterobacteriaceae* contamination in fresh vegetables. Further research could analyze the vegetables' planting, harvesting, and distribution processes as risk factors for *Enterobacteriaceae* contamination in fresh vegetables. Food vendors of *lalapan* and consumers should wash and cook fresh vegetables until they are cooked to be safe for consumption.

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The Influence of External Service Quality and Satisfaction on Patient Loyalty in Surabaya Islamic Hospital

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A B S T R A C T

One of the most essential things in the success of a service besides the value of satisfaction is customer loyalty. Loyalty here is an indicator of how many customers want to promote our services without us asking, while repeated visits from customers make customers happy and proud to use our services. This study aimed to measure the value of Customer Satisfaction, Loyalty, and External Service Quality. This study used secondary data, totaling 356 patients who completed a customer satisfaction survey at Surabaya Islamic Hospital. This study showed that the characteristics of the patients at the Surabaya Islamic Hospital were particularly women aged <25 years with a BPJS patient guarantor who lived 5-10 km and had known the Surabaya Islamic Hospital for > 20 years, while in the external service quality customer assessment which included product, organizational image, safety, empathy, reliability, responsiveness at Surabaya Islamic Hospital was good and there was a relationship between External service quality and satisfaction significantly influence patient loyalty at Surabaya Islamic Hospital.

INTRODUCTION

Hospitals have the function of providing medical treatment and health recovery services by hospital service standards. The era of globalization is not only an opportunity but also a threat to the development of hospitals, where competition between hospitals will be higher (Rahmawati, 2014). To survive and develop, hospitals must strive to improve services to patients by the provisions or standards of hospital services (Badriyah, Wibowo, and Sumaryanto, 2020). Measuring the performance of a hospital's services can be known through several indicators. By the Regulation of the Minister of Health of the Republic of Indonesia Number 129 of 2008 concerning Minimum Hospital Service Standards (Ministry of Health of the Republic of Indonesia, 2009). These service quality indicators can be used to measure the quality of services in hospitals. The quality of hospital services has two components: compliance with predetermined quality standards and fulfillment of customer satisfaction. The quality of health services refers to the level of perfection of the appearance of health services that are held on the one hand to satisfy service users. And on the other hand, the procedures for implementing them are by the professional code of ethics and established standards (Subiyantoro &Ambarwati, 2017).

External service quality plays an essential role in determining whether customers are satisfied when seeking treatment. If the customer is satisfied, it is hoped that it will lead to patient loyalty to the hospital.

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Many researchers have realized that the values of service quality and customer satisfaction are interrelated because service quality and customer satisfaction have a significant relationship (Tuhu Hidayat, 2016). Saputra (2021), argues that there are external service quality factors in service quality that affect satisfaction and loyalty.

The creation of customer satisfaction can provide several benefits, including a reasonable basis for repurchasing and creating customer loyalty and forming a word-of-mouth recommendation that is profitable for the company (Tjiptono, 2011). Based on research conducted by Jihan and Made (2018), satisfaction does not entirely affect patient loyalty. Hospitals should pay attention to this because satisfied patients are only sometimes loyal to the services provided by the hospital. Loyalty generated by satisfaction does not necessarily produce the highest level of loyalty (Gunawan, 2013). Loyalty has several levels, and the hospital must know at what level of loyalty the patient has been given satisfaction. This greatly determines the policies to be taken by the hospital (Sektiyaningsih, Indria Sukma; Haryana, Arif; Rosalina, 2019).

Although service satisfaction at the Surabaya Islamic Hospital is on average to the provisions of hospital policy, it is also necessary to analyze the level of patient loyalty at the Surabaya Islamic Hospital (Bouranta, Chitiris, and Paravantis, 2009). Not all patients who are satisfied with the services received can be at a good level of loyalty to the services provided by the hospital (Puryanti, 2021).

Based on research that researchers in the previous year carried out regarding the effect of service quality (Badriyah, Wibowo, and Sumaryanto, 2020), perceived service quality on the level of patient loyalty in this study researchers will add the satisfaction variable as an intermediate variable. So the research topic that researchers will raise is external service quality analysis and satisfaction with the level of patient loyalty (Rizan, Prasetya, and Kresnamurti, 2014).

METHOD

This research is descriptive-analytic research with a cross-sectional design, namely, the research variables are measured only once at a particular time. Data was collected using a questionnaire with Likert's summated rating method on external service quality questions. This research was conducted at the Surabaya Islamic Hospital. This research activity will be carried out in November - December 2022. This research is done by processing secondary data in the Public Relations Unit of the Surabaya Islamic Hospital as many as 365 visitors filled out a customer satisfaction survey.

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RESULT

Table 1. Identification of the patient characteristics of the Surabaya Islamic Hospital

No	Characteristics	Amount	Percentage
	Age		
1	< 25 years	112	30.68%
2	25 - 35 Years	110	30.14%
3	36 - 45 Years	50	13.70%
4	46 - 55 Years	42	11.51%
5	> 55 Years	51	13.97%
	Gender		
1	Man	152	41.64%
2	Woman	213	58.36%
	Guarantor		
1	Insurance/Institution	27	7.40%
2	BPJS	257	70.41%
3	Ministry of Health	68	18.63%
4	General	13	3.56%
	Distance		
1	< 5km	109	29.86%
2	5-10km	160	43.84%
3	11-20km	55	15.07%
4	> 20km	41	11.23%
	Have Known the Surabaya Islamic Hospital		
1	< 5 years	86	23.56%
2	5 - 10 Years	99	27.12%
3	11 - 20 Years	65	17.81%
4	> 20 Years	115	31.51%

Service quality is an essential component of customer perception because it contains information about quality and customer satisfaction. Service quality can be seen from two perspectives, namely internal service quality and external service quality. External service quality is used to assess service quality and satisfaction from the consumer side. Meanwhile, internal service quality is used to assess service quality and satisfaction from the employee side (Kotler &Keller, 2016).

Table 2. Identification of External Service Quality Dimensions (1) Product, (2) Organizational Image, (3) Safety, (4) Empathy, (5) Reliability, (6) Responsiveness at Surabaya Islamic Hospital

No	Dimensions	Average	Percentage	interpretation
	Product			
1	Room facilities are sufficient for patient's needs	4.75	95.01%	Well
2	A clean and tidy treatment room	4.80	96.05%	Well
3	Bed cleanliness	4.75	94.90%	Well
4	Cleanliness of water and bathrooms	4.72	94.41%	Well
	Average	4.75	95.10%	Well
	Brand Image			
1	Overall satisfaction related to the facilities provided by the Surabaya Islamic Hospital	4.63	92.55%	Well
2	Nurses provide maximum service to create a sense of trust in patients	4.80	95.95%	Well
3	Nurses take time to communicate with patients	4.50	89.97%	Well
	Average	4.64	92.82%	Well
	Safety			
1	The doctor explains the information about the action to be taken	4.72	94.41%	Well
2	Patients feel safe with the actions given by doctors and nurses	4.80	96.00%	Well
	Average	4.76	95.21%	Well
	Reliability			
1	The doctor serves on time	4.83	96.60%	Well

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2	Nurses serve in a friendly and courteous manner	4.84	96.88%	Well
	Average	4.84	96.74%	Well
	Empathy			
1	Doctors pay special attention to each patient	4.65	92.99%	Well
2	The doctor tries to calm the patient's anxiety about the disease he is suffering from	4.68	93.70%	Well
3	The nurse comforts and encourages a speedy recovery and prays for the patient	4.78	95.56%	Well
4	The nurse listens to the patient's complaints carefully	4.82	96.33%	Well
	Average	4.73	94.64%	Well
	Responsiveness			
1	Fast and precise inspection service	4.72	94.36%	Well
2	Nurses pay attention and are patient in understanding the needs of patients	4.72	94.41%	Well
3	Speed of nurses to assist when needed	4.79	95.73%	Well
4	Doctor's speed in handling complaints	4.71	94.14%	Well
	Average	4.74	94.66%	Well

Loyalty can be defined as loyalty. However, this loyalty is taken without coercion, arising from past self-consciousness. Efforts made for creating consumer satisfaction are more likely to influence the attitudes of consumers, here is Customer Loyalty at Surabaya Islamic Hospital.

