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RESEARCH ARTICLES

AUTHOR GUIDELINES

Global Medical and Health Communication is a journal that publishes medical and health scientific articles published every 4 (four) months. Articles are original research that needs to be disseminated and written in English.

The submitted manuscript must be an article that has never been published, and the author must ensure that all co-authors have agreed by signing a statement on the seal. For original research, we accept the study which is last then 7 (seven) years when the manuscript is submitted. The manuscript is an original article free from plagiarism. When the article is published in another journal then in the next journal, the article will be disallowed.

All articles will be discussed by experts in the field of scholarly concern (peer reviewer) and will be edited by the editor. The editor reserves the right to add or subtract sentences, both abstracts, and scripts without changing the meaning. Manuscripts that are accepted for publication will become the property of the publisher. It is not allowed to be published in other media. The needed revised manuscripts will be returned to the author. Research articles must be approved by the health research ethics committee or consider the ethical aspects of research accounted for.

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Typed the article in Microsoft Word format with paper size A4 (21.0×29.7 cm), 4 cm left and top margin, 3 cm down and right, not back and forth. The font is black Georgia with 12 pt size, typed justified except for a title with a spacing of two spaces. Typing a new paragraph 6 taps from the left edge of the line, unless the first paragraph is not typed indented. In one manuscript only in English. Typed italic the untranslatable terms in a foreign language or regional language. It is recommended to use a professional translator who understands the health field or software such as Grammarly in writing English manuscripts. The maximum script length is 20 pages (including images, tables, and photos). Each page is numbered typed on the bottom right page, sequentially starting from the title page to the last page.

Table title is the typed center, font size 11 pt, bold, initial letter of each word written with a capital letter, except conjunctions. The titles are numbered and written on top of the table. Example: Table 3 *Neisseria gonorrhoeae* Resistance to 8 Types of Antimicrobials in 20 Specimens. Table, no vertical dividing line, and there are only three horizontal borderlines. Created tables in sequence two spaces from the text. Table descriptions and abbreviations are placed in the table description, not on the table title.

Typed center figure title with 11 pt font size, bold, numbered according to the appearance in the text and typed under the image. The source of the cited image and or table should be added to references if it is not the author's work.

Figures (graphs, diagrams, and photos) and tables besides being written in place, are also made separately on other text pages with sufficient sharpness and darkness. A maximum number of tables and or images are 6 (six) pieces. Figures are sent in black and white or colored format when required, uploaded to the Supplementary File(s) are in high-resolution jpeg, jpg, or png formats.

Write correspondence as to the footnote on the first page containing the full name of the author with degrees/academic degrees, institution, address, mobile phone, and e-mail.

Content and Format Articles

The article contains results of original research in the field of basic medical or applied, and health. The article format consists of Title, Introduction, Methods, Results, Discussion, Conclusion(s), Conflict of Interest, Acknowledgments, and References.

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Maximum article title consists of 12 words (choose words and terms that are dense meaning and able to characterize the entire contents of the script). Typed with bold fonts, size 12 pt, one space, the initial letter of each word is written in capital letters (except the conjunctive), and center. The ownership row consists of 2 elements, the author name and origin institution. The author's name written with the initial fonts is capital and bold, size 11 pt, one space, and center. Institution name written with the initial fonts is capital, size 10 pt, one space, and center.

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The abstract is typed using 12 pt font size and one space. The abstract is written in one paragraph, one space, a maximum of 250 words, and should describe the entire contents of the article. The abstract should be suitable for the format of introduction, methods (contain method, place, and time of the study), results, discussion, and conclusion. Abstract be equipped with keywords consisting of 3–5 words.

Introduction

The introduction begins with the general background of the study in a brief maximum of one paragraph. Then, load the State of the Art (a brief review of literature or previous studies, 1–2 paragraphs) to justify/strengthen the statement of novelty or significance or scientific contribution or originality of this article and try to have references to articles from journals of the last 10 years that strengthen the justification for originality or contributions.

Before writing the purpose of the study, there must be a clear and explicit Gap Analysis or statement of gaps (originality) or a statement of the contribution of novelty (novelty statement), or the unique difference of this research compared to previous studies, also in

terms of the importance of whether or not the research was conducted.

Methods
Methods contain the material under study, and the way described briefly by the order of operation as well as the location and time of the study. Explain statistical methods in detail. Consideration of ethical issues is included. If the protocol has been approved then the ethical clearance/approval letter number and the health research ethics committee must be written.

Results
The result is the core of scientific writing. This section presents data and information that will be used as the basis of the conclusion and is even expected to get a new theory. In results, listed the tables and or images, graphics, photos to explain and abbreviate the description should be given; numbered according to their appearance in the text. Results of the study and discussion should be written separately.

Discussion
Discussion of the article reveals, explains, and discusses the results of the study with an analysis by the research design, interpretation, and explanation of its synthesis. Also, the results obtained are compared with the results of previous research of others. Suggestions are also written here.

Conclusion(s)
The conclusion is submitted by the results obtained by the researcher and written briefly and clearly in two or three sentences in one paragraph.

Conflict of Interest
All authors must make a formal statement at the time of submission indicating any potential conflict of interest that might constitute an embarrassment to any of the authors if it were not to be declared and were to emerge after publication. Such conflicts might include but are not limited to, shareholding in or receipt of a grant or consultancy fee from a company whose product features in the submitted manuscript or which manufactures a competing product.

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Theodoridou K, Vasilopoulou VA, Katsiaflaka A, Theodoridou MN, Roka V, Rachiotis G, et al. Association of treatment for bacterial meningitis with the development of sequelae. Intern J Infect Dis. 2013;17(9):e707–13.
Zhang B, Kunde D, Tristram S. *Haemophilus haemolyticus* is infrequently misidentified as *Haemophilus influenzae* in diagnostic specimens in Australia. Diagn Microbiol Infect Dis. 2014;80(4): 272–3.

Books and Other Monographs
Editor as Author
Nriagu J, editor. Encyclopedia of environmental health. Michigan: Elsevier BV; 2011.

Organization as Author
World Health Organization. Guideline: neonatal vitamin A supplementation. Geneva: WHO Press; 2011.

Chapter in Book
Miller LG. Community-associated methicillin resistant *Staphylococcus aureus*. In: Weber JT, editor. Antimicrobial resistance. Beyond the breakpoint. Basel: Karger; 2010. p. 1–20.

Conference Proceeding
Nicholai T. Homeopathy. Proceedings of the Workshop Alternative Medicines; 2011 November 30; Brussels Belgium. Brussels: ENVI; 2011.

Journal Article from Internet
King P. *Haemophilus influenzae* and the lung (*Haemophilus* and the lung). Clin Transl Med. 2012;1:10 [cited 2015 August 15]. Available from: https://clintransmed.springeropen.com/articles/10.1186/2001-1326-1-10.

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RESEARCH ARTICLE

Relationship of Knowledge and Perception of Self-Medication of Cough Medicine to Lung Function Disorders in Construction Workers in Indonesia

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Abstract

Construction workers were at high risk for chronic lung disease and decreased lung function, which often causes coughing symptoms. Self-medicated cough medicines were not only at risk for the incidence of side effects but also associated with the economy. This study aimed to determine differences in knowledge and perceptions about pulmonary function disorders. This study was an observational study using a case-control design conducted from April to December 2018. The subject was actively working in Rungkut subdistrict, Surabaya. Data will be presented descriptively, with relationships and differences analyzed using the chi-square test. Respondents found in both groups were 158, with 79 respondents in each group. Most of the respondents had a very high level of knowledge and perception in the group with impaired lung function (p=0.000). In addition, there is a relationship between knowledge and perception of self-medication of cough medicine. In conclusion, knowledge is related to construction workers' perception of self-medication of cough medicine.

Keywords: Cough medicine, knowledge, lung function, perception, self-medication

Introduction

Surabaya is the second largest city in Indonesia.[1] The current focus of the Surabaya City Government is through the trade and services sector to fulfill the welfare of the residents of Surabaya city. City-scale and environmental-scale development is a priority to support development in the city of Surabaya.[2] The construction process produces various kinds of pollutants, such as pollution and fine dust, which will have a negative impact, especially on the health of the workers involved in the construction, namely construction workers.[3]

Pollutants in the workers' environment will be inhaled by the workers and enter the lungs, which will later settle in the alveoli, causing health problems such as acute respiratory infections (ARI), chronic obstructive pulmonary disease (COPD), asthma, bronchitis, and cancer.[4,5] More than 50% of construction workers are regularly exposed to air pollution such as steam, gas, dust, or smoke.[6] Pulmonary dysfunction causes a vast health burden worldwide. An estimated 235 million people worldwide have asthma, while more than 200 million suffer from COPD. The other 65 million have moderate to severe COPD, 8.7 million people suffer from tuberculosis (TB) each year, and more than 50 million people struggle with the disease of the lungs due to work.[7] Globally, the incidence of COPD is predicted to increase due to several risk factors, such as the aging of the population, as well as a lack of knowledge and awareness of the disease itself.[8]

The main thing that is a risk factor for COPD is smoking. In other studies, the leading cause of COPD is 85% of smokers diagnosed cases.[8–10] Cigarette smoke can cause the withdrawal of immune cells into the airways and lungs. Products exposed to cigarette smoke can cause a prolonged inflammatory response that damages the epithelium of the airways and lung tissue, reduces lung defense mechanisms, and interferes with tissue repair in the lungs.[11–13] As frequent smoking can cause symptoms such as dyspnea, increased sputum production, and coughing, these symptoms can be early detection of pulmonary function disorders, namely COPD.[14] Of the symptoms that commonly occur, cough is one of the risk factors for pulmonary function disorders, namely COPD, especially in chronic cough in smokers.[8] Coughing is the body's defense mechanism in the respiratory tract or

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is a symptom of an illness.[15] Smoking is a cause of cough often experienced by subjects (41%). The cough symptom experienced by smokers was mostly a cough with phlegm (51%) with a coughing time of less than one year ago (35%).[16]

One way smokers can relieve cough symptoms is to use a cough medicine. Many people do self-medication or self-medication for complaints of fever, headache, cough, and flu. At present, self-medication is one of many societies' biggest socio-health and economic problems. In some developing countries, many drugs are available to the public without a prescription, and many people are self-medicating because of their lower costs than paying for medical services. In most developing countries, more than 60–80% of health problems are associated with self-medication.[17,18] Many types of drugs are used to treat cough symptoms depending on the type of cough and its cause. For example, the medicine for coughs that occur due to smoking is the mucolytic type.[19] Smoking can cause mucus hypersecretion because the substances in smoking cause damage to the cilia cells in the throat. Mucolytic, in this case, works by reducing the viscosity of the mucus, which is secreted excessively. It is expected to reduce the cough symptoms that occur in smokers.[20] Apart from mucolytics, other cough medicines that can also be used to treat coughs are the antitussive class and expectorants. Mucolytics and expectorants are cough medicines used for coughs with phlegm. In contrast, antitussives are used for coughs with phlegm (dry cough) and should not be used for coughs with phlegm because they can increase the risk of infection by bacteria or viruses. Incompatible use of drugs can have adverse effects on health.[21]

Self-medicated cough medicines are not only at risk for the incidence of side effects but are also associated with the economy. Self-medication is an attempt or selection of modern, herbal, or traditional medicine by an individual to overcome a symptom or a disease. Still, in its implementation, self-medication can be a source of medication errors due to the patient's need for knowledge about the drug and the disease. A person who feels sick will make efforts to regain his health. The options they can take to seek a cure for the disease include seeing a doctor or self-medication.[16–18] This study aims to determine whether there are differences in knowledge and perceptions of smokers with impaired lung function and those without pulmonary function disorders. It is because pulmonary function disorders will affect cough symptoms, which can affect knowledge and thus affect self-medication patterns,[22] and perceptions of a smoker. Illness perceptions of adolescents with chronic illnesses need to be better understood. Adolescents develop and mature cognitively and socio-emotionally and become more involved in managing their condition.[23,24]

Methods

This observational study used a case-control design to determine differences in knowledge and perceptions about cough medicine medication among construction workers. The research location used in this study is in the East Surabaya region, East Java. This research was conducted from April to December 2018, with the ethical test No. 034/KE/I/2018 at the University of Surabaya. The research variables in this study included lung function, knowledge, and perceptions about cough medicine self-medication. Pulmonary function is the ability of the lungs to enter air to remove air from the lungs. A pulmonary function test is when you breathe to find out how well a person is getting in and expelling air from the lungs. The tool used was spirometry. The results of pulmonary function (FEV_1) that were not affected were >70% and the pulmonary function affected was <0.70%.[8] The pulmonary function of the respondents was tested using spirometry with the Contec Handheld SP10 Spirometer.

Self-medicated knowledge was the respondent's knowledge of self-medication without a doctor's prescription or professional advice.[17,25] In this study included: (1) Knowledge of cough. Respondents' understanding of the nature/type of cough they suffer, the frequency of coughing, and the causes of coughing are related to the respondent's smoking habits. (2) Knowledge of the use of self-medicated cough medicines. Respondent's understanding of the types of cough medicines for self-medication, indications, side effects, contraindications, dosages, duration of use, and personal effects that occurred on respondents when using these self-medicated cough medicines.

The perception was the respondent's opinion or view on the following matters: (1) Perception of cough. This aspect relates to the respondent's opinion regarding the cough he is experiencing, limited activity due to the cough he is experiencing, and actions taken to overcome the cough. (2) Perceptions of the use of self-medicated

cough medicines. This aspect is related to the respondents' personal opinions regarding using self-medicated cough medicines which include the reasons for choosing a self-medicated cough medicine profile and the benefits obtained by the respondent after using the cough medicine.

The population used in this study were masons in East Surabaya. The accessible population was construction workers actively working in a housing project in the Rungkut subdistrict, East Surabaya. The sample desired to answer from this study was construction workers who meet the inclusion and exclusion criteria. Construction builder in Surabaya: male, 18–60 years, has been a builder for at least five years, smoker, and has experience using cough medicine independently. Using the Lemeshow formula, the number of samples taken in this study was because the population is unknown or infinite. Based on the results of the above calculations, the sample size set in this study was 62 respondents, so the researcher had to collect data from at least 62 respondents in this study. The sampling technique used was purposive sampling. The procedure for recruiting respondents was carried out by collecting data on all workers in the housing project in the Rungkut subistrict. Then each worker was contacted to assess the research criteria and willingness to become a respondent.

The questionnaire on knowledge and perceptions of cough medicine self-medication was derived from previous studies.[15] Data on knowledge and perceptions of drug self-medication will be presented descriptively. Test relationships and differences using the chi-square test.

Results

The knowledge questionnaire consists of 8 questions regarding knowledge of cough (no. 1–4) and self-medicated cough medicines (no. 5–8). Meanwhile, the perception questionnaire consists of 6 questions: perception of cough (no. 1–4) and perception of the use of self-medicated cough medicines (no. 5–8). All questions in the questionnaire were valid. In addition, the r-count value was greater than 0.361 (r-table value). At the same time, the reliability test results of all questions were also declared reliable because the value of Cronbach's alpha exceeds 0.6.