Table 3. Identification of patient loyalty at Surabaya Islamic Hospital

No	Loyalty	Average	Percentage	Well
1	I am delighted with this. I will always recommend doing services at Rs Islam Surabaya	4.64	92.77%	Well
2	Always use the services at Surabaya Islamic Hospital	4.64	92.77%	Well
3	I am delighted, and I will always talk about the goodness of this Surabaya Islamic Hospital in terms of service	4.69	93.81%	Well
	Average	4.66	93.12%	Well

According to Kotler (2012), satisfaction is a person's level of satisfaction after comparing perceived performance or results compared to expectations. The level of satisfaction is a function of the difference between perceived performance and expectations. The following are patient satisfaction at Surabaya Islamic Hospital

Table 4. Identification of satisfaction in Surabaya Islamic Hospital.

No	Satisfaction	Average	Percentage	Well
1	Overall satisfaction related to the facilities provided by the Surabaya Islamic Hospital	4.62	92.49%	Well
2	I am delighted with this. I will always recommend doing services at Rs Islam Surabaya	4.64	92.71%	Well
3	Overall satisfaction related to the services provided by the Surabaya Islamic Hospital	4.64	92.74%	Well
4	I am delighted, and I will always talk about the goodness of this Surabaya Islamic Hospital in terms of service	4.63	92.65%	Well
	Average	4.66	93.11%	Well

Table 5. The Effect of External Service Quality and Satisfaction on patient loyalty at the Surabaya Islamic Hospital

No	Variable	Sig	Interpretation
1	Loyalty	0.000	Related
2	Satisfaction	0.000	Related

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DISCUSSION

Services are a series of processes of production and consumption that cannot be separated. Customers are often active in the production process, so it is considered complex. It is essential to understand what customers want; when a company understands what customers feel, it can influence customers according to what the company wants (Rahmawati, 2014). Service is a process of the subjective experience of production and consumption carried out together, including interactions between customers and officers. The interaction between customers and officers impacts the service perceived by customers (Gronroos, 2007).

Service quality is important to customer perception because it contains information about quality and customer satisfaction (Badriyah, Wibowo and Sumaryanto, 2020). Service quality can be seen from two perspectives, namely internal service quality and external service quality. External service quality is used to assess service quality and satisfaction from the consumer side. Meanwhile, internal service quality is used to assess service quality and satisfaction from the employee side (Kotler &Keller, 2016).

Service quality is a must that companies must do to survive and continue to gain customer trust. Consumption patterns and customer lifestyles require companies to be able to provide quality services. Service quality is the main thing that is considered by the company, which involves all the resources owned by the company. If the service received or perceived is as expected, then the service quality is perceived as good and satisfying. The importance of quality can be explained from two angles, namely, from the point of operational management and marketing management. From an operational point of view, product quality is an essential policy in increasing product competitiveness which must provide satisfaction to consumers that exceed or at least equals the quality of competing products (Nugraha, Suryaningsih, and Paramita, 2018).

Service quality andexternal service quality has several attributes that can be used to assess service quality, namely (Kotler &Keller, 2016):

1. The product includes service products owned by the company, which include products, infrastructure, facilities, tariffs
2. Organizational image is the company's image compared to competitors
3. Safety is security resulting from service products for consumers
4. Empathy makes it easy to have good communication relationships, is considerate, and understands customer needs.
5. Reliability is the ability to provide fast, accurate, and satisfactory services
6. Responsiveness in providing services to patients

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The creation of customer satisfaction can provide several benefits, including a good basis for repurchasing and creating customer loyalty and forming a word-of-mouth recommendation that is profitable for the company (Tjiptono, 2011). Based on research conducted (by Jihan and Made, (2018), satisfaction does not entirely affect patient loyalty. Hospitals should pay attention to this because satisfied patients are only sometimes loyal to the services provided by the hospital. Loyalty generated by satisfaction does not necessarily produce the highest level of loyalty (Gunawan, 2013). Loyalty has several levels, and the hospital must know at what level of loyalty the patient has been given satisfaction. This greatly determines the policies to be taken by the hospital (Sektiyaningsih, Indria Sukma; Haryana, Arif; Rosalina, 2019). Although service satisfaction at the Surabaya Islamic Hospital on average is to the provisions of hospital policies, it is also necessary to analyze how the level of patient loyalty in Surabaya Islamic Hospital. Not all patients who are satisfied with the services received can be at a good level of loyalty to the services provided by the hospital (Puryanti, 2021).

CONCLUSION

Characteristics of patients at the Surabaya Islamic Hospital are primarily women aged <25 years with BPJS patient guarantees who live 5-10 Km with a long history of knowing the Surabaya Islamic Hospital for >20 years while in customer assessment External service quality, which includes the product, organizational image, safety, empathy, reliability, responsiveness at Surabaya Islamic Hospital is good and there is a relationship External service quality and satisfaction significantly influence patient loyalty at Surabaya Islamic Hospital.

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Factors Affecting Nurses in Implementing Patient Safety in Hospitals: A Literature Review

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A B S T R A C T

Patient safety is the most important indicator in the healthcare system that is expected to be a reference for producing ideal healthcare services and reducing patient incidents. The nurse factors are the main factor related to patient safety because nurses interact more often with patients. This study aims to identify the factors influencing nurses implementing patient safety in hospitals. This article was a literature review with a descriptive approach by collecting several journals and articles from the Indonesia One Search and Google Scholar databases with specified inclusion criteria. Based on the results of a review of six articles shows that several factors influence nurses in implementing patient safety, including age, attitude, knowledge, work motivation, workload, length of work, supervision, and organizational culture. The implementation of patient safety goals by nurses in hospitals can be categorized as either good or bad because several factors influence it. For this reason, the coordination of the hospital must carry out activities to strengthen the factors that affect nurses so that patient safety can be adequately implemented.

INTRODUCTION

Patient safety is a process in healthcare facilities that provides patient care safely (Tutiany et al., 2017). It is expected that the implementation of patient safety in hospitals can create safer patient care. Patient safety is the most important indicator in the healthcare system that is expected to be a reference for producing ideal healthcare services and reducing incidents in patients (Delvita, 2021). As a form of concern in improving the quality and safety of patient-focused healthcare services, in 2013, the Joint Commission International (JCI) issued six patient safety goals (International Patient Safety Goals), which are currently being implemented as a standard for all hospitals worldwide. Patient safety goals have six key points, including accurate patient identification, increased effective communication, maintaining the safety of the high-alert medication, ensuring the right location, the right patient for surgery, and the correct procedure for patients, reducing the risk of infection, and reducing the risk of patient falls (Kemenkes, 2017).

Hospitals are the most vulnerable place for patient safety incidents as a place that is labor-intensive, capital-intensive, technology-intensive, and problem-intensive with various procedures, professions, and standards. A patient safety incident is any unintended event that may result in or potentially result in injury to patients that could have been prevented. According to the Regulation of the Minister of Health of the Republic of Indonesia Number 1691 of 2011, types of patient safety incidents consist of

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Unexpected Incidents (KTD), Near Miss Incidents (KNC), No Harm Incidents (KTC), and Potential Harm Incidents (KPC) (Menkes, 2011). The consequences of these incidents can lead to injury, endangerment of life, prolonged treatment, and even death (Cahyono & Suharjo, 2008).

Based on data from the National Patient Safety Committee (KNKP), the number of patient safety incident reports in Indonesia from 2015 to 2019 continues to increase. In 2019, the number of reported incidents was 7.465 cases, a drastic increase compared to the previous year's 1.489 cases. Of the 7.465 cases, 38%, or as many as 2.837 cases, were categorized as Near Miss Incidents (KNC). 31% or as many as 2.314 cases were categorized as No Harm Incidents (KTC), and 2.314 cases were categorized as Unexpected Incidents (KTD). These incidents resulted in 171 deaths, 80 cases of serious injury, 372 cases of moderate injury, 1.183 cases of minor injury, and 5.659 cases of no injury. The occurrence of these incidents should be minimized by implementing patient safety goals by the hospital to prevent incidents that harm patients.

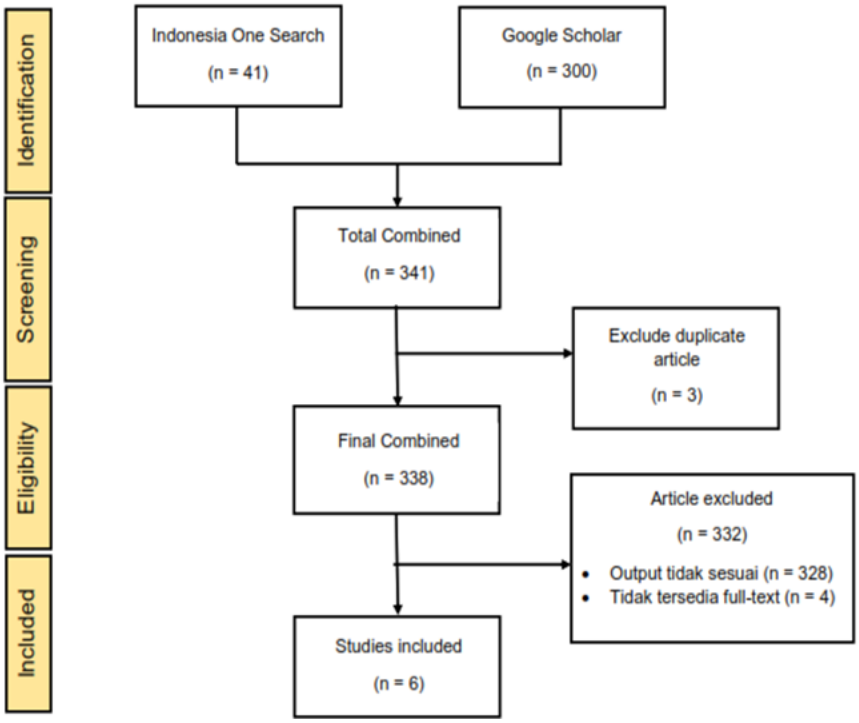
One of the inputs related to implementing patient safety in hospitals is healthcare workers. Nurses are directly involved with patients in providing care, making them more at risk of safety hazards than other healthcare workers. This makes nurses the main factor in patient safety in hospitals, such as the case in the Inpatient Ward of the Tanjungpura University Hospital in Pontianak, where information related to treatment was not provided by nurses to the patient or their families. Nurses also did not double-check with other nurses and did not correctly identify the patient according to standards before giving medicine (Safitri, 2018). Therefore, strengthening the implementation of patient safety, particularly in terms of human resources, is necessary. The implementation of patient safety in hospitals must be carried out by all nurses with a target achievement of 100% so that it does not become the root cause of many other errors.

This study aims to identify the factors influencing nurses implementing patient safety in hospitals. The results of this study are expected to be useful for hospitals and the profession to optimize the factors that affect the implementation of patient safety, thus encouraging better patient safety implementation in hospitals.

METHOD

This article was a literature review with a descriptive approach by collecting several journals and articles from the Indonesia One Search and Google Scholar databases. The keywords used were in Indonesian, namely "patient safety" AND "nurse" AND "hospital". The inclusion criteria for determining articles were original research articles published within the last five years, from 2017 to 2022, available for free access, in full text and the Indonesian language, and articles that studied the factors influencing nurses in implementing patient safety in hospitals. From several literature findings, the author chose to use six research articles that were considered relevant to the topic of discussion using the PRISMA (Preferred

Reporting Items for Systematic Reviews and Meta-analyses) framework and combined them with being reviewed and concluded in the literature review.



Picture 1. PRISMA flow diagram of article selection

RESULT

Table 1. Summary of literature review findings

Author (Years)	Objective	Location	Design	Sample	Results
Pambudi et al., (2018)	To determine the factors influencing nurses in implementing the 6 Patient Safety Goals (SKP) on Joint Commission International (JCI) Accreditation in inpatient wards.	Inpatient unit, Panti Waluya Hospital Malang	Descriptive analytic with cross sectional approach.	124 nurses	Implementing 6 Patient Safety Goals (SKP) in the inpatient ward has mostly been done well. Factors that influence the implementation of the 6 SKP are the length of work (p = 0.018), nurse's knowledge (p = 0.002), number of dependents (p = 0.018), nurse's motivation (p = 0.019), organizational influence (p = 0.029), and supervision (p = 0.001).
Faridah et al., (2019)	To identify the factors influencing the implementation of patient safety culture among nurses in inpatient care.	Inpatient of Tangerang General Hospital	Quantitative with cross sectional approach	68 nurses	Most nurses have implemented patient safety cultures well. There is an influence of motivation (p = 0.002), level of knowledge (p = 0.007), and leadership support (p = 0.028) on the implementation of patient safety.
Sarasanti et al., (2018)	To identify the factors influencing the	Inpatient unit, X Hospital,	*Cross sectional*	48 nurses	The implementation of patient safety goals has been running

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Author (Years)	Objective	Location	Design	Sample	Results
	implementation of patient safety in inpatient units.	Jakarta			well. There is an influence of facilities (p = 0.000), organizational culture (p = 0.000), and supervision (p = 0.033) on the implementation of patient safety goals.
Kalsum et al., (2022)	To determine the factors influencing the implementation of patient safety in inpatient wards.	Inpatient unit, Permata Madina General Hospital, Panyabungan	*Cross sectional*	35 nurses	There are still healthcare workers who pay less attention to patient safety. Supervision (p = 0.038) and knowledge (p = 0.008) have a significant influence on the implementation of patient safety in the inpatient ward.
Aminayanti et al., (2021)	To analyze the influence of nurses' knowledge, attitudes, and work motivation on implementing of patient safety in inpatient units.	Inpatient unit of Sekayu Regional Public Hospital	Quantitative with a causal survey approach.	105 nurses	There are still nurses who work without applying patient safety principles. Nurse's attitude (p=0.000) and knowledge (p=0.000) variables significantly affect the implementation of patient safety
Handayani & Kusumapradja, (2018)	To identify the factors that influence and have the most impact on implementing of patient safety programs in inpatient units.	Inpatient unit, X Hospital, Tangerang Selatan	Quantitative approach, survey method, and correlational technique.	30 nurses	The implementation of the patient safety program is only 43.3% of respondents and is categorized as low. There is an influence of age (p = 0.002) and nurse's work motivation (p = 0.000) on the implementation of the patient safety program.

DISCUSSION

The Implementation of Patient Safety

Based on the results analysis of the study in the table above, it is known that nurses' implementation of patient safety goals in several hospitals is categorized as good. However, in several other hospitals, nurses' implementation of patient safety is still inadequate. This is influenced by several factors in nurses. Implementing patient safety in hospitals running well can be seen from the number of nurses who say often and consistently and the relatively high level of compliance with hand hygiene procedures when carrying out actions (Sarasanti et al., 2018).

However, in some hospitals, nurses' implementation of patient safety is categorized as inadequate. This is evident from the continued presence of healthcare workers who make mistakes in identifying patients and the risks to patients and their management. In addition, there are also discrepancies in incident reporting and analysis and a lack of solutions to minimize the risks and prevent injuries resulting from inappropriate actions (Kalsum et al., 2022). This is supported by other research indicating that in the low implementation of patient safety, the indicator of reducing patient fall risk has the lowest implementation value compared to the other five indicators (Handayani & Kusumapradja, 2018). The lack of awareness

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by patient families when accompanying the patient and limited human resources are obstacles to reducing patient fall risk (Tanjung et al., 2021).