In this study, respondents were divided into two groups, those with impaired lung function and without lung function disorders group. Respondents found in both groups were 158, with 79 respondents in each group. Table 1 depicts that most age groups from both groups are in early adulthood, with body mass index

Table 1 Frequency Distribution of Respondent Characteristics

Respondent Characteristics	Groups				Difference Test
	Without Lung Function Disorders		With Lung Function Disorders		
	n=79	%	n=79	%	p Value
Age (years)					
Late adolescence (17–25)	20	25.32	15	18.99	0.113*
Early adulthood (26–35)	33	41.77	45	56.97	
Late adulthood (36–45)	13	16.46	15	18.99	
Early elderly (46–55)	10	12.66	3	3.80	
Late elderly (56–65)	3	3.80	1	1.27	
BMI (kg/m^2)					
Thin (<18.5)	7	8.86	6	7.59	0.485*
Normal (18.5–25.0)	59	74.68	66	83.54	
Excess body weight (25.0–27.0)	8	10.13	5	6.33	
Obesity (≥27.0)	5	6.33	2	2.53	
The lung function value (%)					
Mild (FEV_1>80% predicted)	0	0.00	66	83.54	
Worsening (50%<FEV_1<80% predicted)	0	0.00	13	16.46	

Note: *p value>0.05, meaning that there was no significant difference between the two groups, so the characteristic items did not affect the research results

Table 2 Classification of Knowledge of Self-Medication of Cough Medicine

Classification of Knowledge	Groups				Difference Test
	Without Lung Function Disorders		With Lung Function Disorders		
	n=79	%	n=79	%	p Value
Very high	69	87.34	71	89.87	0.000
High	10	12.66	8	10.13	
Low	0	0.00	0	0.00	

Note: p value<0.05 significant

(BMI) being normal. Different tests with chi-square tests on the characteristics of age and BMI in the two groups aimed to determine whether these characteristics affect the study results. The different tests showed that the p value of age and BMI<0.05 means no significant difference between the two groups, so the characteristic items did not affect the study results.

As assessed by the Brinkmann index, the severity of smoking did not differ significantly between the two groups (p=0.540), namely at the moderate level (200–600). In addition, filter cigarettes were more widely used in both groups (p=0.600) than non-filter.

The knowledge explained to the respondents will be described following the questions in the questionnaire based on smoking, cough symptoms, and the use of cough medicines. Each aspect of the question answered correctly will be given a value of 1; if it is wrong, it will be given a value of 0. The results of all respondents will then be grouped into three categories: very high, high, and low. Respondents who fall into the very high category have a range of 9–12. At the same time, the knowledge value for high was 5–8, and for the low category <5.

Table 3 Profile of Respondents' Answers Regarding Perception of Self-Medication of Cough Medicine

Questions		Groups				Difference Test
		Without Lung Function Disorders		With Lung Function Disorders		
		n=79	%	n=79	%	p Value
1 Cough is a disorder in the body that can interfere with daily activities	Agree	67	84.81	61	77.22	0.000
	Disagree	23	29.11	7	8.86	
2 The smoking activity was one of the factors that most often triggered coughs	Agree	63	79.75	58	73.42	0.000
	Disagree	21	26.58	16	20.25	
3 The more often you smoke, the more frequently you cough	Agree	79	100.00	30	37.97	0.000
	Disagree	0	0.00	12	15.19	
4 The cough that smokers often experience are a cough with phlegm	Agree	75	94.94	37	46.84	0.000
	Disagree	27	34.18	19	24.05	
5 The cough experienced by a smoker would go away by itself without having to see a doctor	Agree	48	60.76	16	20.25	0.000
	Disagree	56	70.89	38	48.10	
6 Cough medicine used only relieves cough symptoms	Agree	62	78.48	14	17.72	0.023
	Disagree	55	69.62	27	34.18	

Note: p value<0.05 significant

Table 4 Classification of Perception of Self-Medication of Cough Medicine

Classification of Perception	Groups				Difference Test
	Without Lung Function Disorders		With Lung Function Disorders		
	n=79	%	n=79	%	p Value
Very high	48	60.76	46	58.23	0.000
High	28	35.44	27	34.18	
Low	3	3.80	6	7.59	

Note: p value<0.05 significant

Table 5 Cross-Tabulation of Knowledge Results and Perceptions of Self-Medication of Cough Medicine

Classification of Knowledge	Classification of Perception				Difference Test
	Very High (n=94)	High (n=55)	Low (n=9)	Total (n=158)	p Value
Very high	89	45	6	140	0.000
High	5	10	3	18	
Low	0	0	0	0	

Note: p value<0.05 significant

Questions no. 1 and no. 4 show that these factors do not significantly differ between the two groups, so the characteristic items did not affect the research results. However, at the classification level, the knowledge level showed a significant difference (p=0.000) between the two groups (Table 2).

Respondents' perceptions measured by this questionnaire were divided into three aspects, very good, good, and mediocre. In the perception question, there are a total of 6 questions related to smoking, cough medicine, and the use of cough medicine. Everyone who answers agrees it is given point 2, and those who answer disagree are given point 1, and those who answer don't know will not be assessed or 0. The results of the total points will be categorized into three categories as well as knowledge, namely very good with points (38–26), good with points (25–13), and mediocre (<13).

Table 3 shows the respondents' answers on the perception of self-medication of cough medicine, and all items indicate a difference between the two groups.

Table 4 shows that most respondents have good perceptions, both in the group with pulmonary function disorders and without lung function disorders, which have almost the same percentage. It can be seen from the results of the highest rate of respondents, with a very good category. in the lung function disorders and without pulmonary function disorders. There was a significant difference in the different tests on the perception category of respondents with the impaired and without pulmonary function groups. It can be seen in the other test using SPSS version 25, which shows p=0.000.

Table 5 illustrates the relationship between knowledge and perception. Most of the respondents belonged to respondents with very high levels of perception and very high levels of knowledge as well (89 of 158). However, a significant difference was seen in the different tests using SPSS version 25, which shows p=0.000.

Discussion

The research subjects were all male because men's and women's lung function and exercise tolerance differ. The difference is due to the different hormones and structures in men and women. Hormones that can affect lung function are the hormones estrogen and progesterone.

Estrogen and progesterone are steroid hormones. Steroid hormones are synthesized in the gonads and adrenal glands. Female lungs tend to be smaller, lighter, and contain fewer bronchioles than male lungs. The number of alveoli per unit area and alveolar volume is not different between men and women, but men have larger lungs than women. Thus, the alveoli's total number and surface area are more significant in men than in women.[26] In this study, using spirometry.[15]

There are two common types of cigarettes, kretek, and white cigarettes. Kretek cigarettes are also divided into filter and non-filter clove cigarettes. Non-filter cigarettes are more dangerous than filter cigarettes because the nicotine and tar content in non-filter cigarettes is higher. In filter cigarettes, all the combustion products from cigarettes will be inhaled and enter the respiratory tract.[27]

The results above are under the theory which explains that non-filter cigarettes are more dangerous than filter cigarettes. Hence, the spirometry value in non-filter cigarettes is smaller because the nicotine and tar content is higher. After all, non-filter cigarettes do not use filters so that all cigarette combustion results will be completely sucked into the respiratory tract.[28] There are limitations in this study, namely that some respondents changed types of cigarettes several times, which could affect lung function and data results. I was controlled by asking which kind of cigarette they smoked most often. Tobacco use over a long period is associated with an increased likelihood of developing COPD, frequent productive coughing, and frequent congestion. It can affect physical activity even after controlling the smoking habit. The future use of cumulative cigarette consumption can show a consistent relationship between lung disease and non-smokers, ex-smokers, and smokers, distinguished by the number of daily cigarettes. Research conducted by Al Hariri et al.[29] stated that the value of lung function decreased in smokers and non-smokers. In addition, a significant correlation was found between the number of cigarettes smoked daily and the duration of smoking with decreased FVC and FEV_1 values. In this study, the severity was calculated using the Brinkman index, the multiplication of the length of smoking and the average number of cigarettes smoked per day. The severity level is categorized into 3, mild (0–200), moderate (200–600), and severe (>600).[30]

Coughing up with excessive phlegm or not occurring almost every day for at least three months of the year for two consecutive years. Chronic cough is associated with worsening airflow obstruction and progressive decline in lung function.[31] Two large-scale epidemiological studies have also shown that mucus hypersecretion is significantly and consistently associated with a reduction in excess FEV_1 and an increased risk of COPD. The number of goblet cells and enlarged submucosa glands in response to chronic irritation of the airways by cigarette smoke or other harmful particles.[31] Excess mucus or phlegm can be a symptom of COPD. The breathing tube can produce several ounces of mucus on a typical day. Mucus is needed to keep the respiratory tract moist. However, when the lungs become infected or irritated by irritation, more mucus is produced than average, which often causes coughing. Smoking is the most common cause of mucus production. Therefore, everyone should avoid being around smoke and limit exposure to other things that can irritate the lungs, such as pollution and smoke (paints, cleaning products, and perfumes), drugs such as bronchodilators (to open the airways), expectorants (to make mucus easier to cough up), mucolytics (to thin, thick mucus) and antibiotics (to treat infections in the lungs).[13,31] In the different tests conducted on impaired lung function and without impaired lung function with the frequency of cough experienced, there is no significant difference, as evidenced by a p value of 1.00. It indicates no significant difference between the lung function disorders and the non-impaired lung function groups with the cough they experience.

Pharmacological therapy treatment is usually classified based on the cough type, antitussive, expectorant, and mucolytic. A cough with an antitussive or dry cough is a cough medicine whose mechanism of action is to suppress cough. Antitussives alone can cause sputum retention, which may harm patients with chronic bronchitis and bronchiectasis history.[32] While cough medicine with the expectorant type is a drug that can stimulate the release of phlegm from the airways. There is no specific evidence that expectorants can stimulate expectorants. It only comes from practical experience that cough medicine with the mucolytic type is a treatment. Patients aim for mucous secretions associated with acute and chronic bronchopulmonary disorders (for example, pneumonia, bronchitis, lung disease, tracheobronchitis, chronic asthma bronchitis, tuberculosis, bronchiectasis,

Amyloidosis major lungs); atelectasis caused by a blockage of mucus. Examples of drugs that have mucolytic effects include acetylcysteine, bromhexine, and ambroxol.[21]

Frequent smoking results in dyspnea, increased sputum production and coughing. These symptoms can be detected early from lung function disruption and COPD. Of the symptoms that commonly occur, cough is one of the risk factors for pulmonary function disorders, namely COPD, especially in chronic coughs in smokers.[8] Coughing can also be a pathological result of the condition. Coughing itself is also an early sign of symptoms of respiratory tract disease.[14] Further examinations, such as chest x-ray, were needed to see the possibility of tuberculosis, bronchial carcinoma, or other pulmonary dysfunction. Coughing also often occurs in smokers who usually consider coughing to be a normal thing that often occurs.[14] A cough that a smoker experience is known as a smoker's cough, an early sign of bronchitis, which occurs because the lungs cannot release the mucus in the bronchi. This cough occurs because the mucus catches the black powder and dust from the inhaled air and prevents them from clogging the lungs.[15]

Self-medication is the primary choice for the community to deal with health complaints, so the role of self-medication cannot be ignored.[33] According to WHO, self-medication is an individual's selection and use of modern medicine, herbs, and traditional medicine to treat illness or symptoms. It occurs due to the patient's lack of knowledge about drugs and their diseases.[17] Likewise, perceptual learning can also shape decision-making patterns about medicines and illnesses patients suffer.

This study has several limitations, such as lung function only referring to age, weight and height, gender, smoking, and length of exposure to pollution. In addition, other factors can affect lung function, such as the classification level of smokers, the type of cigarettes used, genetics, and pollution. In addition, the types of pollution that builders get are different. Finally, there are differences in the kinds of pollution builders get based on their work division.

Conclusions

Respondents with lung function disorders have a better level of knowledge—meanwhile, respondents without lung function disorders better-perceived self-medication of cough medicine. There was a relationship between knowledge and perception of self-medication of cough medicine in construction workers.

Conflict of Interest

Authors declare none.

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RESEARCH ARTICLE

Relationship between Emotional and Spiritual Intelligence Levels with Non-Suicidal Self-Injury (NSSI) Behaviour in Adolescents during COVID-19 Pandemic

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Abstract

The problem of growth and development in adolescence and the emergence of the COVID-19 pandemic is psychosocial stress that could trigger anxiety, depression, and non-suicidal self-injury (NSSI). This research aims to describe the relationship between the level of emotional intelligence and spiritual intelligence with NSSI behavior in adolescents. We conducted quantitative correlational research with a cross-sectional approach. Subjects in the study consist of high school students in Bandung from June 2021 to July 2021. The examination was carried out through a questionnaire of Self-Harm Inventory (SHI) instrument, the emotional intelligence scale, and the spiritual intelligence scale. Sixty respondents with NSSI behavior were found (30.15%) out of 199 respondents, mostly aged 15–17 and female. Among them, 54 meet the mild NSSI behavior, and six people tend severe psychopathology. All adolescents with NSSI behavior were found to exhibit a level of emotional and spiritual intelligence in the moderate category. Statistically, there is a significant and simultaneous relationship between the level of emotional and spiritual intelligence and NSSI behavior in adolescents. Therefore, psychosocial intervention effort is essential for adolescents with NSSI to increase their spiritual and emotional intelligence. Adolescents with severe psychopathology need to be referred to a psychiatrist for further examination.

Keywords: Adolescent, COVID-19 pandemic, emotional intelligence, NSSI, spiritual intelligence

Introduction

Several studies have reported that the COVID-19 pandemic is psychosocial stress for children and adolescents because it interferes with the mental development of children and adolescents due to restrictions on children's social activities, school closures, and others. This condition can trigger the emergence of mental-emotional problems in children and adolescents in the form of depression, anxiety, and stress.[1–4] Even some studies reported an increase in self-harming behavior among adolescents during the COVID-19 pandemic.[2,3,5]

Adolescents under stress could perform self-harming behavior[2,4,6] even though they do not intend to commit suicide, known as non-suicidal self-injury (NSSI).[4,7,8] Adolescents did NSSI to channel negative emotions and emotionally overcome pain by hurting themselves.[6–9]

The usual treatment for adolescents with NSSI is the provision of psycho-pharmacotherapy and psychosocial interventions. Currently, the administration of psycho-pharmacotherapy, such as antidepressants or combinations with antipsychotics, mood stabilizers, and others, has given satisfactory results.[7,8]

Treatment by medication alone is not enough, as pursuing cognitive and emotional, behavioral, and attitude changes also require psychosocial intervention. Several attempts at psychosocial intervention have been carried out, such as cognitive behavior therapy (CBT) and various other psychotherapies. However, the results are still not optimal for the overall success of therapy.[7,8]

Several researchers have reported a significant relationship between the level of emotional intelligence and spiritual intelligence with stress, anxiety, aggression, conduct disorders, and depression.[10–13]

One of the assessments of the emotional and spiritual intelligence level is through the calculation and analysis of the emotional intelligence questionnaire and the spiritual intelligence questionnaire filled out by adolescents. The higher the value of the level of emotional intelligence, the more children and adolescents can understand and integrate

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emotions and thoughts in controlling their behavior.[11,14] However, if a low level of emotional and spiritual intelligence is found, it will certainly affect mental and emotional problems and daily life.[11,13]

If there is an increase in the assessment of the level of emotional intelligence and the level of spiritual intelligence through training, adolescents with NSSI are expected to be able to control their thoughts and behavior so they do not hurt themselves.

This study aims to determine the relationship between emotional and spiritual intelligence with NSSI behavior in adolescents.

Methods

This study uses a quantitative approach for correlational research with a cross-sectional approach. This study uses primary data from a questionnaire, statistical calculations, and correlational analytics with a quota sampling technique.

The research subjects were students of class X, class XI, and class XII of vocational high school in Bandung from June 2021 to July 2021 who met the inclusion criteria. Respondent determination is done by the Slovin sampling method on a total population of 254 people with a confidence interval of 95% and an error margin of 5%, thus producing 199 respondents. The examination was conducted using the Self-Harm Inventory (SHI) instrument, the emotional intelligence scale 40, and the spiritual intelligence scale, tested for validity and reliability. Students are advised to fill out this questionnaire correctly and honestly because the researcher would keep the confidentiality of the data. Subject names are written with initials to maintain confidentiality, and filling out the questionnaire at school accompanied by the teacher and at home accompanied by parents.

The data collection method is by using Google Forms to fill out the SHI Early Detection Questionnaire, emotional intelligence scale, and spiritual intelligence scale. The respondent's parents filled out the informed consent stating their willingness to participate as the subject of this study.

In this study, to assess SHI or NSSI, the Indonesian version of the SHI instrument was used.[15] SHI consists of 22-item statements based on experiences of self-harm. Statements are filled in alone with the answers "yes" (score 1) and "no" (score 0). Assessment of the SHI questionnaire on the respondents of this study showed that most of the respondents carried out mild self-harm behavior (cut-off >5). The results of the SHI questionnaire assessment with a cut-off of >11 on adolescent respondents with NSSI behavior mean that there was a tendency to have severe psychopathology in these adolescents.

Emotional intelligence is measured using the emotional intelligence scale 40, validated and tested for reliability. This scale consists of forty statements about emotional states when dealing with various situations. This scale has been validated and tested for reliability. After adding it up, we get a low emotional intelligence score of 40–93, a medium of 94–146, and a high of 147–200.

Measurement of spiritual intelligence in this study used the Spiritual Intelligence Self-Report Inventory (SISRI) questionnaire. This questionnaire has been translated into Indonesian, validated, and tested for reliability. This questionnaire consists of 24 statements, but three items cannot be used after analyzing the items, so only 21 items are used to discuss the research data. The questionnaire is divided into four dimensions: the ability to think critically, the ability to find and create meaning, the ability to explore spiritual aspects, and the ability to develop spiritual aspects. After the calculation, the total value of spiritual intelligence scores is 0–21 low, 22–62 moderate, and 63–84 high.

The research data obtained was then tested by testing the hypothesis with a correlation test using the SPSS 24.00 for Windows to identify the relationship between emotional intelligence and spiritual intelligence variables with NSSI or self-harm injury behavior variables, correlation strength, and direction of correlation.

Results

Table 1 shows that from a total sample of 199 people, 60 have NSSI, including 45 (22.61%) female adolescents and 15 (7.54%) male adolescents. Table 2 shows a description of the assessment of the SHI questionnaire on respondents with NSSI. The SHI questionnaire assessment with a cut-off >5 showed mild self-harm (never had mild self-harm), found in 53 people (88%) aged 15–17 years and one person (2%) at the age of 18 years, more in females by 39

Table 1 Characteristics of Respondents Who Show NSSI Behavior

Characteristics	Gender				Total	
	Male		Female			
	n=62	%	n=137	%	n=199	%
Non-NSSI	47	23.62	92	46.23	139	69.85
NSSI	15	7.54	45	22.61	60	30.15

Table 2 Description of the SHI Assessment of Respondents with NSSI

Variables	SHI Score			
	Cut-off >5		Cut-off >11	
	n=54	%	n=6	%
Age (years)				
12–14	0	0	0	0
15–17	53	88	6	10
18	1	2	0	0
Gender				
Male	15	25	0	0
Female	39	65	6	10
Grade				
Class X	23	39	3	5
Class XI	20	33	2	3
Class XII	11	18	1	2

people (65%) and the most in class X as many as 23 people (39%). The SHI assessment with a cut-off score of >11 means that the respondent has psychopathology, found in 6 (10%) females aged 15–17. Respondents with severe psychopathology are recommended to be referred to a psychiatrist for further examination.

Table 3 shows the level of emotional intelligence in adolescents who perform NSSI in the moderate category, as many as 42 people (70%) at the age of 15–17 years. While the level of emotional intelligence in the low category was found at the age of 15–17 years in as many as seven people (11.7%), and the level of emotional intelligence in the high category was found in respondents aged 15–17 years as many as ten people (16.7%).

Table 4 shows the level of spiritual intelligence in respondents with NSSI behavior in the moderate category, namely 53 people (88.3%) aged 15–17 years. The level of spiritual intelligence in the moderate category was found more in women, namely 39 people (65.0%). There are no respondents who have a high category of spiritual intelligence.

Table 5 shows Pearson's bivariate correlation test between spiritual intelligence and NSSI behavior, which obtained a correlation number of 0.000 (<0.05), meaning there is a significant correlation between the spiritual intelligence variable and the SHI variable. Based on the

Table 3 Levels of Emotional Intelligence in Adolescents Who Do NSSI

Variables	Emotional Intelligence (EQ)					
	Low		Moderate		High	
	n=7	%	n=43	%	n=10	%
Age (years)						
12–14	0	0.0	0	0.0	0	0.0
15–17	7	11.7	42	70.0	10	16.7
18	0	0.0	1	1.7	0	0.0
Gender						
Male	1	1.7	12	20.0	2	3.3
Female	6	10.0	31	51.7	8	13.3
Grade						
Class X	3	5.0	14	23.3	9	15.0
Class XI	3	5.0	18	30.0	1	1.7
Class XII	1	1.7	11	18.3	0	0.0

Table 4 Levels of Spiritual Intelligence in Adolescents Who Do NSSI

Variables	Spiritual Intelligence (SQ)					
	Low		Moderate		High	
	n=6	%	n=54	%	n=0	%
Age (years)						
12–14	0	0.0	0	0.0	0	0.0
15–17	6	10.0	53	88.3	0	0.0
18	0	0.0	1	1.7	0	0.0
Gender						
Male	0	0.0	15	25.0	0	0.0
Female	6	10.0	39	65.0	0	0.0
Grade						
Class X	3	5.0	23	38.3	0	0.0
Class XI	2	3.3	20	33.3	0	0.0
Class XII	1	1.7	11	18.3	0	0.0

Table 5 Relationship between Spiritual Intelligence Level and NSSI Behavior

		SQ (X2)	SHI (Y)
SQ (X2)	Pearson's correlation	1	−0.705*
	Sig. (2-tailed)		0.000
	n	60	60
SHI (Y)	Pearson's correlation	−0.705*	1
	Sig. (2-tailed)	0.000	
	n	60	60

Note: *correlation is significant at the 0.01 level (2-tailed)

r-calculated value in Pearson's correlation table obtained 0.705 (>r-table 0.254), it can be concluded that there is a relationship between the spiritual intelligence variable and the SHI variable. The value of the r-count is negative; this indicates that the relationship between spiritual intelligence variables is negative, meaning that the higher the spiritual intelligence, the lower the NSSI behavior.

Table 6 shows the simultaneous relationship between the emotional intelligence variable (X1) and the spiritual intelligence variable (X2) on the SHI variable (Y). The researcher used multiple linear regression analysis techniques with the output of Sig. of 0.000 (<0.05), and the value of the F-count is 31.113 (>F-). These show that emotional and spiritual intelligence simultaneously affect the behavior of NSSI.

Discussion

From the results of this study, it was found that 60 respondents (30.15%) and mid-teenagers in the 15–17 year age group had 59 respondents (98%).

Table 6 Relationship between Emotional Intelligence Level and Spiritual Intelligence Level with NSSI Behavior

ANOVA						
Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	158.975	2	79.488	31.113[a]	0.000[b]
	Residual	145.625	57	2.555		
	Total	304.600	59			

Note: [a]dependent variable: SHI (Y), [b]predictors: (constant), SQ (X2), EQ (X1)

Many teenagers have contemplated suicidal ideation, attempted suicide, or self-harm in their lifetime. According to Hawton et al.,[10] the average lifetime prevalence of adolescent self-harm is around 13%, previously preceded by about 6% in the last 12 months. These show that adolescents are an age group that is a risk factor for behavior NSSI because NSSI behavior is carried out higher in adolescents compared to other age groups.

NSSI behavior in this study was more in female adolescents, as many as 45 people (22.61%), than in male adolescents. These findings are the same as the results of previous studies, namely, the average suicidal thoughts or self-harm behavior in women are higher than in men.[16–19]

Assessment with the SHI questionnaire on the respondents of this study showed that most of the respondents carried out mild self-harm behavior (cut-off >5), as many as 53 people (88%) at the age of 15–17 years and one person (2%) at the age 18. The results of the SHI questionnaire assessment with a cut-off of >11 on adolescent respondents with NSSI behavior in this study found six people (10%), meaning there was a tendency to have severe psychopathology in these adolescents. Every teenager with severe psychopathology needs to be observed, have an examination, and get treatment by a psychiatrist.[20]

Not all people who engage in self-harm behavior (NSSI) intend to commit suicide. Still, according to some experts, people who engage in self-harm behavior have a 1.68-fold risk of committing suicide.[12] In DSM-TR-5, self-harm behavior is listed as a separate diagnostic category named non-suicidal self-injury.[6] Self-harm is a person's failure to cope with stress. Self-harm is an essential mental health symptom that can occur in the average population or patients with a mental disorder diagnosis.

Based on Pearson's bivariate correlation test, the Sig. (2-tailed) between emotional intelligence and NSSI behavior is 0.000 (<0.05), which means there is a significant correlation between emotional intelligence variables and NSSI behavior variables.

The value of r-count is negative, which means that the relationship between emotional intelligence variables is negative; in other words. the higher the level of emotional intelligence, the lower the self-harm behavior (NSSI), and conversely, the lower the emotional intelligence level, the higher the NSSI behavior. The results of this study follow the results of the previous study regarding the relationship between emotional intelligence and depression levels in adolescents, which states that there is a negative correlation between emotional intelligence and depression levels in adolescents, namely the higher emotional intelligence possessed by adolescents, the lower the level of depression.[21,22]

This study had a significant relationship between spiritual intelligence and negative NSSI behavior. The level of spiritual intelligence in the low category was found in 10% of respondents with NSSI behavior. However, this study did not find a high level of spiritual intelligence in adolescent respondents with NSSI behavior. The level of spiritual intelligence in the high category is likely to prevent NSSI behavior in adolescents. So, efforts to increase spiritual intelligence through emotional spiritual quotient (ESQ) training are very important for adolescents with NSSI behavior.

Conclusions

There is a relationship between emotional and spiritual intelligence with NSSI behavior. The relationship between emotional intelligence variables is negative, meaning that the higher the emotional intelligence, the lower the self-harm or NSSI behavior.

Conflict of Interest

None declared.

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RESEARCH ARTICLE

The Use of Ovitrap and the Female *Aedes* sp. Density in the Tamansari Vilage of Bandung City

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Abstract

Dengue hemorrhagic fever (DHF) incidence in Indonesia, which become one of the mortality causes, is relatively high. Therefore, the government launched the mosquito nest eradication (MNE) movement with an indicator of the larva-free rate to reduce the incidence of DHF. Another effort in vector control is using ovitrap to break the life chain of dengue vectors. This study aimed to determine the effect of using ovitrap on the female *Aedes* sp. density in the Tamansari village area of Bandung city. This quantitative experimental study was conducted on 60 houses in two neighborhood associations in the Tamansari village area. Both community groups were assessed for ovitrap index and the number of eggs trapped on ovitrap filter paper before and after treatment. The treatment group consisting of 30 houses was given one ovitrap inside and one ovitrap outside the house for four weeks. Ovitrap is changed every five days. The second group is the control community. The data obtained were analyzed using the Wilcoxon and chi-square tests with a degree of confidence of 0.05. In this study, the ovitrap index of this area was found between 0.67–0.80, which indicates that this area is at high risk of DHF transmission. Statistical tests showed that the use of ovitrap did not affect female *Aedes* sp. density as assessed by the ovitrap index. The results showed that using ovitrap could not control the population of *Aedes* sp.

Keywords: *Aedes* sp., density, ovitrap, ovitrap index

Introduction

Dengue hemorrhagic fever (DHF) is still an infectious disease in Indonesia. Dengue virus, the cause, is spread through its vector: *Aedes* sp.[1–3] Efforts to reduce the incidence of DHF are to control the population of vector that spreads the disease. DHF vector population in the environment can be controlled by breaking the chain of life, mosquito nest eradication (MNE), and using insecticides. The government is promoting the MNE movement with the national target of achieving a larva-free rate of 95% in endemic areas, but in 2017 this target still needs to be achieved.[1] The use of insecticides to eliminate adult mosquitoes encounters resistance constraints; *Aedes* sp. is no longer sensitive to certain classes of insecticides.[4–11]

Other efforts in controlling dengue vectors have been widely studied recently, including ovitrap. It is a trap for female mosquitoes *Aedes* sp. to lay eggs in these places, which can break the life chain of the *Aedes* sp. at the egg stage, causing cessation of egg development into adults. Previous studies have shown that ovitrap is effective in reducing the population density of *Aedes* sp. larvae.[12,13]

Ovitrap is a black water container equipped with a stick or filter paper to trap for mosquitoes to lay eggs. The color chosen for the ovitrap is black because *Aedes aegypti* mosquitoes tend to lay their eggs in black water containers.[14,15] Wooden sticks or filter paper are absorbent media for attaching mosquito eggs, which the mother lays on the water surface. Mosquito eggs will stick to the media and can be observed further. Ovitrap is distributed, collected, inspected, and destroyed every five days so that the trapped eggs do not develop into adult mosquitoes.[12–19]

Ovitrap is commonly used in vector surveillance to detect vector density by calculating the ovitrap index. The ovitrap index was calculated by dividing the number of egg-positive ovitraps by the number of ovitraps distributed.[16–21] The ovitrap index was more sensitive than the larval index (breteau index, house index, and container index), which monitored the presence of larvae.[16,22,23]

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This study aims to determine the effect of using ovitrap on the density of female *Aedes* sp.

Methods

It was an experimental quantitative study in two community groups of neighborhood association (*rukun tetangga*, RT) in the Tamansari village area in April 2021. One community group comprising 30 adjacent houses was treated with ovitrap placement for four weeks. They were replaced every five days, and the other group consisting of 30 houses, acted as controls. The village staff recommends conducting research in certain RT areas because those were the highest incidence of dengue fever in Tamansari; previous research found that the Tamansari village has a high container and ovitrap index. Ovitrap is made from a small black bucket with walls covered with filter paper and filled with well water as high as 3 cm. Ovitrap was stored for five days, both inside and outside the participants' houses. The eggs attached to the filter paper on the ovitrap were counted to determine the number of eggs and the ovitrap index. The ovitrap index was calculated by dividing the number of positive ovitraps by the total number of ovitraps. The effect of ovitrap on female *Aedes* sp. density assessed by the ovitrap index was analyzed using the Wilcoxon and chi-square tests with a degree of confidence of 0.05. This study also conducted a survey of the presence of larvae in containers of participants' houses with the larva-free number parameter, which was the 1–container index. The container index is calculated by dividing the number of positive containers for larvae by the total number of containers inspected.

Results

The number of positive larvae containers obtained from larva surveys on clean water containers in 60 houses in RW 7, Tamansari village, Bandung Wetan sub-district, Bandung city, are listed in Table 1. The container index for all samples is 3%, and the larva-free rate is 97%. Containers that were positive for larvae were buckets of used paint in the yard, clothesline, and water tank. The larva-free rate of houses in RW 7, Tamansari village, Bandung Wetan sub-district, Bandung city, has reached the target set by the government, which is more than 95%.

Female *Aedes* sp. density was assessed from the ovitrap index, which was the number of positive ovitraps for *Aedes* sp. compared to the number of ovitraps distributed. The higher the ovitrap index, the higher the density of female mosquitoes. Although the larva-free rate of this area has reached the national target, which is above 95%, this area still needs to be free of *Aedes* sp. females. The ovitrap index of this region is between 0.67–0.80, indicating that this region is at high risk of dengue transmission. The ovitrap index in RW 07 Tamansari, Bandung city, is described in Table 2.

In this study, the number of eggs in the ovitrap

Table 1 Number of Larvae-Positive Clean Water Containers

Groups	Number of Positive Containers	Number of Containers Inspected	Container Index	Larva-free Number
Treatment	0	58	0	1
Control	3	57	0.05	0.95
Total	3	115	0.03	0.97

Table 2 Ovitrap Index

Groups	Number of Positive Ovitrap	Ovitrap Index
Treatment		
Before treatment	40	0.67
After treatment	47	0.78
Control		
Before treatment	46	0.77
After treatment	48	0.80

was calculated to monitor the number of eggs produced by female *Aedes* sp., which can describe the number of female mosquitoes roughly because the age of the mosquito also influences the number of eggs produced by females, the amount of blood sucked, and others. The average number of eggs in the treatment group before and after treatment was 53.25 and 64.83, while the average number in the control group was 62.07 and 83. In this study, there was no decrease in the number of eggs in the treatment and control groups after treatment with ovitrap. The number of eggs trapped in the ovitrap of the treatment and control groups is shown in Table 3.