Factors Influencing the Implementation of Patient Safety

Based on the results analysis of the study in the table above, it was found that several factors that influence nurses in implementing patient safety in hospitals, including age, attitude, knowledge, work motivation, workload, length of work, supervision, and organizational culture.

According to Uswantari in Noli et al., (2021), age is the length of time a person has lived since birth. Age is one of the factors that influences nurses in implementing patient safety goals in hospitals (Galleryzki et al., 2021), because age can describe how a nurse behaves with their views and responsibilities in properly implementing patient safety goals. This is supported by other research that shows that the age factor positively affects the implementation of patient safety programs (Handayani & Kusumapradja, 2018). Other research has shown that the increasing age of health workers is accompanied by decreased patient safety incidents because they become wiser, more careful, and comply with policies, procedures, and SOPs (Rahayu et al., 2018).

The tendency to react to a thing, person, or object with likes, dislikes, or indifference is the definition of attitude (Sabri, 1996). The results of research conducted by Aminayanti et al., (2021) show that attitude positively affects patient safety implementation. This means that the higher the value of attitude, the higher the implementation of patient safety. The nurse's attitude toward patient safety is strongly related to the level of education, experience, and frequency of attending patient safety training (Salih et al., 2021). Attitude greatly influences, as seen from nurses who implement patient safety poorly tend to have negative attitudes, such as impatience, noncompliance, and irresponsibility (Mukhlis, 2021).

According to Notoatmodjo in Masturoh & Anggita, (2018), knowledge is the result of knowing, and occurs after someone senses an object. Based on research by Pambudi et al., (2018), a p-value=0.002 was obtained, meaning there is an influence between knowledge and the behavior of implementing patient safety goals, etc., in hospitals. This is supported by other research, which shows that out of 16 nurses with good knowledge, 13 nurses implement patient safety in a good category (Kalsum et al., 2022). In this case, nurses must understand the concept of hospital patient safety (KPRS) and the six patient safety goals (Faridah et al., 2019).

Motivation is how needs to encourage someone to carry out activities to achieve certain goals (Goni et al., 2021). Based on research conducted by Pambudi et al., (2018), the statistical test results of the influence of motivation on the behavior of implementing 6 SKP using chi-square obtained a p-value = 0.007, meaning there is an effect of motivation on the behavior of implementing 6 SKP in the inpatient ward. This result is in line with other studies that show a significant influence of the motivation variable on

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implementating patient safety programs (Handayani & Kusumapradja, 2018). It can be said that if nurses have high motivation to implement patient safety goals, then the drive to achieve them will come from within them so that nurses consciously implement patient safety goals, even though the hospital environment does not apply a reward and punishment system.

The nurse's tenure refers to the length of time a nurse has worked since being officially appointed as an employee in a hospital or other health facility. The longer the working period, the more likely the nurse is to acquire increased skills and knowledge, as well as more challenging work, recognition, and appreciation (Safitri, 2018). The results of research conducted by Pambudi et al., (2018) showed a significant influence between nurses' tenure and the behavior of implementing the six patient safety goals in the inpatient ward. Nurses who applied patient safety goals in the good category mostly had a tenure of more than five years. If it is associated with the results of research conducted by Putri et al., (2022), where the average length of work for nurses is more than five years, it means that nurse's skills are increasing in implementing six patient safety goals and it has become a habit to apply them.

According to Mukhtar and Iskandar in Nurdia et al., (2017), supervision comes from the word "super", meaning more or above, and "vision" meaning to see or review. Supervision can also be called monitoring. This means that superiors monitor or review the activities being carried out by their subordinates. Supervision or monitoring can encourage nurses to implement patient safety goals. This is supported by the research of Kalsum et al., (2022), which states that there is a relationship between supervision and the implementation of patient safety in hospital inpatient wards. This is in line with the research of Safitri (2018), which states that supervisory support from leaders can encourage nurses to be more compliant up to 21 times compared to nurses who receive less supervisory support from their leaders. Data from Panti Waluya Malang Hospital shows that 50% of supervision is inadequate, resulting in the suboptimal implementation of patient safety goals in the hospital (Pambudi et al., 2018).

CONCLUSION

The implementation of patient safety goals by nurses in several hospitals has been categorized as good, but in some other hospitals, the implementation is still inadequate. This is influenced by several factors related to the nurses, including age, attitude, knowledge, work motivation, workload, length of work, supervision, and organizational culture. Therefore, coordination is needed from the hospital management to strengthen these factors that affect the nurses, such as conducting routine patient safety training to increase their knowledge so that patient safety can be implemented correctly to avoid incidents and increase patient satisfaction.

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Determinants of Dental and Oral Hygiene in School-Aged Children

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A B S T R A C T

Dental disease is an essential concern due to the vulnerability of the school-age group to dental and oral health problems. This study analyzes the correlation between knowledge and attitude toward oral and dental hygiene, tooth brushing behavior, and parental roles with dental and oral hygiene in school-aged children (10-12 years). This research method was descriptive-analytic with a cross-sectional design. The population in this study were students in grades 4, 5, and 6 at SDN 30 Mataram, totaling 120 people. There were 50 respondents with a simple random sampling. Instruments to assess knowledge, attitude, and parental roles were a questionnaire. In addition, Oral Hygiene Index-Simplified (OHI-S) to measure dental and oral hygiene, and an observation sheet to evaluate brushing teeth practice. The data analysis technique used Chi-Square to determine oral and dental health determinants in school-age children. There was a significant correlation between knowledge and attitude toward dental and oral health, tooth brushing behavior, and parental roles with dental and oral hygiene in school-aged children with significant values sequentially, p=0.006, p=0.000, p=0.000, p=0.000. In conclusion, The determinant of dental and oral hygiene in school-aged children are knowledge and attitude toward oral and dental health, teeth brushing practice, and parental roles.

INTRODUCTION

Damage to teeth can affect the health of other limbs. It will interfere with daily activities because teeth are an integral part of our body (Rahman, Ilmi, and Anam, 2018). One of the factors that can damage teeth is food and beverages. Some are healthy for teeth, and some can harm teeth (Pratiwi, 2007). Environment, knowledge, education, public awareness, and dental health management, including prevention and treatment, must be considered in dental health efforts. However, most people ignore dental health. They think dental care is unimportant, even though its benefits are vital in supporting health and body image (Pratiwi, 2007). The mouth's function is not just an entrance for food and drink. The mouth is an essential part of our body. It mirrors dental health because many diseases have symptoms in the mouth. In addition, dental health is vital to ensure good nutritional status. Moreover, its role is critical in the speaking process and attractive body image. Thus, the teeth' functions are to chew food to facilitate the digestive process, talk well, and support body image (Nainggolan, 2019).

Most children like to consume cariogenic foods because they taste sweet. Therefore, school age is at high risk of experiencing dental caries (Kusuma and Taiyeb, 2020). The incidence of dental caries in Indonesia was 88.8%, with 56.6% root caries, and above 70% had dental caries in all age groups. Specifically, its incidence in children aged 5-9 was 92.6% (Kementerian Kesehatan RI, 2020). In addition, the national prevalence of dental and oral problems was 57.6%. Indonesian people with dental caries were 45.3% in

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all age groups, 54.0% in 5-9 years old children group, and 1.89% in aged 10-12 years (Kementerian Kesehatan RI, 2018).

Various factors influence dental and oral hygiene. One of them is the lack of knowledge of dental and oral hygiene. Knowledge is a strong domain for the formation of one's behavior. In addition, a lack of knowledge can significantly result in poor dental and oral hygiene. Knowledge stimulates attitude and practice, then forms behavior (Silaban, 2013). Factors affecting knowledge include the level of education and socio-economic. Low education can lead to a lack of understanding about maintaining dental and oral health (Rama, Suwargiani, and Susilawati, 2017).