The use of ovitrap for four weeks is expected to break the chain of mosquito breeding and reduce the density of female *Aedes* sp. The effect of using ovitrap was analyzed by comparing the number of positive ovitraps in the treatment and control groups (Table 4), comparing the mean number of eggs before and after treatment in the treatment and control groups (Table 5), and comparing the mean difference in the number of eggs before and after treatment in the treatment and control group (Table 6).

The statistical test results showed that the use of ovitrap did not affect female *Aedes* sp. density, assessed by the ovitrap index and number of eggs.

Table 3 The Number of Eggs of *Aedes* sp.

Groups	Number of Eggs	Average Egg Number
Treatment		
Before		
Outside	1930	64.33
Inside	1265	42.17
Total	3490	53.25
After		
Outside	2360	78.67
Inside	1530	51.00
Total	3890	64.83
Control		
Before		
Outside	2164	72.13
Inside	1560	52.00
Total	3724	62.07
After		
Outside	2910	97.00
Inside	2070	69.00
Total	4980	83.00

Table 4 Comparison of the Number of Positive Ovitraps in the Treatment and Control Groups

Groups	Before	After	p
Treatment	40	47	0.67*
Control	46	48	

Note: *chi-square test, p<0.05 significant

Discussion

The larva-free rate in RW 7, Tamansari village, Bandung Wetan sub-district, Bandung, has reached the target set by the government, which is more than 95%. According to the city government, Bandung has reached the larva-free rate, although previous research says otherwise.[24,25]

In addition, most people use buckets as a water reservoir in the bathroom as a substitute for a water tank. The bucket's volume is smaller than the water tank, so cleaning and replacing the water more frequently was easier. Because the water quality in the area is good, residents rarely have quantities of water containers inside the house. Residents rarely use water dispensers,

Table 5 Comparison of the Number of Eggs in the Treatment and Control Groups before and after Treatment

Groups	Average Number of Eggs	p
Treatment		
Before	53.25	0.342*
After	64.83	
Control		
Before	62.07	0.262*
After	83.00	

Note: *2-way Wilcoxon, p<0.05 significant

Table 6 Comparison of The Difference in The Number of Eggs Before and After Treatment in The Treatment and Control Groups

Groups	Mean of Difference	p
Treatment	−11.58	0.548*
Control	−20.93	

Note: *2-way Wilcoxon, p<0.05 significant

which contain a reservoir for spilled water, often used by mosquitoes to lay eggs.

The area of RW 07 in the Tamansari village is densely populated. Items that can be used as water reservoirs, such as garbage in the yard, and drinking places for birds or other animals, are rarely found in this environment because the houses are tiny, and the yards are narrow or do not exist. The bird's drinking water reservoir can become a nest for mosquitoes.

This area has reached the national larva-free rate target, above 95%, but is not yet free of female *Aedes* sp. Installation of ovitrap in this area still shows the presence of female *Aedes* sp. with ovitrap index ranging from 0.67–0.80. The ovitrap index in RW 07 showed a high risk of DHF transmission because the ovitrap index in this area exceeds the transmission threshold of 0.1.[26] According to the Hong Kong government, the ovitrap index exceeding 0.2 requires additional eradication of mosquito nets, administration of larvicides, and spraying insecticides to reduce the risk of DHF transmission.[27]

The high ovitrap index with a low container index in this area is due to the sensitivity of the ovitrap index being higher than the larva index, such as the container index in detecting the presence and density of *Aedes* sp.[16,22,23] The low container index in people's houses and the high ovitrap index indicate that the mosquito nests are not inside people's houses. Mosquito nets can be outside people's houses, such as plastic waste logged with water, gutters, and water containers in public places such as public buildings, mosques, and schools.[28,29] *Aedes* sp. can fly approximately 50–100 meters so that if a mosquito nest is found, then within that radius, the residents' houses are threatened with DHF transmission even though the environment is clean.[26,30,31] This shows the importance of caring for the environment outside our homes, reminding neighbors to eradicate mosquito nests, and being concerned about cleaning garbage or containers holding water on roads, in vacant houses, or in public places beside concern about eradicating mosquito's nests in our home.

In this study, we assessed the use of ovitrap to control the population of *Aedes* sp. Unfortunately, the result said that the use of ovitrap did not affect the density of female *Aedes* sp.—mosquitoes, which were assessed by the ovitrap index and number of eggs. Previous studies found that ovitrap can reduce the container, house, and breed indexes.[12,13] The treatment of the study by storing ovitrap for a while in people's houses can also make residents more disciplined in eradicating mosquito nests at home, thereby reducing the container, house, and breed index.

The ineffectiveness of ovitrap in breaking the life chain of mosquitoes to reduce mosquito density, which was assessed by the ovitrap index, could be because there are still many mosquito nests besides ovitrap. The mosquito population in the area does not change much by destroying eggs on ovitraps. The ineffectiveness of ovitrap in controlling mosquito population growth in this study can be caused by the short research time, namely four weeks, which can only observe one mosquito life cycle. No method is good enough to control the population of *Aedes* sp. mosquitoes. Therefore, further research to control this mosquito population needs to be done.

The ineffectiveness of breaking the chain using ovitrap on mosquito density assessed by the ovitrap index parameter can be caused by the large number of mosquito nests in the area, which only slightly changes the mosquito population. The use of ovitrap to control mosquito population growth has yet to be observed in this study because the research time is short, i.e., four weeks which can only observe one mosquito life cycle.

Conclusions

Using ovitrap does not affect the female *Aedes* sp. density assessed by the ovitrap index. The best method for controlling the mosquito population has yet to be determined. Therefore, further research is needed.

Conflict of Interest

None declared.

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RESEARCH ARTICLE

Stigma and Discrimination of People with HIV/AIDS by Health Officers in Bulukumba Regency

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Abstract

Stigma and discrimination against people with human immunodeficiency virus/acquired immune deficiency syndrome (HIV/AIDS) are among the biggest obstacles to preventing and overcoming (HIV/AIDS) in Indonesia. This study aims to analyze the factors related to stigma and discrimination and determine the types of stigma and discrimination given by health workers to people with HIV/AIDS. The population in this study were health workers in 20 health centers in Bulukumba, consisting of nurses, midwives, health analysts, doctors, and public health. The sampling technique used a total sampling of 322 health workers, and data was collected online through Google Forms on 15–26 February 2021 and analyzed univariately and bivariate using the chi-square and linear association tests. The results showed that type of profession (p=0.041) and knowledge (p=0.019) were factors related to stigma and discrimination. The most considerable stigma experienced by people with HIV/AIDS was feeling disgusted and uncomfortable being around people with HIV/AIDS, and the notion that HIV/AIDS disease suffered was only the result of free sex. At the same time, discrimination was a form of the biggest problem was the behavior of health workers who will use layered handsome when performing/providing services to people with HIV/AIDS.

Keywords: Discrimination, HIV/AIDS, knowledge, stigma, type of profession

Introduction

It is crucial to study health workers' behavior toward people with HIV/AIDS in health service agencies to help indirectly reduce the HIV epidemic rate in Indonesia. With the pattern of HIV transmission through unprotected heterosexual sex, injecting drug users, and male sex with men, people with HIV/AIDS are very vulnerable to receiving stigma from the community, including health workers.[1] The emergence of stigma is one of the obstacles faced in the fight against HIV/AIDS.[1] Based on Asia Pacific Regional analysis data that stigma and discrimination exist in almost all sectors, including the health sector (54%), community (32%), family (18%), and the workplace (18%).[2]

Stigma and discrimination cause many difficulties for people with HIV/AIDS, such as their decision to seek HIV counseling and testing, prevention of mother-to-child transmission, and the possibility of disclosing their status. These attitudes and behaviors can also hinder progress in prevention and treatment. AIDS control and discrimination from the outside will cause negative emotions for people with HIV/AIDS, such as anxiety, depression, guilt, and other mental health symptoms.[2–4]

A previous study stated that the emergence of stigma and discrimination against people with HIV/AIDS is caused by the risk factors for this disease associated with deviant sexual behavior, drug abuse, and dangerous drugs or drugs. In addition, it is also said that people with HIV infection (HIV positive) receive unfair treatment (discrimination) and stigma because of their illness. The stigma index of people with HIV/AIDS indicates that 1 in 8 patients with HIV/AIDS does not receive health services because of stigma and discrimination.[5]

Stigma and discrimination have become social punishments by people in various parts of the world against people living with HIV and AIDS, which can take various forms, including acts of isolation, rejection, discrimination, and avoidance of people infected with HIV. Many people are reluctant to test for HIV and AIDS because of society's strong stigma and discrimination. Even though everyone infected person can transmit this virus to 100 other people.[6] Furthermore, stigma affects people with HIV/AIDS by causing depression, anxiety, sadness, guilt, and worthlessness. In addition, stigma can reduce the quality of life, limit access

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and use of health services, and reduce adherence to antiretrovirals (ARVs).[7]

The still strong stigma has a severe impact on HIV-positive people as well as on HIV control efforts as a whole. Stigma makes people with HIV/AIDS reluctant to seek health services and social support they should be able to get. Many people with HIV/AIDS have lost jobs or opportunities to get jobs, insurance, and other public services; even a child can be denied a school education.[8,9]

Stigmatization can also hinder efforts to prevent HIV transmission. This is because of the solid values and beliefs some people hold in society. They prefer withholding information about the proper ways to prevent HIV transmission and are more likely to support regulations and policies that make at-risk populations even more vulnerable.[10]

Stigma and discrimination against people with HIV/AIDS are influenced by the level of knowledge and perceptions.[11] Even stigma and discrimination against people with HIV/AIDS by health workers were also influenced by the knowledge and perceptions of health workers about HIV and AIDS.[12,13] Another factor that influences the occurrence of stigma and discrimination is the level of education and length of work. A previous study states that the type of health worker, according to his educational background, affects the score of stigma and discrimination against HIV/AIDS patients. The length of work affects the occurrence of stigma and discrimination because someone who has worked for a long time tends to have broader insights and more experience, which plays a vital role in changing the behavior of a health worker.[14]

Studies on stigma and discrimination by health workers, especially in the Bulukumba regency, are still very rarely found, and based on preliminary studies; there are still many health workers who have a negative stigma and discriminate against people with HIV/AIDS, which of course, has a massive impact on efforts to control HIV/AIDS. This study aims to analyze the factors related to stigma and discrimination and determine the types of stigma and discrimination given by health workers to people with HIV/AIDS.

Methods

This research is a descriptive study with a cross-sectional design to determine the relationship between variables identified at a one-time unit.[16] The research subjects were all health workers in 20 health centers in Bulukumba, consisting of nurses, midwives, health analysts, doctors, and public health. The sampling technique uses total sampling with a total sample of 322 workers, and data was collected online through Google Forms from 15–26 February 2021 and analyzed univariately by providing an overview of the frequency distribution of the independent and dependent variables. Bivariate analysis using a chi-square test and linear by linear association with a value of <0.05. This research has received approval from the ethical commission from the Sekolah Tinggi Ilmu Kesehatan (STIKES) Nani Hasanuddin Makassar with the Ethics Number: 022a/STIKES-NH/KEPK/I/2021.

The research instrument is a questionnaire sheet in a structured statement to identify demographic characteristics, knowledge, stigma, and discrimination of health workers against people with HIV/AIDS in the Bulukumba regency. The knowledge variable was measured using the Gutman scale with 20 statement items. A positive statement was given a value of "1" if the answer was "yes," a value of "0" if the answer was "no," and a score of "0" if the answer was "yes." Variables of stigma and discrimination are measured using a Likert scale, a positive statement for the answer choice "always" is given a value of 4, the answer "often" is given a value of 3, the answer of "sometimes" is given a value of 2, and the answer "disagree" is given a value of 1. As for the negative statement, for the answer choice, "always" is given a value of 1, the answer "often" is given a value of 2, the answer "sometimes" is given a value of 3, and the answer "disagree" is given value 4.

Results

Table 1 shows that most of the respondents are female with a total of 265 people (82.3%), with the highest average education being Diploma III (DIII) with 195 people (60.6%), the largest type of profession is nurses with 156 people (48.4%) with a period of working >10 years as many as 98 people (30.4%) and <10 years as many as 224 people (69.6%).

Table 2 shows that knowledge of HIV and AIDS by health workers is in a good category, as many as 180 people (55.9%), and the less category, as many as 142 people (44.1%), while the behavior of health workers who do not practice stigma

Table 1 Distribution and Frequency of Socio-Demographic Factors of Health Workers

Characteristics	n=322 (%)
Gender	
Male	57 (17.7)
Female	265 (82.3)
Education	
SPK	4 (1.2)
DIII	195 (60.6)
DIV	20 (6.2)
S1	66 (20.0)
Ners	32 (9.9)
S2	5 (1.5)
Profession	
Nurse	156 (48.4)
Midwifery	119 (37.0)
Analyst	28 (6.7)
Other health professions	19 (5.9)
Length of work (years)	
≥10	98 (30.4)
<10	224 (69.6)

Table 2 Distribution and Frequency of Knowledge Factors, Stigma, and Discrimination of Health Workers

Variables	n=322 (%)
Knowledge	
Good	180 (55.9)
Not Good	142 (44.1)
Stigma and discrimination	
Not stigmatize	191 (59.3)
Stigmatize	131 (40.7)

and discrimination is 191 people (59.0%) and 131 people (40.7%).

Table 3 shows that socio-demographic variables (gender and education are not associated with stigma and discrimination for people with HIV/AIDS by health workers, while socio-demographic variables (profession with p=0.041 and length of work with p=0.003) and knowledge about HIV and AIDS with p=0.019

Table 3 Analysis of Socio-Demographic Factors and Knowledge with Stigma and Discrimination of Health Workers in Bulukumba District

Variables	Stigma and Discrimination				p
	Not Stigmatize		Stigmatize		
	n=191	%	n=131	%	
Gender	38	66.7	19	33.3	0.213
Male	153	57.7	112	42.3	
Female					
Education	3	75.1	1	25.0	0.362
SPK	110	56.4	85	43.6	
DIII	12	60.0	8	40.0	
DIV	45	39.1	21	31.8	
S1	17	53.1	15	46.9	
Ners	4	80.0	1	20.0	
S2					
Type of profession	88	56.4	68	43.6	0.041**
Nurse	70	58.8	49	41.2	
Midwifery	16	57.1	12	42.9	
Analyst	17	89.5	2	10.5	
Other health professions					
Length of work (years)	66	67.3	32	32.6	0.051
≥10	125	55.8	99	44.1	
<10					
Knowledge	117	65.0	63	35.0	0.019*
Good	74	52.1	68	47.9	
Not good					

Note: *chi-square, **linier by linier association, p<0.05 significant

associated with stigma and discrimination against people with HIV/AIDS by health workers in Bulukumba regency.

Picture of stigma and discrimination carried out by health workers in 20 health centers in Bulukumba regency is that there are still around 275 people (85.4%) health workers in the always, often, and sometimes categories (Table 4). Sometimes people think that HIV/AIDS is caused by free sex; 156 people (48.4%) will stay away from touching people with HIV/AIDS after knowing their status, 174 people (54%) are afraid of people with HIV/AIDS, 162 people (50.3%) feel disgusted with people with HIV/AIDS, 62 people (19.3%) health workers do not want to treat people with HIV/AIDS, 173 people (84.9%) will use layered handscoon when they want to do a treatment. Treatment/action for people with HIV/AIDS, there are still 200 people (62.1%) who feel uncomfortable around people with HIV and AIDS, and 48 people (15%) will refuse to provide health services/education to people with HIV/AIDS, and 161 people (50%) will isolate when providing services to people living with HIV/AIDS.

Discussion

In this study, gender does not affect stigma and discrimination. This result aligns with previous research, which stated that there was no significant relationship based on gender, stigma, and discrimination among people with HIV/AIDS.[15–17] However, stigmatization in this study was more significant among female nurses (42.3%) than male nurses (33.3%).

The provision of stigma and discrimination is also unrelated to the education level of health workers in Bulukumba regency (p=0.362). This result differs from the previous research, which said that education is one of the factors that can influence the emergence of stigma and discrimination against people with HIV/AIDS.[17] Theoretically, education affects stigma and discrimination, but this study does not apply. These differences are due to many factors that influence the provision of stigma and discrimination, including the perception of health workers toward people with HIV/AIDS. If the perception of health workers is negative, it will impact their behavior—and vice versa.

The profession of health workers shows a relationship with the provision of stigma and discrimination (p=0.041.) The presence of stigma and discrimination reinforces this, the first highest being the nursing profession (43.6%), the health analyst profession (42.0%), followed by midwifery (41.5%), and other professions, including doctors and public health workers (10.5%). The variable length of work illustrates no relationship between the length of work and the provision of stigma and discrimination

Table 4 Forms of Stigma and Discrimination of Health Workers

Forms of Stigma and Discrimination	Always n (%)	Often n (%)	Sometimes n (%)	Never n (%)
Do you think that all people with HIV are the result of free sex?	49 (15.2)	98 (30.4)	128 (39.8)	47 (14.6)
Would you stay away/avoid touching people with HIV/AIDS after knowing their status?	22 (6.8)	29 (9.0)	105 (32.6)	166 (52.6)
Are you afraid of people with HIV/AIDS?	34 (10.6)	33 (10.2)	107 (33.2)	148 (46.0)
Do you feel disgusted with people with HIV/AIDS?	19 (5.9)	11 (3.4)	132 (41)	160 (49.7)
Are you going to treat people with HIV/AIDS?	101 (31.4)	95 (29.5)	64 (19.9)	62 (19.3)
Do you use a layered handscoon during treatment for people with HIV/AIDS?	158 (49.1)	43 (13.4)	72 (22.4)	49 (15.2)
Do you feel uncomfortable around people with HIV/AIDS?	25 (7.8)	21 (6.5)	154 (47.8)	122 (37.9)
Would you refuse to provide health services/education to people with HIV/AIDS?	6 (1.9)	7 (2.2)	35 (10.9)	274 (85.1)
Are you going to isolate them in providing services to people with HIV/AIDS?	45 (14)	19 (6.9)	97 (30.1)	161 (50.0)

against people with HIV/AIDS by health workers in Bulukumba regency (p>0.05), which shows that stigma and discrimination do not depend on the length of time a person has worked in the health sector but are also strongly influenced by knowledge. The results of this research are supported by previous research, which said that there was no significant difference in the behavior of nurses towards people with HIV/AIDS in nurses who had fewer working hours, in contrast to research conducted in Japan which showed that more senior nurses were more experienced in caring for people with HIV/AIDS.[18]

Stigma arises because correct and complete HIV information is still considered minimal, especially in the mechanism of HIV transmission, groups of people at risk of contracting HIV, and ways to prevent it, including using condoms.[19,20] Stigma is the biggest barrier to preventing HIV transmission and treatment, mainly when healthcare providers impose stigma and discrimination that can affect the quality of life and access to health services.[21] In addition, the stigma against people living with HIV/AIDS also causes people who have symptoms or are suspected of having HIV to be reluctant to take a test to find out their HIV status because if the results are positive, they are afraid of being rejected by their families and especially by their partners.

The emergence of stigma is one of the obstacles faced in dealing with HIV and AIDS. Based on Asia Pacific Regional analysis data that stigma and discrimination exist in almost all sectors, including the health sector (54%), community (32%), family (18%), and the workplace (18%).[2]

Based on the analysis of the relationship, there is a relationship between knowledge about HIV and AIDS with the provision of stigma and discrimination against people with HIV/AIDS by health workers (p=0.019). Based on this analysis, it can be seen that there are 63 health workers (35%) who have good knowledge of health workers who stigmatize and discriminate against people with HIV/AIDS. This proves that knowledge is not the only factor contributing to stigma and discrimination by health workers. But knowledge about HIV and AIDS dramatically influences a person's attitude toward people with HIV/AIDS. Stigma against people with HIV/AIDS appears related to someone's ignorance about the mechanism of HIV transmission and negative attitudes that are influenced by the HIV and AIDS epidemic.

The highest percentage of stigma and discrimination in this study is found in the nursing profession (43.6%), health analysts (42.9%), midwives (41.2%), and the rest (doctors, public health) (10.5%)). This is, of course, very unfortunate because health workers, especially nurses and midwives who are directly related to services to the community, are expected to be able to provide education to the general public to detect the stigma that people with HIV/AIDS obtain. But in reality, the stigma is actually carried out by the service providers themselves. Nurses are health workers with the tremendous potential to help reduce the stigma of patients with HIV/AIDS. However, it was found that nurses gave the most significant percentage in stigmatizing and discriminating against patients with HIV/AIDS. Stigma from nurses identified in previous studies makes patients with HIV/AIDS feel uncomfortable in health services. Research conducted in Bali also found that patients with HIV/AIDS were refused treatment and discriminated against in health services. Some people living with HIV/AIDS also complain of the same thing, namely isolation, discrimination, and violations of their civil rights, and that discrimination is also the reason people with HIV/AIDS are reluctant to reveal their positive HIV status to others.[22]

The same research was also conducted by Suswani, stating that the stigma and discrimination that people with HIV/AIDS in Bulukumba regency experience are not only given by their families and communities but also by the health workers themselves, and this is one of the reasons why people with HIV/AIDS who suffer from in Bulukumba regency access health services in Makassar.[23]

The stigma given by health workers in Bulukumba regency illustrates that as many as 45.6% are in the "always" and "often" categories assuming that all people with HIV are the result of free sex, 20.8% are afraid of people with HIV/AIDS, and 9.3% feel disgusted. At the same time, the forms of discrimination given are avoiding/avoiding people with touching AIDS (15.8%), refusing to treat people with AIDS (19.3%), using layered handscoon during treatment (62.5%), refusing to provide health services (4.1%), and isolate people with HIV/AIDS while providing health services (20.9%). Stigma and discrimination given by health workers are not only caused by a lack of knowledge but also due to a lack of interaction between health workers and

people with HIV/AIDS.

Misunderstanding or lack of knowledge about HIV and AIDS often impacts the fear of people with HIV/AIDS, thus leading to the rejection of people with HIV/AIDS. In the end, this makes people with HIV/AIDS be closed, withdrawn, and even difficult to access good, safe, and comfortable services and guaranteed confidentiality—impact on the quality of life of people with HIV/AIDS. Providing complete information, either through counseling, counseling, or outreach about HIV and AIDS, is vital to reduce stigma and discrimination.[24]

Providing knowledge or information related to HIV is one effective way to explain the prevention and transmission of HIV. Someone with good and correct knowledge of HIV is expected to reduce and even eliminate stigma in people with HIV/AIDS. Perceptions of people with HIV/AIDS influence attitudes and behaviors to give stigma. The results of previous studies stated a significant relationship between stigmatizing HIV/AIDS and a person's experience in interacting with people with HIV/AIDS, also related to experiences of shame and blame related to AIDS.[24]

Stigma and discrimination are important issues that require efforts and cooperation between the government, relevant agencies, the community, and people with HIV/AIDS themselves. Efforts to reduce stigma and discrimination continue to be encouraged to achieve the target of zero stigmas and discrimination in 2030 for all people with HIV who know their HIV status to take HIV treatment so that there are no more new HIV infections and deaths from AIDS.

Conclusions

The type of profession and knowledge of health workers gave a significant relationship to stigma and discrimination in Bulukumba regency, while the most considerable stigma experienced was feeling disgusted and uncomfortable around people with HIV/AIDS and the assumption that HIV/AIDS suffered only as a result of from free sex. The form of discrimination with the largest percentage is the behavior of health workers who will use layered handsome when performing/providing services to people with HIV/AIDS.

Conflict of Interest

All the authors of this article there is no conflict of interest.

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RESEARCH ARTICLE

Acceptance and Utilization of Long-Lasting Insecticide-Treated Nets (LLINs) by the Community of Mamboro Sub-district and Katiku Tana Sub-district, Central Sumba Regency, East Nusa Tenggara

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Abstract

Distribution of mosquito nets is one healthcare strategy implemented to control the number of malaria cases in Indonesia. East Nusa Tenggara is one of the provinces contributing to high malaria rates. Cases are high in several areas, including Central Sumba regency. This study aimed to describe the behavior of the people of Mamboro and Katiku Tana sub-districts in using long-lasting insecticide-treated nets (LLINs), the number of LLINs owned, number of beds, number of family members, number of pregnant women and toddlers, distribution of LLINs in families, and LLINs utilization. This is a descriptive quantitative study with a cross-sectional design. The research was conducted in the work area of the Mananga Health Center of Susu Wendewa village of Mamboro sub-district and Malinjak Health Center of Makata Keri village of Katiku Tana sub-district, Central Sumba regency. The research was carried out from 9–19 September 2021 with 341 heads of families as respondents. Data were collected using questionnaires and in-depth interviews. Most families had LLINs (n=287; 94.1%); the total number of LLINs owned was 341, used by 1,220 (94.7%) family members with ten pregnant women and 35 children under five. The number of installed LLINs was 290 units (85%), LLINs obtained from the health centers within 1–3 months was 44% (126 families), 314 units (92%) were used while sleeping, and there were still family members who did not use LLINs every night. We conclude that the acceptance and utilization of LLINs should not stop at the distribution of LLINs to the public and must be supported by an evaluation in the form of regular surveys to ensure that LLINs are correctly used.

Keywords: Acceptance, LLINs, utilization

Introduction

Malaria is a zoonotic disease through mosquito bites still found in East Nusa Tenggara province, especially Central Sumba regency. Malaria is a disease caused by vectors (protozoa) of the genus *Plasmodium* which is transmitted through the bite of the *Anopheles* mosquito.[1,2]

The epidemiological triad explains that disease is determined by three factors: the host, the cause of the disease (agent), and the environment (environment). Malaria transmission is related to humans as hosts and their behavior, the presence of *Plasmodium* in the female mosquito, and the environment as a breeding and resting place for vectors.[3] These three factors determine the risk of malaria transmission; thus, the three factors of human behavior, the presence of agents, and the environment must be considered to prevent malaria transmission. Prevention by controlling vectors and preventing mosquito bites to humans needs to be done to break the chain of transmission.[4,5]

One of the programs carried out by the government to control malaria to achieve elimination is the distribution and use of long-lasting insecticide-treated nets (LLINs).[6] LLINs are recommended as a strategic factor in breaking the malaria transmission chain because the insecticide content in the fiber can kill mosquitoes.[7,8] The use of LLINs, or polished nets, has been recommended by the World Health Organization since November 2004.[9] Several efforts have been made by the Indonesian government to control malaria, including the distribution of insecticide-treated nets since 2007 and strengthened by the issuance of Minister of Health of Indonesia Decree Number

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293 of 2009. Insecticides used in LLINs are safe for humans and have been used by many countries. In Indonesia, insecticides from the pyrethroid group recommended in the malaria control program are permethrin, deltamethrin, and lambdacyhalothrin.[10]

Utilizing LLINs to minimize malaria is one of the most commonly used and cheapest alternatives, as well as free of charge. Using LLINs will protect pregnant women from mosquito bites, thereby reducing anemia and maternal mortality, low birth weight, and newborn mortality, increasing growth and development during pregnancy.[11,12] The LLINs distribution program in malaria-endemic areas is one of the efforts made by the Ministry of Health of Indonesia to prevent malaria transmission, especially in high-endemic areas, with a minimum target of 80% of the population in the area getting it. The Ministry of Health of Indonesia estimates that 35% of the population living in endemic areas may be at risk of malaria.

The LLINs distribution program is done regardless of the socioeconomic status of the recipient. The program is aimed at at-risk populations living in malaria vector areas, especially the patient's location and receptive areas. Residents who live within Anopheles' flight distance from the patient's house received top priority. The type of LLINs distributed are two pieces of 160×180×150 cm and are distributed for each family. The distribution of 2 mosquito nets is intended so that all family members can be accommodated.[13]

Controlling the *Anopheles* population in the home is an excellent effort to reduce the potential for bites in family members. Prevention efforts can be made by increasing awareness of the risk of mosquito bites, including using LLINs at night. LLINs are durable, with an adequate insecticide level that lasts at least three years, have the power to kill perched mosquitoes, and are resistant to 20-washing cycles in laboratory testing. After being washed, LLINs still maintain their effectiveness level, including reducing the person-hour density of mosquitoes.[14] The effectiveness of LLINs is influenced by people's behavior in their use, such as sleeping habits outside the home, perceptions of their reliability, duration of use, how to install and wash the type of insecticide added, and the support from the community to use them.[15,16] Community behavior can differ in each region concerning culture, culture, and ethnicity as a predisposing factor.[6,9,17]

In addition to the use of LLINs, efforts to control malaria vectors have been carried out by controlling the adult mosquito population through an indoor residual spray, larviciding, and modification/manipulation of mosquito breeding habitats to shorten the lifespan of mosquitoes so that the spread and transmission of malaria can be interrupted.[18,19]

Malaria control that has been carried out in Central Sumba regency, East Nusa Tenggara province, includes the distribution of LLINs and spraying homes with insecticides (indoor residual spraying, IRS) with active ingredients of the pyrethroid group.[20] Distribution has been carried out since 2017, regularly every six months; however, there has never been an evaluation of using LLINs. This study aimed to assess the behavior of the people of Mamboro and Katiku Tana sub-districts in using LLINs, assessing the number of LLINs owned, number of beds, number of family members, number of pregnant women and toddlers, distribution of LLINs in families, and LLINs utilization. In addition, the way the family installed LLINs and the physical condition of the LLINs used were also surveyed.

Methods

This is quantitative descriptive research. The research was carried out in the work area of the Mananga Health Center of Susu Wendewa village of Mamboro sub-district and Malinjak Health Center of Makata Keri village of Katiku Tana sub-district, Central Sumba regency. The research was carried out from 9–19 September 2021. We use an affordable population sampling technique, simple random sampling with a minimum target of 150 household heads/health centers. The number of respondents was 301 heads of families who were met during home visits. Data were collected by in-depth interview guides using questionnaire sheets, focus group discussion (FGD) guidelines, observation guides, recording devices (smartphones), laptops, and cameras. The questionnaire we use is a checklist form; respondents do not fill in directly but answer questions through interviews, and field enumerators fill in the answers. Data were presented in narrative form (sentences) and tabulated in tables. This research has received a research ethics permit from the Health Research Ethics Committee of the Politeknik Kesehatan

Kementerian Kesehatan Kupang, number LB.02.03/1/0119/2021. All respondents signed the informed consent as a sign of willingness to participate in the study.

Results

Table 1 shows that the respondents 166 were women (55.1%) and 135 were men (44.9%). Most of the respondents belonged to 30–39 years (31.6%), followed by 40–49 years (19.3%), and most of the respondents were farmers 184 (61.1%). Most of the respondents came from Makata Keri 184 (61.1%) and Susu Wandewa 124 (41%), under the working area Laimajori Health Center 99 (32.9%) and Wunga Health Center 49 (16.3%).

Table 1 Respondent Characteristics

Characteristics	n=301 (%)
Gender	
Male	135 (44.9)
Female	166 (55.1)
Age (years)	
20–29	46 (15.3)
30–39	95 (31.6)
40–49	58 (19.3)
50–59	49 (16.3)
60–69	53 (17.6)
Occupation	
Farmer	184 (61.1)
Civil servant	19 (6.3)
Private sector	12 (4.0)
Other	86 (28.6)
Origin	
Makata Keri	136 (45.0)
Susu Wandewa	124 (41.0)
Laitapedang	9 (3.0)
Katiku Kana	1 (0.3)
Rahwoya	3 (1.0)
Other	28 (9.3)
Nearest health center	
Paledi	29 (9.6)
Karendi	13 (4.3)
Mamboro	2 (0.7)
Makata Keri	41 (13.6)
Wunga	49 (16.3)
Tana Bara	19 (6.3)
Kabondok	43 (14.3)
Laimajori	6 (2.0)
Other	99 (32.9)

Most families have LLINs (n=287, 94.1%), and only a small proportion do not have LLINs 17 or 5.9% (Table 2). Total LLINs owned were 341 units, used by 1,220 (94.7%) family members with ten pregnant women and 35 children under five. Families that do not have LLINs consist of 68 family members, with five pregnant women and 25 children under five.