In general, there is a lack of knowledge, attitudes, and practice regarding preventing dental and oral diseases in Elementary school students. A preliminary study at SDN 30 Mataram (Mataram 30 Public Elementary School) on all students in grades 1 to 6 showed that most respondents in grades 4, 5, and 6 had poor dental and oral hygiene (66.67%), and only 33.33% had good. Most respondents did not brush their teeth before bed and consumed chocolate, candy, and other sweet foods. This study analyzes the correlation between knowledge and attitude toward oral and dental hygiene, tooth brushing behavior, and parental roles with dental and oral hygiene in school-aged children (10-12 years).

METHOD

This research method was descriptive-analytic with a cross-sectional design. The population in this study were students in grades 4, 5, and 6 at SDN 30 Mataram, totaling 120 people. There were 50 respondents with a simple random sampling. Instruments to assess knowledge, attitude, and parental roles were a questionnaire. In addition, Oral Hygiene Index-Simplified (OHI-S) to measure dental and oral hygiene, and an observation sheet to evaluate brushing teeth practice. The data analysis technique used Chi-Square to determine oral and dental health determinants in school-age children. The research ethics used are informed consent signed by the child and parents, anonymity (no name), and confidentiality. The ethics clearance was conducted at STIKES YARSI Mataram with certificate number SK: 037/STIKES/Y.III/LPPM/I-G/III/2020.

RESULT

Almost half of the respondents had moderate dental and oral hygiene knowledge (48%) and moderate dental and oral hygiene (40%). 18% of respondents with good knowledge had good dental and oral hygiene. The Chi-square test obtained p=0.006. Thus, there was a significant correlation between dental and oral hygiene knowledge with dental and oral hygiene in school-aged children (Table 1).

Table 1. The Correlation between Knowledge and Dental and Oral Hygiene in School-Aged Children

Knowledge	Dental and Oral Hygiene						Total		Chi-Square test
	Good		Moderate		Poor				
	n	%	n	%	n	%	n	%	
Good	9	18	5	10	0	0	14	28	*p*=0.006
Moderate	7	14	7	14	10	20	24	48	
Less	2	4	8	16	2	4	12	24	
Total	18	36	20	40	12	24	50	100	

Half respondents had a neutral attitude toward dental and oral hygiene, and almost half (40%) had moderate dental and oral hygiene. 16% of respondents with a positive attitude had good dental and oral hygiene. The Chi-square test obtained *p*=0.000. Thus, there was a significant correlation between attitude toward dental and oral health with dental and oral health behavior in school-aged children (Table 2).

Table 2. The Correlation between Attitude and Dental and Oral Hygiene in School-Aged Children

Attitude	Dental and Oral Hygiene						n	%	Chi-Square test
	Good		Moderate		Poor				
	n	%	n	%	n	%			
Positive	8	16	5	10	0	0	13	26	*p*=0.000
Neutral	8	16	7	14	10	20	25	50	
Negative	2	4	8	16	2	4	12	24	
Total	18	36	20	40	12	24	50	100	

Almost half of the respondents had moderate brushing behavior (44%) and moderate dental and oral hygiene (40%). 22% of respondents with good brushing behavior had good dental and oral hygiene. In addition, 22% of respondents with moderate brushing behavior had moderate dental and oral hygiene. The Chi-square test obtained *p*=0.000. Thus, there was a significant correlation between tooth brushing behavior with dental and oral hygiene in school-aged children (Table 3).

Table 3. The Correlation between Tooth Brushing Behavior and Dental and Oral Hygiene in School-Aged Children

Tooth Brushing Behavior	Dental and Oral Hygiene						n	%	Chi-Square test
	Good		Moderate		Poor				
	n	%	n	%	n	%			
Good	11	22	1	2	0	0	12	24	*p*=0.000
Moderate	6	12	11	22	5	10	22	44	
Poor	1	2	8	16	7	14	16	32	
Total	18	36	20	40	12	24	50	100	

Almost half of the respondents had good parental roles (40%) and moderate dental and oral hygiene (40%). 30% of respondents with good parental roles had good dental and oral hygiene. The Chi-square test obtained *p*=0.000. Thus, there was a significant correlation between parental roles and dental and oral hygiene in school-aged children (Table 4).

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Table 4. The Correlation between Parental Roles and Dental and Oral Hygiene in School-Aged Children

Parental Roles	Dental and Oral Hygiene						n	%	Chi-Square test
	Good		Moderate		Poor				
	n	%	n	%	n	%			
Good	15	30	5	10	0	0	20	40	*p*=0.000
Moderate	1	2	6	12	5	10	12	24	
Poor	2	4	9	18	7	14	18	36	
Total	18	36	20	40	12	24	50	100	

DISCUSSION

Knowledge results from curiosity through sensory processes, especially in the eyes and ears of particular objects (Donsu, 2017). It is fundamental for forming behavior in individuals (Silaban, 2013). This paper showed that dental and oral health knowledge correlated with dental and oral hygiene in school-aged children. Respondents with good knowledge could maintain good dental hygiene to avoid dental disease. Conversely, respondents with less knowledge about oral and dental hygiene could not keep their teeth hygienic, causing dental diseases such as loose teeth, cavities, and toothaches. It is in line with a previous study. A study found a relationship between knowledge about dental and oral health and dental and oral care behavior in school-age children (Yusmanijar and Abdulhaq, 2019).

Most respondents in this study had good and moderate knowledge. It illustrates that knowledge about dental and oral health is a simple thing that primary school children understand. However, a few respondents with good knowledge had moderate dental and oral hygiene or could not fully carry out dental hygiene care. Besides knowledge, external factors can influence behavior. The factors include parental roles in supporting children's dental and oral hygiene. In addition, previous research found that the other factor was family support as the motivation from outside a person (external) (Rahmaniar and Prasetyowati, 2022). Preschool children still depend on their parents so parental motivation can affect dental and oral hygiene during that period.

Furthermore, our study indicated a significant correlation between schoolers' attitudes toward dental and oral health with dental and oral hygiene. It is because attitude is one of the factors that can affect the cleanliness of a person's teeth and mouth. However, attitude is not the only determinant for forming behavior. A few elementary school students in this research with good knowledge and attitudes toward dental and oral health had poor dental and oral health behavior. There is no guarantee that attitudes will be displayed in behavior. A prior investigation also found that even though students had good knowledge of dental and oral health, they did not maintain dental and oral health well (Sirat, 2015).

A few respondents with neutral attitudes towards dental and oral health had moderate and poor dental and oral hygiene. It might be because they did not brush their teeth optimally, so dental and oral hygiene remained in the moderate and poor category. However, a neutral attitude can be an excellent opportunity to start a positive attitude toward dental and oral hygiene. Parental supervision is also critical in

maintaining oral and dental hygiene to protect from various diseases (Rahmaniar and Prasetyowati, 2022).

This paper also found a correlation between tooth brushing behavior and dental and oral hygiene. It is because behavior is the realization of knowledge and attitude into real action. Behavior is also a person's response to a stimulus in action. It is evident in the form of practices that others can easily observe or see (Sirat, 2015). This study result supports previous studies, which concluded a significant correlation between brushing behavior and the incidence of dental caries (Evyana, Rohmawati, and Perdana, 2016). Therefore, brushing behavior is one of the factors affecting dental and oral hygiene. A child who can brush well will be able to maintain good dental and oral hygiene and vice versa. Further, poor dental and oral can cause dental caries.

Furthermore, this research indicated a significant correlation between parental roles and dental and oral hygiene in school-aged children. The parental role is one factor affecting dental and oral hygiene. Therefore, parental knowledge is crucial for children's dental and oral hygiene. Other studies also found that caring and parental roles in using toothbrushes were significant (Devi, 2014). In addition, there was a correlation between maternal knowledge and action with plaque index in children (Guswan and Yandi, 2017). Dental and oral health in preschool age is essential. However, parents still often ignore dental diseases. They consider tooth decay common in children, whereas poor dental care potentially causes dental disease in childhood.

A study also revealed that the low motivation of parents caused nonoptimal brushing behavior in children. A lack of parental motivation made children ignore when parents gave orders to brush (Rahmaniar and Prasetyowati, 2022). Thus, parental roles regarding dental and oral hygiene are essential for primary school children. The roles include inviting children to check their teeth every six months and maintaining good oral hygiene in children. In addition, if there is tartar, immediately take the children to the dentist for a cleaning. Furthermore, they should motivate children to brush their teeth to improve their dental and oral hygiene.