Most families have two units of LLINs, with 136 families (45.2%). A total of 69 households owned three units of LLINs (23%), and 54 households owned one unit of LLINs (18%); no families had six units of LLINs. Most families only have 2-bed units in 1 house (n=124; 41.2%), 3-bed units (n=73; 24.3%), and 1-bed unit (n=54; 18%), and no family with six bedrooms (Table 3).

Of all LLINs owned (341 units), most of them have been installed, with 290 units (85%) and 51 units (15%) not installed, permanent brands are 273 units (80%), and other brands are 68 units (20%). Based on the respondent's confession, they received LLINs from the health centers about 1–3 months ago, as many as 126 families (44%), and 85 families (29%) received three months ≤1 year ago, the remaining 76 families (27%) received <3 months ago (Table 4).

Even though having LLINs installed and installed does not mean they are used every night, of the 341 units of LLINs owned, only 314 units (92%) are used while sleeping, 17 units (5%) are sometimes used, and 14 units (4%) are not used. It was still found that there were family members who did not use LLINs every night, namely, 29 households (10%), and most of them had used LLINs 258 households (90%). We also found several problems with the installation of LLINs, and there were still parts of the LLINs that allowed mosquitoes to enter, namely 177 units (52%). LLINs were correctly installed, covering all parts of the bed, namely 116 units (34%), and there were still LLINs that had been installed dependent but not used, i.e., 48 units (14%). Holes were still found in 188 LLINs (55%), and 153 units (45%) had no holes (Table 4).

We also asked what efforts were made to prevent mosquito bites, including whether there was spraying from the health centers in the past <1 year, 291 households (90%) answered no, and the remaining ten families (10%) answered there was spraying. In addition to using LLINs, only 80 households (30%) used mosquito coils, and 45 families (15%) used mosquito lotion; most of them did not use mosquito repellent,

Table 2 Distribution of LLINs Ownership

LLINs Ownership	Families n=301 (%)	Individual n=1,288 (%)	Nets n=341 (%)	Pregnant Women n=15	Toddler n=60 (%)
Owned LLINs	287 (94.1)	1.220 (94.7)	341 (100.0)	10	35 (58.0)
Does not own LLINs	17 (5.9)	68 (5.3)	0 (0.0)	5	25 (42.0)

namely 167 people (56%). The mosquito bite prevention device is also not routinely used every night, recognized by 203 households (68%) and routinely used by 98 households (32%).

We also asked what efforts were made to prevent mosquito bites, including whether there was spraying from the health centers in the past <1 year, 291 households (90%) answered no, and the remaining ten families (10%) answered there was spraying (Figure). In addition to using LLINs, only 80 households (30%) used mosquito coils, and 45 families (15%) used mosquito lotion; most of them did not use mosquito repellent, namely 167 people (56%). The mosquito bite prevention device is also not routinely used every night, recognized by 203 households (68%) and routinely used by 98 households (32%).

Discussion

The results of our study still found pregnant women and toddlers who did not use LLINs. Families that do not have LLINs (17 families) consist of 68 family members, with five pregnant women and 25 children under five. When pregnant women or toddlers are infected with mosquito bites that cause malaria, it becomes a unique problem and requires serious treatment.[21]

Table 3 Distribution of LLINs in families

Number of LLINs per Bed per Household	Number of Household Owning LLINs n=301 (%)	Number of Household Owning Bed n=301 (%)
0	17 (5.7)	13 (4.3)
1	54 (18.0)	54 (18.0)
2	136 (45.2)	124 (41.2)
3	69 (23.0)	73 (24.3)
4	23 (7.6)	33 (11.0)
5	2 (0.7)	4 (1.3)
6	0 (0.0)	0 (0.0)

Table 4 LLINs Utilization

Characteristics	n (%)
All LLINs installed	
Yes	290 (85)
No	51 (15)
LLINs brand	
Permanent	273 (80)
Others	68 (20)
Duration of use LLINs	
3 months	0 (0)
1–3 months	126 (44)
3≤12 months	76 (27)
1–3 years	85 (29)
LLINs used when sleeping	
Yes	314 (92)
No	14 (4)
Sometimes	17 (5)
Family members not using LLINs during sleep	
Yes	29 (10)
No	258 (90)
Correct installation of LLINs	
Still have opening for mosquito to enter	177 (52)
Correctly installed	116 (34)
Not installed	48 (14)
Condition of LLINs	
Holes	188 (55)
No holes	153 (45)
Reason for not owning LLINs	
Damaged	17 (100)
Others	0 (0)
Fogging within <1 year	
Yes	10 (3)
No	291 (97)
Mosquito repellents other than LLINs	89 (30)
Mosquito coils	45 (15)
Lotion	167 (56)
None	
Using mosquito repellents regularly	98 (32)
Yes	203 (68)
No	

Figure Properly Installed Mosquito Nets and In-depth Interview during Data Collection
Note: counter-clockwise

Malaria infection in pregnancy is very detrimental to both the mother and the fetus it contains because it can increase maternal and fetal morbidity and mortality. Pregnant women and the fetus they contain will have a higher potential for infection, and infected infants will experience long suffering.[4,12] LLINs should be prioritized for pregnant women and toddlers to reduce further impacts.

Isir et al.[22] in Sorong, Papua province, had previously reported the results of a study conducted on 178 pregnant women; as many as 65.38% of respondents had at least one LLIN in their homes obtained from the health centers (55.13%), as many as 34.62% of respondents said that LLINs were given to them when they were in the 3rd trimester of pregnancy. However, as many as 35.9% of respondents have not used it correctly. Respondents hoped that LLINs should be provided free of charge (43.59%). All pregnant women know about LLINs, but their use is incorrect; all respondents are ready to use LLINs if adequate information is provided and LLINs are available at affordable prices or free.

Another study by Manik et al.[21] in Biak Numfor Papua province reported two variables related to the incidence of malaria in pregnant women, namely sleeping without using LLINs (OR=3.768, p=0.024, 95% CI=1.158–12.270) and anemia Hb<9 g% (OR=5.500, p=0.013, 95% CI=1.323–22.862). In comparison, three variables, namely low economic status, first parity, and four and nutritional status, were not related to the incidence of malaria.[18] Pregnant women who sleep without using LLINs risk becoming infected with malaria and other diseases transmitted through mosquito bites.

The results showed that most families had LLINs, namely 287 (94.1%), with 341 LLINs, used by 1,220 (94.7%) family members. Of all LLINs

owned, we surveyed most already installed, namely 290 units (85%). What is interesting, we found that although having LLINs installed and installed does not mean they are used every night, of the 341 units of LLINs owned, only 314 units (92%) are used while sleeping, 17 units (5%) are sometimes used and 14 units (4%) not used. This condition shows that some families still do not use LLINs well.

The factor likely to have a major influence is the knowledge/awareness of the importance of using these LLINs.[9,23,24] Marina et al.[24] reported that the use of LLINs in the community is still low in West Sumba, East Nusa Tenggara, so more intensive socialization and education are needed to increase the use of LLINs in the community. Their results showed that 83.9% of respondents had LLINs and as many as 82.4% of the LLINs were obtained from the program (LLINs), and the use of LLINs was obtained by 60.5%. They concluded that socio-demographic factors related to using LLINs were gender, marital status, education, age, employment status, and the respondent's position.

Several researchers reported the same result that all respondents who received the distribution of LLINs had all used mosquito nets for three years, but not all family members slept in LLINs.[15] The results also showed that most respondents installed LLINs correctly in all beds, fully or partially. Previous studies also mention that the knowledge of the use of LLINs by respondents is not maximized, and in the use of LLINs, a small number of respondents complain of heat, so it is necessary to evaluate the socialization activities of the benefits and how to install and maintain LLINs that have been carried out.[9,20,25] New canal initiatives are needed to increase people's knowledge about using LLINs.[26]

Widiastuti and Lesmana in Kulon Progo Yogyakarta province reported the contrast that knowledge was not related to adherence to using LLINs this was because even though the community had gained knowledge through counseling, and media information, there were still many other factors beyond knowledge to comply with using LLINs such as attitudes and perceptions of people who have a sense of belonging discomfort and feeling of heat while inside LLINs.[27]

Previous studies have explained that the highest risk factor influencing the incidence of malaria is the use of LLINs (p=0.001, OR=12.98),[28] (OR=2.8),[29] which means that the risk of malaria is more significant in people who do not install LLINs compared to people who install LLINs while sleeping. Other risk factors that were also reported were the type of wall of the house, individual activities to go out at night, use of wire netting, and trust with the behavior of using LLINs.[28–31]

Simanjorang and Kodim[32] in Manalu Sangihe islands, North Sulawesi province, found that most respondents (98%) had good knowledge of LLINs and adhered to using LLINs at night (83.1%), around 96.1% installed LLINs correctly, around 85.7% of respondents maintained and washed LLINs, and about 93.9% were exposed to direct sunlight. Currently, the LLINs owned by the community are mosquito nets with insecticide LLINs (96.8%) and ordinary mosquito nets (3.2%).

The use of LLINs every night is the primary choice for Mamboro and Katiku Tana sub-district residents to avoid mosquito bites. The availability of sold mosquito coils and mosquito repellent lotions can be an additional effort, but it costs money to buy them. The results showed that only 80 households (30%) used mosquito coils, and 45 families (15%) used mosquito lotions; most of them did not use mosquito repellent, namely 167 people (56%). The mosquito repellent is also not routinely used every night, recognized by 203 households (68%) and routinely used by 98 households (32%). The influencing factor could be daily habits/low awareness to avoid mosquito bites.

Previous studies have shown similar results; Supranelfi and Oktarina[23] in South Sumatera reported that the most widely used mosquito bite prevention efforts in South Sumatra were using non-insecticide mosquito nets and mosquito repellents, while LLINs were generally used for more than three years. Respondents who live in areas that have obtained a certificate of malaria elimination tend to sleep using insecticide-treated mosquito nets; in addition, respondents with low levels of education also tend to use LLINs.

Based on the results of our research, we provide recommendations to health centers to improve preventive programs through family-approach counseling. Overall, the people of Mamboro and Katiku Tana sub-districts have received LLINs, as indicated by data from respondents receiving mosquito nets from the health center about 1–3 months ago as many as 126 families (44%), and

85 families (29%) receiving three months ≤1 year who received then.

It is known that at the Mamboro and Katiku Tana Health Centers, each has a malaria control program holder, the functions of the personnel are not only compiling malaria eradication activities, carrying out surveillance and detecting outbreaks but also monitoring and evaluating programs that have been running Evaluation from the health centers would be a routine program to ensure that mosquito nets have been used correctly. We assess that mosquito nets are only distributed but not followed in their use. Regular surveys every year or semester can be a solution to maximize the use of mosquito nets.

Umasugi et al.[33] in Tomalehu Maluku province gave the same recommendation that in addition to conducting health education counseling and education strategies related to the use of good and correct mosquito nets with malaria prevention and control, education, and use of mosquito nets have been completed and are effective in increasing public understanding in using mosquito nets to prevent recurrence of malaria. Some houses using a house-to-house persuasive approach still keep the mosquito nets obtained from the distribution of the health department and NGOs. Persuasive education strategies go directly to homes and invite residents to install excellent and correct mosquito nets.

The same thing was concluded by Yahya[34] from South Sumatra that it is necessary to disseminate information regarding the purpose of distributing mosquito nets, how to use them, how to wash them, and which family members are prioritized to sleep with mosquito nets when the mosquito nets are distributed to the community. In addition, it is necessary to socialize the action of heating the bed net (heat-assisted regeneration) to increase the effectiveness of the insecticide in the mosquito net.

The coverage of the use of mosquito nets is low, influenced by many factors; for example, some people feel uncomfortable using mosquito nets in tiny homes. The frequency of use of mosquito nets is different in some areas. Several existing barriers, such as beliefs, culture, tourism, gender roles, seasons, and perceptions, affect the low use of mosquito nets. Consideration of social conditions, culture, and participation of community leaders and health workers positively affect the behavior of using malaria nets. The insecticide-treated bed net program should be evaluated to assess its effectiveness, including why people in Bengkulu are unwilling to use it.[35] We offer solutions like routine visits to each family by malaria program holders from the health center. Another approach is through community and religious leaders so that people want to use insecticide-treated nets.

Conclusions

The distribution of LLINs has been going well, as evidenced by the fact that most families have mosquito nets and use them while sleeping, and there were still family members who did not use LLINs every night. Nevertheless, acceptance and utilization of LLINs should not stop at the distribution process; a good evaluation in regular surveys is required to ensure that LLINs are correctly utilized.

Conflict of Interest

All authors state whether there was a conflict of interest in this article or not.

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RESEARCH ARTICLE

Implementation of Clean and Healthy Lifestyles and Social-Physical Distancing by Indonesian Students during the New Normal of the COVID-19 Pandemic

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Abstract

Applying a clean and healthy lifestyle is one of the measures to prevent the massive transmission of COVID-19. This study aimed to determine the application of a clean and healthy lifestyle and social-physical distancing carried out by Indonesian students during the new normal of COVID-19. This research was conducted in June 2020 with a cross-sectional study approach, with the number of respondents being 5,924 students in Indonesia. The technique of filling out the questionnaire was done online by Google Forms. Furthermore, respondents would be asked to fill in the available consent letter and answer questions. Based on the results, most respondents were female students with majors in health (3,982 respondents) from undergraduate study programs (2,529 respondents). The place of residence during the pandemic was staying home with the family (2,715 respondents). A clean and healthy lifestyle involves several variables. Those were included touching eyes, nose, and mouth; using hand sanitizer; keeping a mask; opening the door with elbows; touching public equipment; shaking hands; touching with family; washing hands with soap; cleaning; changing clothes; washing masks; personal equipment; and washing hands directly after arrival had a significant relationship, with $p<0.005$, and $p<0.002$ for soaking clothes was also significantly related. Therefore, the clean and healthy lifestyle conducted by respondents could be undergone improvement. Also, respondents did not follow the health protocols, which might trigger COVID-19 transmission.

Keywords: Clean and healthy lifestyle, COVID-19, Indonesia, new normal, social-physical distancing

Introduction

The spreading of COVID-19 worldwide has entered the category of warning. This virus has infected big cities and remote villages.[1] The impact of this transmission provides many losses for the community, significantly affecting income and community activities.[2,3] Restrictions imposed by the government are one way to reduce the spread of COVID-19. Although previously, the government conducted to carry out restrictions on a large scale and temporarily did not carry out other activities. It turned out to affect the household and caused an increase in the unemployment rate.[3]

The government finally took action to carry out rules to carry out routines with the new normal of COVID-19.[4] The regulation expects the public to do their activities in general, along with applying health protocols correctly. Health protocols that can be carried out include maintaining distances, washing hands, cleaning the body after and before leaving the house, wearing masks, limiting mobilization and interaction, and staying away from crowds.[5]

The application of health protocols is an obligation during outdoor activities; it is also a discipline that must be carried out by every level of society.[4,6] The case of the COVID-19 pandemic brought various changes in society. In the new normal era of COVID-19, a clean and healthy lifestyle should not be abandoned. On the contrary, it is a restricted recommendation for the community.[7] A complete implementation

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of health protocols must accompany a clean and healthy lifestyle. It is the primary key to preventing the spread of the COVID-19 virus. In addition to this implementation, nutritional intake is also supported by increasing the body's immune system. Good information for consumption during a pandemic is according to the body's needs and multivitamin supplementation.[8]

The importance of healthy and clean living behavior can improve the quality of life and public health.[9] A clean and healthy lifestyle can be implemented in the household, school, workplace, and public places. The implementation has many benefits for health, even during the COVID-19 pandemic. This has become an obligation not to be hosted by the virus.[2]

Healthy and clean lifestyles are all behaviors carried out based on awareness so that such behavior can help both the environment and oneself. A clean and healthy lifestyle includes many factors, including consuming nutritious food, exercising/physical activity, washing hands in running water, using soap, not smoking, avoiding touching the face, wearing masks, and getting enough rest by following the clean and healthy lifestyle pattern. This study aimed to determine the application of a clean and healthy lifestyle and social-physical distancing carried out by Indonesian students during the new normal of COVID-19.

Methods

This research was conducted in June 2020 with a cross-sectional study approach. The respondents involved were 5,924 students throughout Indonesia with a range of ages 17–24. Respondents who participated in this study agreed and signed the online informed consent attached to the questionnaires. Furthermore, the respondent could fill out the questionnaire after signing the agreement. Dissemination of the questionnaire itself was done by distribution via social media and presented in Google Forms. Respondents who contributed to the research had an associate degree of D3, an associate degree of D4, and a bachelor's degree. Before the questionnaire was used as a measuring tool in this study, the researchers conducted a validity and reliability test.

The analysis used in this research was descriptive quantitative with a bivariate test through SPSS 25. The code of ethics for this study was approved by the Health Research Ethics Committee of the Politeknik Kesehatan Kementerian Kesehatan Mataram, number LB.01.03/1.1/2208/2020.

Results

Most students came from health major study programs, with about 3,982 respondents, and the most dominant gender in this study was female (3,682 respondents). The most widely taken education was a bachelor's degree from 2,529 respondents, and then in the sequence was an associate degree of D3 from 2,169 respondents and an associate degree of D4 from 1,226 respondents (Table 1). Furthermore, about 2,715 respondents chose to live with their

Table 1 Respondents Characteristics

Characteristics	Male		Female		Total		p Value
	n=845	%	n=5,079	%	n=5,924	%	
Major							
Health	300	7.5	3,682	92.5	3,982	100	0.000
Non-health	545	28.0	1,397	72.0	1,942	100	
Education							
Associate degree D3	210	9.7	1,959	90.3	2,169	100	0.000
Associate degree D4	138	11.2	1,088	88.8	1,226	100	
Bachelor degree	497	19.7	2,032	80.3	2,529	100	
Residence							
Boarding house	344	13.8	2,147	86.2	2,491	100	
With family	406	14.9	2,309	85.1	2,715	100	0.160
Dormitory	92	13.0	617	87.0	709	100	
Others	3	33.3	6	66.7	9	100	

Table 2 Implementation of Healthy and Clean Lifestyles for Indonesian Students during the New Normal Period of COVID-19

Variables	Male		Female		Total		p Value
	n=845	%	n=5,079	%	n=5,924	%	
Clean and healthy lifestyle							
Never	134	19.74	545	80.26	679	100	0.000
Rarely	124	14.76	716	85.24	840	100	
Sometimes	306	13.53	1,956	86.47	2,262	100	
Often	192	13.07	1,277	86.93	1,469	100	
Always	89	13.21	585	86.79	674	100	
Touching eyes, nose, and mouth							
Yes	571	12.88	3,860	81.22	4,431	100	0.000
No	274	18.35	1,219	81.65	1,493	100	
Using hand sanitizer							
Yes	422	10.50	3,597	89.50	4,019	100	0.000
No	423	22.21	1,482	77.79	1,905	100	
Keep using mask							
Yes	743	13.26	4,858	86.74	5,601	100	0.000
No	102	31.57	221	68.43	323	100	
Open the door by the elbow							
Yes	437	11.04	3,520	88.96	3,957	100	0.000
No	308	15.65	1,559	79.25	1,967	100	
Touching common equipment							
Yes	677	12.83	4,598	87.17	5,275	100	0.000
No	168	26.73	481	75.27	639	100	
Handshake							
Yes	673	12.56	4,682	87.44	5,355	100	0.000
No	172	30.23	397	69.77	569	100	
Touching family members							
Yes	154	19.39	640	80.61	794	100	0.000
No	691	13.46	4,439	86.54	5,130	100	
Wash hands with soap							
Yes	780	13.67	4,924	86.33	5,704	100	0.000
No	65	29.56	155	70.45	220	100	
Clean up							
Yes	741	13.65	4,685	86.35	5,426	100	0.000
No	104	20.88	394	79.12	498	100	
Changing clothes							
Yes	637	12.76	4,355	87.24	4,992	100	0.000
No	208	22.31	724	77.69	932	100	
Soaking clothes							
Yes	592	13.80	3,469	86.20	4,001	100	0.002
No	313	16.27	1,610	83.73	1,923	100	
Wash mask							
Yes	576	12.99	3,860	87.01	4,436	100	0.000
No	269	18.07	1,219	81.93	1,488	100	
Personal equipment							
Yes	457	12.95	3,072	87.05	3,529	100	0.000
No	388	16.21	2,007	83.79	2,395	100	
Wash hands when arriving							
Yes	788	13.81	4,922	86.19	5,710	100	0.000
No	57	26.63	157	73.37	214	100	

families during the COVID-19 pandemic. The remaining 2,491 respondents lived in boarding houses and dormitories (709 respondents), and about nine chose others. Table 1 explains a significant relationship between majors and gender, education level, and gender (p=0.000). The residence also had a significant relationship (p=0.16).

Table 2 shows respondents who apply a healthy and clean lifestyle are categorized into occasional (2,262). As many as 1,469 respondents were included in frequently applying a clean and healthy lifestyle. While in the variable "touching the eye" (4,431 respondents). Besides, for the variable using hand sanitizer, respondents commonly already applied it (4,019 respondents). About 5,601 out of 5,924 respondents still used masks (p<0.05). Then 3,957 respondents answered opening the door with their elbow, and 1,967 did not open it with their elbow when entering. On the variable "touching public equipment," 5,275 respondents answered "yes," while 639 respondents answered "no," mainly when they left the house and opened the car door or other public equipment. Finally, the data presented show that respondents had avoided shaking hands directly with the community (5,355 respondents).

The variable "touching family members" showed that as many as 5,130 respondents answered "no." It indicated that the respondents understood the safety of family members and guarded against contamination due to activities carried out outside the home. Another variable, namely "washing hands with soap," showed 5,704 respondents answered "yes" and 220 respondents answered "no." Then, for the variable "clean up," they answered "yes" (5,426 respondents). Moreover, the variable "change clothes" is where 4,992 respondents answered "yes." Then, followed by the variable "soaking clothes" after entering the house were 4,001 respondents (p<0.005).

In addition, 4,436 respondents showed that they answered "yes" to the variable "wash masks." Cleaning personal equipment that had been used was responded to "yes" (3,529 respondents) and "no" (2,395 respondents). This data illustrates that many respondents still did not care about their respective personal roles. Meanwhile, when arriving and leaving the house, 5,710 respondents answered: "yes" to the variable "wash hands when arrived" (p<0.005).

Discussion

The majority of respondents mainly were female from health majors. The large number of female respondents majoring in health was because the Indonesian region tends to choose the disciplines of health and biology.[10,11] In addition, the health department is influenced because it has something to do with social construction, the influence of parents and gender associations, and the influence of employment. Besides that, the health department is considered one of the most suitable women.[12]

This study shows that a bachelor's degree is a higher education with more decent job opportunities than diplomas. Besides that, the bachelor's level is regarded as the most sought-after and the icon of the bachelor, which the public considers to have a broader scope of material compared to other associate degree education levels. It was further explained that the higher number of bachelor graduates indicates the quality of education in Indonesia itself.[13]

The Ministry of Education, Culture, and Technology Research, in Letter Number 15 of 2020 concerning the implementation of learning, issued a temporary ban that all have to stay at home in the new normal period. The goal is to stop the spread of the COVID-19 virus. By the prohibition, many respondents prefer to remain temporarily with families. However, almost the same number of respondents choose to live in boarding houses.

This study result shows many respondents who "sometimes" lived clean and healthy lifestyles. This could be due to the influence of adaptation to new habits, so many respondents still needed to get used to it.[14,15] The importance of implementing clean and healthy living behavior during a pandemic should become a daily habit. In addition, this movement aims to improve the quality of life and public health. The application of clean and healthy living can be made in schools, workplaces, and other public facilities.[16]

The work of the COVID-19 virus is that it can cause invasion of parts of the body so that the virus can bind to protein parts in the body. The respondents' understanding is considered significant (p<0.005) on the condition of touching the eyes, nose, and mouth.[17] The cause is not allowed to touch the eye area, nose, and mouth because the body has a mechanism to remove immune mediators that attack these

areas.[18,19] Moreover, in such cases, the virus can take advantage of body parts, bind to proteins, and replicate by infecting.

Most of the respondents in this study had implemented hand sanitizers well (p<0.005). In this case, the respondent maintained hand hygiene outside the house. The use of hand sanitizers is one of the efforts to prevent the spread of the COVID-19 virus. This is also in line with respondents who continue to use masks when traveling; using masks when outside is aimed at protecting themselves from contamination.

Regarding COVID-19, opening the door with an elbow is a practical step in avoiding the spread of the virus. Furthermore, it is in line with respondents who had a significant relationship with the behavior of respondents in taking care of themselves (p<0.005). Thus, respondents have followed the rules to protect themselves from being infected directly or indirectly by spreading the virus, even by touching public equipment.

Shaking hands is a part of social culture, but by the COVID-19 pandemic, this culture has had to be temporarily suspended. Because shaking hands can attach various viruses, bacteria, or germs to the hands,[20,21] this is also the case with contact with family. Moreover, considering the transmission of the virus can be through various unknown media, this very microscopic size becomes one of the parts that cannot be detected.

The respondents who washed their hands were included in the excellent category (p<0.005). Washing hands with soap consistently can improve health status. Washing hands looks easy, but many people still need to do it better or tend to be underestimated. Furthermore, the condition of the respondents also did a lot of self-cleaning when they got home. This awareness is one of the increased awareness of the respondents.[1,22]

One way to stop the spread of the COVID-19 virus was to self-clean.[23,24] See Table 2 that respondents had done self-cleaning well (p<0.005). Cleaning oneself could prevent the spread of COVID-19; this self-cleaning could also be in the form of changing clothes (p<0.005), soaking clothes (p<0.005), washing masks (p<0.005), personal equipment (p<0.005). In addition, when they came home after outside activities, many respondents washed their hands when they got home (p<0.005).[14,22–25]

With the massive spread of COVID-19, people must always maintain personal hygiene and care for themselves whenever and wherever. So it is because self-cleaning can benefit self-protection to be healthier and avoid the COVID-19 virus.

Conclusions

The implementation of clean and healthy living by Indonesian students is good. Although the tightening had been carried out well, the facilities provided by the government still needed to be improved to optimize the reduction of COVID-19. With this support, new virus cases can be avoided.

Conflict of Interest

None declared.

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RESEARCH ARTICLE

Is Resilience Knowledge Related to the Mental Health of First-Year Medical Students?

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Abstract

The many demands faced by first-year medical students can impact mental health. For students to function well, resilience is needed. This study aimed to determine the relationship between resilience knowledge and the mental health of first-year medical students. This quantitative study was conducted at the Faculty of Medicine, Universitas Islam Bandung, in October 2022. Respondents were 92 students in the first 2022/2023 academic year—data collection method was by distributing two Google Forms links. The first contains a pre-test regarding resilience knowledge, while the second includes the self-reporting questionnaire-29 (SRQ-29). Univariate analysis used distribution assumptions, frequency distribution (median, mean, standard deviation), and proportion distribution (percentage, 95% CI). Bivariate analysis used the t test, Wilcoxon test, and chi-square test. Most respondents were female, 59% (95% CI=52.62, 72.37). The majority of respondents were 18 years old. The highest order of mental health screening was post-traumatic stress disorder symptoms at 59% (95% CI=48.27, 68.39), mental-emotional disorder (anxiety and depression) symptoms at 37% (95% CI=27.62, 47.37), and psychotic symptoms at 27% (95% CI 18.98, 37.28). No respondents experienced symptoms of narcotic or psychotropic drugs. Respondents who indicated mental health disorders were more significant than those who did not, namely 60% (95% CI=49.35, 69.39). There was no relationship between resilience knowledge and mental health (p=0.75). Respondent's understanding of resilience was good, but more indicated mental health disorders.

Keywords: Medical students, mental health, resilience

Introduction

Medical education institutions are places to produce qualified and professional human resources (doctors) to improve the welfare of society, especially in the health sector. However, in the process, students encountered many obstacles.[1] The challenges of medical education are even more pronounced for first-year students. Undergraduates face various demands and problems, including the need for developmental tasks, the role transition process, academic requests, and anxiety.[2]

First-year medical students experience a transition of life from high school to college. As a previous study stated, the transition period experienced by first-year students is more complex than the previous school transition.[3] As college students, adolescents must face various social and academic norms that are different from the social and educational standards that apply when they are still in high school. They have to face the challenge of adjusting to adulthood.[4] Clark states that first-year students who successfully undergo the transition period are successful.[5]

The most common cause of stress in first-year medical students is academic stress due to the pressure of facing exams, coursework, and busy lecture times.[3] A previous study stated that the challenges expressed by some students, namely the difficulty of following a busy lecture schedule, are quickly disappointed when the plan is different from the expected. Some students also expressed difficulty establishing communication with new people and did not easily adjust to the campus environment and residence.[2]

The diverse academic and non-academic demands that medical school students have to go through can be detrimental to psychological well-being.[6] The psychological stress of medical students is a significant public health concern worldwide.[7] The most prevalent mental problems are depression and anxiety disorders.1 Medical students often do not seek help for mental health problems.[8] Only 24% of students with mental disorders see a doctor at the university hospital,

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and only 2.4% know a psychologist-counselor at the clinic.[9]

Stress that individuals cannot control and overcome will lead to negative cognitive, physiological, and behavioral impacts. Adverse mental effects include difficulty concentrating, remembering lessons, and understanding studies. Those adverse mental effects can result in lower grade point average (GPA) scores.[6] Negative emotional impacts have difficulty motivating oneself, feelings of anxiety, sadness, anger, frustration, and other adverse effects. Adverse physiological effects include health problems, decreased resistance to disease, frequent dizziness, lethargy, weakness, and insomnia. The behavioral effects include procrastination, laziness, consuming junk food, smoking, drug, and alcohol abuse, engaging in excessive pleasure-seeking activities, and the most severe is suicide.[10,11]

Therefore, to continue functioning amidst various stressors, students need the ability to adapt to problems, called resilience.[10] Higher levels of resilience are associated with lower levels of distress ($p<0.001$).[12] However, research on this resilience knowledge is lacking. This study aimed to determine the relationship between resilience knowledge and the mental health of first-year medical students.

Methods

This research was a quantitative study. This study was conducted on first-year Faculty of Medicine Universitas Islam Bandung students in the academic year 2022/2023 in October 2022. Sampling was done voluntarily, with 92 respondents.

The data collection method was carried out with a digital questionnaire instrument using the Google Forms platform, distributed via chat Zoom at a community service webinar on mental health. The first Google Form contains a pre-test regarding students' resilience knowledge, which includes ten questions with three answer choices. Students choose one of the correct answers. The second Google Form contained the self-reporting questionnaire-29 (SRQ-29) questionnaire. SRQ-29 is a mental health screening questionnaire that includes 29 questions. This questionnaire deals with mental health issues such as depression, psychoactive substance use, psychotic disorders, and post-traumatic stress disorder (PTSD) that may have been interfered with in the past 30 days. The World Health Organization developed the questionnaire, adopted by the Ministry of Health's *Sehat Jiwa*.[13] Each question is followed by two answer options, yes and no. Students choose one of the answers that suit them. If there are ≥6 yes answers to questions 1–20, it falls into the category of mental or emotional disorder symptoms (anxiety and depression). If there is one yes answer to question number 21, it falls into the symptoms of drug use (narcotic, psychotropic drugs). If there is one yes answer to questions 22–24, it is a psychotic symptom. If there is one yes answer to questions 25–29, it falls into the PTSD symptom category.[14]

Univariate analysis used distribution assumptions, frequency distribution (median, mean, standard deviation), and proportion distribution (percentage, 95% CI). Bivariate analysis used the t test, Wilcoxon test, and chi-square test. The tool used for data analysis was Stata MP 16.0. This study has obtained ethical approval from the Health Research Ethics Committee of the Universitas Islam Bandung with number: 208/KEPK-Unisba/VIII/2022.