CONCLUSION

The determinant of dental and oral hygiene in school-aged children are knowledge and attitude toward oral and dental health, teeth brushing practice, and parental roles. School institutions should continue to hold dental and oral hygiene counseling programs, and students could maintain and continue to improve dental and oral hygiene. In addition, parents should continue to guide and supervise children in maintaining dental and oral hygiene.

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Enhanced Recovery After Caesarean Delivery: A Narrative Review

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A B S T R A C T

Enhanced recovery after surgery (ERAS) is a philosophy of perioperative care that has been used in other fields since the 1990s but has only recently been applied to obstetric care in the form of Enhanced Recovery After Caesarean Delivery (ERACS). This review highlights perioperative care in ERACS, ERACS guidelines, and the benefits of ERACS. ERACS is a multimodal-based perioperative management protocol to recover the patient's condition immediately. It maintains preoperative organ function and reduces stress response during surgery. The primary keys in this protocol include preoperative counseling, optimization of nutrition, use of standard anesthetic and multimodal analgesia drugs, and early mobilization. The protocol covers perioperative care, from preoperative, intraoperative and postoperative. It involves a multidisciplinary team of anesthesiologists, surgeons, nurses, and nutritionists. The ERACS has many benefits, including shortening the duration of hospitalization, decreasing anxiety and stress, reducing the risk of postoperative infection, and accelerating the body's recovery. In addition, there are faster functional recovery, minimal complications, and a shorter length of stay. It can also improve patient care quality and reduce opioid exposure and dependence. ERACS aims to provide a comfortable patient experience by accelerating the process of patient care and recovery by prioritizing patient safety. However, the obstacle is consistency in carrying out the ERACS protocol in each related service unit, such as polyclinic, operating rooms, and treatment rooms, to implement each protocol comprehensively and optimally.

INTRODUCTION

Law Number 44 of 2009 declares a hospital is a health service institution providing comprehensive individual health services in inpatient, outpatient, and emergency. Various disciplines complement patient care in hospitals with each other (Budhi Setianto, et al., 2021). In addition, clinical considerations implementation is regulated in the regulation of the Minister of Health of the Republic of Indonesia, Number 5 of 2016. It states that clinical advisory is crucial in implementing National Health Insurance. It can ensure quality control and cost control so that the health services provided are effective and efficient according to patients' needs. The clinical advisory also provides certainty in resolving clinical problems in health services during the implementation of National Health Insurance.

Furthermore, Clinical Pathway (CP) is an evidence-based integrated performance planning concept with measurable outcomes for healthcare performance standards, standards of care, and home care. It summarizes every step given to the patient based on patient service standards. In addition, it includes evaluation, diagnosis, information support, rehabilitation, and clinical evaluation. Variances in clinical pathways have been identified to contribute to hospital duration of stay, medicinal drug utilization, hospital outcomes, and costs. ERACS is an intuitive first step to lower variances to improve patient care (Mullman, 2020).

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Enhanced recovery after surgery (ERAS) is a philosophy of perioperative care that has been used in other fields since the 1990s but has only recently been applied to obstetric care in the form of Enhanced Recovery After Caesarean Delivery (ERACS). This review highlights perioperative care in ERACS, ERACS guidelines, and the benefits of ERACS. ERACS is a multimodal-based perioperative management protocol to recover the patient's condition immediately. It maintains preoperative organ function and reduces stress response during surgery. The primary keys in this protocol include preoperative counseling, optimization of nutrition, use of standard anesthetic and multimodal analgesia drugs, and early mobilization (Kurniawaty & Anindita, 2018). The ERACS protocol can increase patient satisfaction, reduce patient length of stay, and reduce costs. The protocol covers perioperative care, from pre-admission, preoperative, and intraoperative. In addition, it includes postoperative, involving a multidisciplinary team of anesthesiologists, surgeons, nurses, and nutritionists. Recent studies revealed that ERACS improved patient outcomes, reduced postoperative complications, accelerated postoperative recovery, and supported faster patient discharge. Further, it could lower hospital costs (Kurniawaty & Anindita, 2018).

The Perioperative Care in ERACS

Preoperative, intraoperative, and postoperative care are critical in implementing ERACS (Tika et al., 2022).

Preoperative care

Pre-admission information, education, and counseling will be provided in preoperative care. Patients should get sufficient information on the surgical and anesthetic procedures the patient will undergo. Ideally, the patient and family meet with the surgeon, anesthesiologist, and nurse for discussion. It can reduce fear and patient anxiety and accelerate patient recovery and discharge. In addition, psychological counseling aims to reduce stress to accelerate wound healing and recovery after surgery. Counseling provides information, leaflets, or multimedia information provided to patients. It can improve patient involvement in perioperative nutrition, mobilization, pain control, and physiotherapy. Besides, it reduces complications after surgery.

Education and counseling are generally necessary for the success of the ERACS. The education and counseling provided contain information about the procedure and what to expect when the patient is in the operating room. In addition, there are surgical plans, pain management plans, goals for nutrition, and early mobilization. Other information provided to the patient is the nutritional information for pregnant women, nursing mothers, length of stay, and criteria for patient discharge (Habib & Ituk U, 2018). Three health workers provided this education: Obstetrics and Gynecology specialists, anesthesiologists, and

Personal Surgery Office (PSO) nurses. It is essential to provide educational materials that can be accessed via the web or taken home to help patients become familiar with the ERACS concept.

During the Covid-19 pandemic, patients with an elective SC surgery plan will undergo PCR (polymerase chain reaction) tests. In addition, patients with emergency surgery will undergo a COVID-19 antigen test. Both tests are carried out after the patient has obtained other test results that the anesthetist uses as a standard for surgical feasibility.

Intraoperative care

Before undergoing the surgical procedure, the patient must fast to avoid postoperative vomiting. The recommended fasting duration before anesthesia is six to eight hours for solid foods and two hours for high-calorie fluids. Taking high-calorie drinks two hours before surgery can reduce thirst, hunger, and anxiety before surgery. There will be ranitidine or omeprazole capsules provisioned two hours before the procedure. In addition, a single dose of broad-spectrum prophylactic antibiotics is provided 30-60 minutes before the ERACS procedure (Kurniawaty & Anindita, 2018). Furthermore, scheduled acetaminophen and non-steroidal anti-inflammatory drugs (NSAIDs) are provided. It includes restricting the dose of neuraxial opioids (morphine), preventing hypothermia and nausea, and assisting mother-toddler bonding (Kurniawaty & Anindita, 2018).

Multimodal analgesia has become a key component for most surgeries or anesthetics. ERACS protocols involve medications and techniques beyond routine surgical anesthesia. Analgesic drugs may be administered immediately preoperative, intraoperative, and continued postoperatively. Non-opioid analgesics minimize opioid consumption in ERACS (Patel & Zakowski, 2021).

Postoperative care

Early mobilization begins by sitting on the edge of the patient's bed. The patient can stroll from the patient's bed to the restroom because the catheter was removed no later than 6 hours after the procedure to avoid urinary tract infections complication in postoperative patients. After removing the catheter, the patient can breastfeed the baby in a comfortable sitting position so there is correct baby attachment when breastfeeding. The patient can be discharged one day after the ERACS procedures (the second day of hospitalization). The criteria for discharge are patients without pain or tolerated pain without additional anti-pain medications such as anti-pain patches or infusions. Based on respondent interviews, there was an increase in patient satisfaction after using the ERACS method among patients who have experienced regular cesarean sections. In addition, patients undergoing SC surgery for the first time thought that SC surgery was not as painful as imagined. So they wanted to give birth with the same method for the next delivery (Tamang, 2021).

ERACS Guidelines

Medical Societies, The American College of Obstetricians and Gynecologists (ACOG), and the Society for Maternal-Fetal Medicine (SMFM) prepare ERACS guidelines based on clinical evidence. Then, they submit those guidelines for practitioners to review, consider, and adopt (Liu, Du, and Yao, 2020). The ERACS guidelines enhance healing after surgical procedures. In addition, the guidelines comprise recommendations to improve all elements of patient care. The ERACS guidelines are an evidence-based practice to remove obstacles in implementation. Thus, training health workers regarding ERACS guidelines and clinical audits is vital (Bowden, 2019).

Table 1. ERACS Guidelines (Liu, Du, and Yao, 2020)

Preoperative care	Protocol
- Antenatal Care - Inpatient Care	- Education and counseling (anesthesia procedures, pain management, nutrition, early mobilization, criteria for patient discharge) - Intake of solid food six to eight hours before surgery - Intake of high-calorie drinks two hours before surgery - Ranitidine or omeprazole provision two hours before the procedure. - A single dose of broad-spectrum prophylactic antibiotics 30-60 minutes before the procedure.
Intraoperative care	**Protocol**
- Prevent hypotension due to anesthetic drugs. - Spinal anesthesia - Multimodal non-opioid analgesia - Optimal uterotonic with a low dose - Improved mother-baby bonding	- Phenylephrine is the vasopressor of choice to prevent maternal hypotension. - A low dose of 0.5% bupivacaine, Fentanyl, and morphine - Paracetamol IV dan NSAID - Low dose oxytocin infusion 15-18 IU/hour - Delayed Cord Clamping and early initiation of breastfeeding
Postoperative care	**Protocol**
- Early oral intake - Early mobilization	- Drinking water for 0-30 minutes post-op. - Food intake 4 hours post-op - Mobilization Level 1: sitting back in bed for 15 to 30 minutes. - Mobilization Level 2: sit on the side of the bed with legs dangling for 5 to 15 minutes. - Mobilization Level 3: Standing - Mobilization Level 4: Walking around the patient ward - Early urinary catheter removal no later than 6 hours after the procedure to minimize the risk of urinary tract infection.

The Benefits of ERACS

There are several reasons why the clinical results of performing ERACS are so impressive. Preoperative education and detailed psychological counseling about the ERACS protocol can help reduce psychological stress and improve patient adherence (Fajriani, 2016). Second, the ERACS protocol reduces hunger, increases carbohydrate intake, relieves stress, and reduces insulin resistance and food loss after surgery (Kurniawaty & Anindita, 2018). Third, the ERACS protocol recommends faster removal of urinary catheters and mobilization to reduce the risk of postoperative urinary tract infections and venous

thromboembolism. Fourth, standard nursing practice, broad-spectrum prophylactic antibiotics, and early mobilization with the ERACS protocol decrease postoperative infection risks such as postoperative wound infections, lung infections, and urinary tract infections (Tamang, 2021). Fifth, multimodal analgesia and intraoperative care can increase patient comfort during surgery (Liu, Du, and Yao, 2020). Last, early postoperative oral nutrition is vital to speed recovery by maintaining body homeostasis so patients can perform daily activities.

According to the latest research, ERACS showed a decreased length of stay in patients. The underlying thing is a significant pain reduction with multimodal analgesia so that post-Sectio Caesaria patients can mobilize for two hours and continue for six hours after surgery. Length of stay (LOS) is one indicator to assess hospital quality. Length of stay is a term given to describe the length of time a patient is hospitalized, from when the patient is recorded at the time of admission until the hospital issues a discharge planning or discharge plan. This data is essential in the medical record to consider patient costs. The hospital expenditure budget is the most significant contributor to state budget expenditure, so the number of patient days or LOS needs to be considered to estimate the management of hospital expenses and financing.

CONCLUSION

The ERACS method as a perioperative program for cesarean section patients has many benefits, including shortening the duration of hospitalization, reducing anxiety and stress, reducing the risk of postoperative infection, and accelerating the body's recovery. In addition, there is faster functional recovery, minimal complications, and a shorter length of stay. Furthermore, it can improve the quality of patient care and reduce opioid exposure and dependence. ERACS aims to provide a comfortable patient experience by accelerating the process of patient care and recovery by prioritizing patient safety. However, the obstacle is consistency in carrying out the ERACS protocol in each related service unit, such as polyclinic, operating rooms, and treatment rooms, to implement each protocol comprehensively and optimally.

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The Correlation between the Leadership Roles of The Head of PHC and Work Discipline in PHC Employees

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A B S T R A C T

Based on a preliminary study in February 2022 at the Medan Sunggal Primary Health Care (PHC), some PHC employees had inadequate work discipline. They did not comply with working hours. In addition, employee absence increased in the last three months of 2022. In addition, 10% of them still did not obey the regulation, such as not wearing uniforms and using sandals at work. This research analyzes the correlation between the leadership roles of the head of PHC and work discipline in PHC employees. This paper was quantitative research using a descriptive-analytic approach with a cross-sectional study design. The population was all employees working at the Medan Sunggal PHC. There were 43 respondents with the total sampling method. The dependent variable was work discipline in PHC employees. Meanwhile, the independent variable was the leadership roles of the head of PHC, with sub-variables communication, direction and guidance, supervision, motivation, and rewards. The instrument utilized a questionnaire. Data analysis used Spearman rank correlation statistical tests with α=0.05. Communication, direction, and guidance were strongly associated with work discipline, with *p*-value each 0.000 and 0.000. Supervision had a weak correlation with work discipline with p=0.000. However, motivation and awards negatively correlated with *p*-value sequentially 0.000 and 0.006. The leadership roles of the head of PHC are associated with work discipline in PHC employees. The head of PHC should perform well in communication, direction and guidance, supervision, motivation, and awarding to improve work discipline in employees.

INTRODUCTION

The characteristics of effective leadership can direct, guide, and lead organizations. In addition, it builds work motivation, creates good social networks, and provides good supervision. It also guides employees in the right direction to achieve goals, according to time and planning. Therefore, managers must be able to direct their employees (Hafied, 2017). Besides leadership, communication is crucial to avoid alienation in the organization and create employee trust so they feel the institution can fulfill their needs. In addition, previous research found that fair compensation following the benefits and applicable law could improve work discipline (Wulandari, 2022).

Work discipline is a tool used by managers to communicate with employees so that they are ready to change their behavior and try to increase awareness and willingness to follow all company rules. It is very beneficial both for the organization and its employees (Lutfi & Widodo, 2018). Work discipline is an

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attitude of respect and obedience to existing written and unwritten regulations and not avoiding sanctions when violating the duties and authorities (Mangkunegara & Prabu, 2013).

Based on a preliminary study in February 2022 at the Medan Sunggal Primary Health Care (PHC), some PHC employees had inadequate work discipline. They did not comply with working hours. In addition, employee absence increased in the last three months of 2022 (19% in January, 29% in February, and 30% in March). In addition, 10% of them still did not obey the regulation, such as not wearing uniforms and using sandals at work. Based on the PHC employees' interview, their lack of discipline during working hours was caused by their businesses, such as housework. In addition, there was a lack of control from the head of PHC. The authors observed that the head of PHC did not at the PHC every day. In 1 month, the average attendance of the head of PHC was four days a week, with each attendance being only 2-3 hours. Thus, the study also found that the head of Medan Sunggal PHC was also lacking in encouraging PHC employees. The absence of the head of the PHC was due to personal business and official affairs outside the PHC, potentially making PHC employees do not receive guidance and direction on their performance. In addition, it might affect the communication between the head of PHC and PHC employees. Lack of communication makes PHC employees sometimes reluctant to talk to the head of PHC.

The leader or manager should motivate their employees. Motivation is a driving force for someone to achieve goals (Amanda, 2021). The role of the head of the PHC as a leader in motivating PHC employees can affect work discipline. Leaders must provide inspiration, enthusiasm, and encouragement to perform employees' duties so that they are less lazy and more disciplined. This research analyzes the correlation between the leadership roles of the head of PHC and work discipline in PHC employees (Fajri, 2016).

METHOD

This paper was quantitative research using a descriptive-analytic approach with a cross-sectional study design. It simultaneously measured the dependent and independent variables. This research was conducted at the Medan Sunggal PHC, Medan, North Sumatra Province, from April to August 2022. The population is the entire object or subject in an area. It fulfills specific requirements related to the research problem or the whole unit or individual within the scope of the research. The population was all employees working at the Medan Sunggal PHC (43 people). The sample is part of the population that is considered representative of the population. The number of samples to be studied was taken using a sampling procedure, namely the total sampling technique, or by involving all employees of the MSPHC, as many as 43 people. The dependent variable was work discipline in PHC employees. Meanwhile, the independent variable was the leadership roles of the head of PHC, with sub-variables communication, direction and guidance, supervision, motivation, and rewards. This study used primary and secondary data. Primary data is obtained by researchers directly from data sources through interviews and

questionnaires to related parties. The secondary data were obtained from the profile of the PHC. The instrument used a questionnaire with several questions. We collected data by distributing a questionnaire to the PHC employees. Data analysis techniques include entering, processing, and analyzing data with Spearman rank correlation statistical tests with α=0.05 using computer software (SPSS version 20). The categorizing of the correlation levels was very weak (0.00 – 0.19), weak (0.20 – 0.39), medium (0.40 – 0.59), strong (0.60 – 0.79), and very strong (0.80 -1.00).

RESULT

Almost all respondents were female (93%). Most had worked at Medan Sunggal PHC for over six years (65.1%). Almost half graduated with a bachelor's degree (46.5%). In addition, 27.9% of respondents were 35-39 years old, and 23.3% were 40-44 years old (Table 1).

Table 1. The characteristics of respondents by sex, age, educational levels, and period of working

The characteristics of respondents	Frequency (n)	Percentage (%)
Sex		
Female	40	93%
Male	3	7%
Age (years old)		
<34	5	11.6%
35-39	12	27.9%
40-44	10	23.3%
45-49	8	18.6%
50-54	8	18.6%
Educational levels		
Senior high school	2	4.7%
Diploma	19	44.2%
Bachelor	20	46.5%
Master	2	4.7%
Period of Working		
>6 Years	28	65.1%
<6 Years	15	34.9%

Almost all respondents considered the head of PHC performed good supervision (93%) and provided good motivation (90.7%). In addition, most thought that the head of PHC provided good direction, guidance (65.1%), and rewards (79.9%). Half also considered that the PHC head had good communication (53.5%) (Table 2).

Table 2. Frequency Distribution of the leadership roles of the head of PHC

The leadership roles of the head of PHC	Frequency (n)	Percentage (%)
Communication		
Poor (<19)	20	46.5
Good (>19)	23	53.5
Direction and Guidance		
Poor (<16)	15	34.9
Good (>16)	28	65.1
Supervision		
Poor (<10)	3	7.0
Good (>10)	40	93.0

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Motivation		
Poor (<16)	4	9.3
Good (>16)	39	90.7
Rewards		
Poor (<10)	9	21.0
Good (>10)	34	79.9

Based on the Spearman correlation test results, all sub-variables of the leadership roles significantly correlated with work discipline. Communication, direction, and guidance were strongly associated with work discipline, with *p*-value each 0.000 and 0.000. Supervision had a weak correlation with work discipline with *p*=0.000. However, motivation and awards negatively correlated with *p*-value sequentially 0.000 and 0.006.

Table 3. The correlation between the leadership roles of the head of PHC and work discipline in PHC employees

Independent Sub-variable	Dependent Variable	r	*p*
Communication	Work Discipline	0.608	0.000*
Direction and Guidance	Work Discipline	0.854	0.000*
Supervision	Work Discipline	0.346	0.000*
Motivation	Work Discipline	-0.672	0.000*
Rewards	Work Discipline	-0.410	0.006*

* Significant

DISCUSSION

Our study showed that the communication of the head of PHC had a significant correlation with work discipline among PHC employees. As a leader, the head of the PHC must be able to carry out his communication role in all aspects, especially in the work discipline among PHC employees. Communication is crucial to achieving common interests contained in the goals or targets of the PHC. Effective communication can affect the work discipline of all employees (Komala & Karlinah, 2009). The better the communication between the leader and the employees, the better the employees' discipline level (Shinta, 2020). The head of the Medan Sunggal PHC communicated in decision-making to get harmonious work. He also planned regular internal meetings with PHC employees through monthly mini workshops. In addition, he was involved and invited PHC employees to formulate PHC goals (Kamal, 2017).

This paper also revealed that the direction and guidance of the head of PHC had a significant relationship with work discipline in PHC employees. Leadership is the process by which one person can direct, guide and influence the behavior and work of others toward specific goals (Sihombing, 2019). A leader can encourage the staff to work with confidence and passion (Telaumbanua & Ginting, 2019). In direction and guidance roles, the head of the PHC should regulate and direct PHC employees to obey PHC regulations. The head of Medan Sunggal PHC rarely provided direct guidance to PHC employees because the head of the PHC was not always at the PHC because of official affairs. It might cause Medan Sunggal

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PHC employees to be less disciplined. However, based on interviews with several PHC employees, the head of the PHC also provided direction and guidance through social media, for example, from a WhatsApp or Facebook group. The head of the Medan Sunggal PHC also always provided guidance and direction regularly through regular monthly mini-workshop meetings and before performing Integrated Health Post activities.

In addition, this research found that supervision significantly correlated with work discipline in PHC employees. Supervision is a function in the management of an organization in monitoring and evaluating an organization's activities. It is crucial because poor supervision potentially produces unmet organizational goals. Thus, leaders must perform supervision roles well. Implementing a plan or program without good and continuous monitoring will slow or non-achievement of the goals and objectives (Lutfi & Widodo, 2018). According to Simatupang & Saroyeni (2018), supervision is a process of following the development of activities to ensure the work goes well. In addition, it corrects unplanned activities. The head of the Medan Sunggal PHC performed periodic monitoring to determine obstacles for PHC employees in completing tasks. Good supervision will increase work discipline and vice versa.

However, this study showed that the motivation of the head of PHC was negatively correlated with work discipline in PHC employees. Motivation is a process that determines how much effort will be devoted to carrying out the work (Yudhana, 2021). Leaders should provide motivation, training, support, and attention to improve the ability and skills of the employees. Most respondents considered that the head of Medan Sunggal PHC provided good motivation, especially for employees with good work discipline. In addition, he motivated and evaluated the program held in monthly mini workshops. However, the head of PHC did not give punishment or sanctions to undisciplined employees, even though providing penalties is one way to increase motivation and work discipline (Simatupang & Saroyeni, 2018).

Our findings also indicated that rewards were negatively correlated with work discipline in PHC employees. The head of Medan Sunggal PHC gave social awards through praise. However, he did not provide financial awards because the City Government has given allowance to the PHC employees. The reward is an appreciation for professional employees (Hafied, 2017). It is essential in planning, organizing, and staffing so that the employees can perform their duties effectively and efficiently. A reward for employees with good work performance is crucial. It also plays an essential role in improving work discipline (Sutrisno, 2009). In addition, it functions as a motivation to improve employee discipline positively. The performance and obedience to the company will increase with the reward system so the employees can work better. Furthermore, rewards positively affect employee satisfaction, so they can cause employees to work harder to achieve their goals. Work satisfaction is associated with happiness so that the employees will do a good deed repeatedly. Moreover, the award can make someone more active in improving goal achievements. Thus, the award can provide satisfaction and love of employees towards

the organization or their work. Further, it can enhance work discipline. If employees' passion for work improves, their discipline will also improve (Yudhana, 2021).

CONCLUSION

The leadership roles of the head of PHC correlate with work discipline in PHC employees. The head of PHC should perform well in communication, direction and guidance, supervision, motivation, and awarding to improve work discipline in employees. All PHC employees must also improve work discipline to perform tasks and PHC programs on time to achieve PHC goals.

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