Results

Table 1 shows more female than male respondents, 59% (95% CI=52.62, 72.37). Characteristics of respondents based on age; the majority were 18 years old. Table 1 also shows the mental health screening of respondents, namely mental emotional disorder symptoms (anxiety and depression) of 37% (95% CI=27.62, 47.37), psychotic symptoms of 27% (95% CI=18.98, 37.28), and PTSD symptoms of 59% (95% CI=48.27, 68.39). No respondents experienced symptoms of narcotic or psychotropic drugs. Overall, 55% (95% CI=49.35, 69.39) of respondents indicated mental health disorders compared to those who did not indicate mental health disorders.

Table 2 shows a similarity in the mean score of knowledge about resilience between the groups that are not indicated and indicated by mental health disorders. The mean score of knowledge about resilience in the group without mental health disorders is 81.08, while in the group with mental health disorders, it is 80. The knowledge score in the group without mental health disorders is more varied than in the other groups. This study shows no relationship between

Table 1 Characteristics of Respondents

Characteristics	n=92	%	95% CI	
Gender				
Female	54	59	52.62	72.37
Male	38	41	27.62	47.38
Mental, emotional disorder (anxiety and depression)	58	63	52.62	72.37
No	34	37	27.62	47.37
Yes				
Psychotic				
No	67	73	62.72	81.02
Yes	25	27	18.98	37.28
PTSD				
No	38	41	31.60	51.73
Yes	54	59	48.27	68.39
Indicated mental health disorder				
No	37	40	30.60	50.64
Yes	55	60	49.35	69.39

Table 2 Relationship between Resilience Knowledge and Mental Health

Mental Health Disorders	Median	Mean	SD	p
No indication	90	81.08	17.12	0.75
Indicated	80	80	15.27	

resilience knowledge and respondents' mental health (p=0.75).

Discussion

The characteristics of respondents based on gender in this study, the most are women (59%). This study's results align with previous research, with most respondents being women, with a percentage of 70.3%.[3] This is also in line with previous research at Universitas Udayana, which shows that most students in the faculty of medicine have female gender (71.1%).[15] Female students have a high interest in motivation in learning. This study aligns with previous research, which explains that learning motivation is closely related to learning activities by female students to become health workers.[16]

In this study, the majority of respondents were 18 years old. This study's results align with previous research, namely that mental disorders often have their first onset shortly before or during college with a typical age range, namely 18–24 years.[17] A previous study stated that the age range was three times higher in experiencing stress compared to different age ranges, and the prevalence of severity of stress levels was more prevalent in that age range.[18] Students are in the intimacy versus self-absorption or isolation stage, where at this stage, there is an urge to socialize, such as having good relations with certain people in the form of cooperation, love, or friendship. So, it is essential for self-adjustment and social adjustment. If there is a failure in self-adjustment, psychosocial conflicts can arise. Psychosocial conflicts can result in mental health disorders.[17]

The mental health screening picture of respondents in this study shows the order of symptoms of mental health disorders from the most experienced by respondents, namely PTSD at 59%, mental and emotional upset (anxiety and depression) at 37%, psychotic at 27%, and as many as 40% who are not indicated by mental health disorders. The results of this study are similar to previous research, which shows that the most psychosocial problems, namely PTSD at 75%, then anxiety and depression at 61.36%, psychotic disorders at 50%, psychoactive substance/drug use at 2.27%, and as many as 22.72% are not

indicated to experience psychosocial problems or mental disorders.[13] PTSD is the most common psychosocial problem found, with a frequency of 32% or 63 respondents (n=196).[19]

According to the American Psychiatric Association, PTSD is a psychiatric disorder that can occur in people who have experienced or witnessed a traumatic event, series of events, or circumstances.[20] Another definition states PTSD is a mental condition in which you experience panic attacks triggered by traumatizing past experiences. PTSD is a mental disorder that can develop after exposure to a highly threatening or terrifying event.[19]

Risk factors for PTSD include the type of trauma, age, gender, low socioeconomic status, education, separation (domestic conflict), prior trauma, general childhood adversity, personal and family psychiatric history, child abuse, poor social support, and initial severity of reaction to trauma.[19,21] Repeated exposure to trauma is said to be protective. PSTD is higher for those with a history of childhood trauma.[21]

Clinical manifestations that appear in an adult must experience the following for at least one month: (1) one symptom of recurrent experience, (2) one symptom of avoidance, (3) one symptom of increased emotional intensity and one symptom of increased reaction, (4) two symptoms of thinking and mood symptoms. The syndrome can be short-term (acute form) or long-term (chronic condition). However, an epidemiological study found that about 25 percent of respondents experienced delayed onset after six months or more.[19]

PTSD symptoms cause clinically significant suffering, functional impairment, and reduced educational prospects.[22] Various impacts can arise from untreated PTSD. Those impacts are the risk of poor physical health, including somatoform, cardiorespiratory, musculoskeletal, gastrointestinal, and immunological disorders. People with PTSD are at higher risk of employment problems, poor social support, and intimate relationship problems, including marital difficulties, than people without PTSD.[19,23] PTSD also triggers the risk of suicide.[19]

The results of this study showed that more respondents indicated mental health disorders than not, 60% (95% CI=49.35, 69.39). This aligns with previous research, where 77.28% of respondents (medical students) indicated mental disorders.[13] Research conducted on medical students at the University of Michigan showed that 53% experienced high depressive symptoms. In Indonesia, of 217 respondents, 12% showed high anxiety symptoms. Students interact with various elements in the learning environment, including the learning process, teachers, academic achievement or load, learning atmosphere, and social environment. In this process, medical students face different demands that can cause stress. One's transition from high school to college student can cause stress, especially in the first year of college. Stress experienced by students harms physical and psychological conditions.[24]

The most common cause of stress in first-year medical students is academic stress due to the pressure of facing exams, coursework, and busy lecture times. A study on medical students in Iraq stated that the most common causes of academic stress were the demands of exams and hectic study times.[25] Other literature says that some of the factors that cause stress in first-year students are an adaptation from the school environment to the university environment, living away from parents, and a poor environment.[26]

The process of adaptation is needed when a person enters a new environment. Adaptation happens to first-year university students, which requires adapting to learning and changes from the school environment to the university environment, such as coursework, tutorials, laboratory activities, and clinical skill labs. Adaptation to learning is a process of mental response and individual behavior or reaction to demands from oneself and academic tasks. In the faculty of medicine, problem-based learning (PBL) is the learning method where students must be active and responsible for their learning.[18]

Problems and difficulties related to the academic field are things that students cannot avoid. Each student has a different reaction to problems. Students who experience problems solving problems have negative emotions and tend to think shortly, so these stressful conditions will more easily trigger stress and can lead to mental health disorders. Students need to understand their inner capacity and find ways to solve problems in addressing their academic responsibilities and be able to assume their responsibilities. In this case, students need resilience.[27]

Resilience refers to negotiating, managing, and adapting to significant sources of stress and trauma.[7] Gatt et al. argue that resilience is

an individual's capacity to rise from adversity, conflict, confusion, and failure and the ability to make positive changes.[28]

High resilience is associated with a healthier lifestyle, good physical performance, increased optimism and mental well-being, and good mental health. Low resilience is associated with self-blame and high levels of anxiety and depression. High resilience can protect against stress so that resilient individuals can adapt and deal with the challenges experienced.[10]

Seven aspects form resilience: (1) Emotion regulation is the ability to manage oneself to continue to live life effectively despite the pressure. Resilient individuals have a series of skills to control their emotions, attention, and behavior; (2) Impulse control is the ability to regulate behavior. Resilient individuals can delay their pleasure to do something better; (3) Ability to analyze problems, which is the ability to accurately diagnose the causes of issues. Resilient individuals can think out of habit to find various potential causes of a problem; (4) Self-efficacy is the belief that one can control the situation and solve the issues. Resilient individuals have confidence in themselves and can build the trust of other individuals, so they have a greater chance of success; (5) Optimism, which is the ability to think positively about their future and have realistic plans to make it happen; (6) Empathy, which is the ability to read the behavioral cues of other individuals and understand their psychological conditions. Resilient individuals can build good relationships with others; (7) Achievement is the ability to improve the positive aspects of their lives and accept new challenges.[10]

In facing academic demands, students specifically need academic resilience. Academic resilience is a person's resilience in dealing with various academic tasks in an educational environment. An academically resilient student will not easily despair in the face of academic difficulties. Four factors determine academic resilience, namely (1) self-belief, belief, and confidence in their ability to understand; (2) control, the ability when they are sure about how to do a good job; (3) composure (low anxiety), anxiety; and (4) commitment or persistence is the ability to continue trying to complete the answer. Three factors influence resilience, external factors (social support), internal factors (self-esteem, spirituality, and altruism), and social skills (overcoming conflict and communication skills).[27]

This study result shows no relationship between knowledge about resilience and mental health in this study (p=0.75). There has been no research on this matter. In this study, respondents' knowledge about resilience was good, but more respondents indicated mental health disorders. Efforts to improve respondents' resilience are no longer targeting their expertise level but building positive attitudes and actions. In the first-year student's age range, what often appears is the level of autonomy. Support is sought from peers, not from family. Perceived social support from friends is a stronger predictor of resilience than from family.[4,8] Peer counselors can be used as one of the solutions to improve student academic resilience. This solution aligns with the results of Mufidah's[29] research, which states that social support correlates with student resilience. These results also align with Sari and Indrawati's[30] research, which says that there is a significant positive relationship between peer social support and academic resilience, which means that the higher the social support of peers, the higher the academic resilience of students. Peer social support provides an effective contribution of 22% to academic resilience. In line with the Islamic view in Surah Al Maidah verse 2, which means: "Help each other in (doing) virtue and piety, and do not help each other in sin and enmity. Fear Allah, verily Allah is very severe in His punishment."

Conclusions

There was no relationship between knowledge of resilience and mental health in respondents. In this study, respondents' knowledge of resilience was good, but more respondents indicated mental health disorders. One way to increase academic resilience is with peer counselors.

Conflict of Interest

The authors declare no conflict of interest.

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RESEARCH ARTICLE

Correlation of Interleukin-6 Level with Neutrophil to Lymphocyte Ratio and Disease Severity in COVID-19 Patients

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Abstract

Coronavirus disease 2019 (COVID-19) causes severe acute respiratory disease in humans and has spread rapidly worldwide since its first identification in December 2019. The neutrophil-to-lymphocyte ratio (NLR) describes the balance between the severity of inflammation and the immune system to be used as an important systemic inflammatory marker. Rapid progression of clinical deterioration is characterized by severe respiratory symptoms related to high levels of pro-inflammatory cytokines, like interleukin-6 (IL-6), indicating that the occurrence of cytokine storms leads to increased mortality. This study aims to assess the correlation between IL-6 and NLR in predicting the severity of COVID-19. This prospective cohort study was conducted at the COVID-19 ward of Universitas Sebelas Maret Hospital in August–September 2021. This study involved 66 COVID-19 patients >18 years old with asymptomatic to critical degree and Charlson Comorbidity Index (CCI) value ≤3. Examination of laboratory parameters and serum IL-6 was carried out when the patient entered the Emergency Room. Statistical test with Pearson's correlation test, significant if $p<0.05$. There is no significant correlation between IL-6 and NLR with $p=0.56$ and $r=0.08$, and a strong correlation between IL-6 and disease severity with $p=0.000$ and $r=0.454$. The conclusion is that IL-6 does not correlate with NLR and strongly correlates with disease severity in COVID-19 patients.

Keywords: COVID-19, disease severity, interleukin-6, neutrophil-to-lymphocyte ratio

Introduction

The coronavirus disease (COVID-19) pandemic has caused a world health crisis. Most countries in the world are experiencing the COVID-19 pandemic.[1] The outbreak of infectious diseases poses a severe threat to global health. Asymptomatic, mild, and moderate symptoms are most symptoms experienced by COVID-19 patients. About 10–20% of cases experience severe symptoms, characterized by the fast development of acute respiratory distress syndrome (ARDS), sepsis, and multiple organ failure.[2–4] COVID-2019 pathogenesis is not fully understood, and the basic mechanisms of clinical severity remain unclear. Recently, immune dysfunction that triggers a cytokine storm has been associated with rapid disease progression. The researchers found that the severity of infection associated with biomarkers played an essential role in COVID-19 severity.[2]

The neutrophil-to-lymphocyte ratio (NLR) is a simple and readily available biomarker that can be calculated by the division between absolute neutrophil count and absolute lymphocyte count; it is a widely used laboratory marker for evaluating infectious diseases. The NLR value is a beneficial marker for assessing the severity and predicting the prognosis of pneumonia patients.[5,6] The previous study has shown that lower lymphocyte counts mainly decreased levels of T lymphocyte subsets, followed by an increase in pro-inflammatory cytokines, such as interleukin-6, associated with severe cases. This suggests that immune dysfunction and cytokine dysregulation are critical factors in the disease progression.[2]

There is no specific examination as a severity predictor for patients, so it is necessary to find factors that can be used to estimate clinical severity in COVID-19 patients, which will signal when the patients meet the predictors of death so they will get the maximum treatment immediately.[4,7] Our research aims to investigate the immune-inflammatory markers in the peripheral blood of patients with various forms of COVID-19, then evaluate the correlation between serum interleukin-6 and NLR in predicting disease severity in COVID-19 patients.

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Methods

This study was conducted at Universitas Sebelas Maret Hospital from August to September 2021. Inclusion criteria used in this research were COVID-19 patients >18 years old, confirmed using the reverse transcription-polymerase chain reaction (RT-PCR) method from a nasopharyngeal swab, and having Charlson Comorbidity Index (CCI) value ≤3 and patients who agreed to participate with signed informed consent.

Research subjects were classified according to the severity of symptoms based on the World Health Organization COVID-19 guidelines into asymptomatic, mild, moderate, severe, and critical cases. This study collects data regarding demographic characteristics, comorbidities, presenting symptoms, vital signs, initial laboratory parameters, and serum interleukin-6 (IL-6). NLR value is obtained from neutrophils divided by lymphocytes using a hematology analyzer—the examination of serum IL-6 using the ELISA method.

Our study is a prospective cohort study on 66 patients with COVID-19. The sampling technique was consecutive sampling—statistics analysis using Pearson correlation. The result is significant if $p<0.05$, and there is a strong correlation if $r=0.4–0.6$. All statistical analyses using SPSS 25.0 for Windows. This study has been approved by the local institutional review board, Universitas Sebelas Maret Health Research Ethics Committee, with ethical clearance number 90/UN27.06.6.1/KEP/EC/2021.

Results

We analyzed 66 COVID-19 patients with all degrees of severity. Baseline characteristics, clinical and blood parameters of patients are shown in Table 1. The results of this study, numerical data (IL-6 value, NLR-value) were presented in mean±standard deviation. The total subject is 66 patients, 33 male and 33 female, divided into 29 patients in the asymptomatic group, 22 in the mild group, nine in the moderate group, four in the severe group, and two critical patients group. The critical group had the largest number of subjects. The critical group is accompanied by an increase in IL 6 corresponding to the patient's critical condition—demographic data are presented in Table 1.

According to the result of this study (Figure), the highest NLR value was found in the moderate group (6.70±4.50). In contrast, the highest IL-6 value was found in the critical group (121.33±27.14). Pearson's correlation analysis shows no correlation between IL-6 and NLR value ($p=0.56$).

There was a significant correlation between IL-6 and clinical severity, which is quite strong ($r=0.45$, $p=0.00$). Statistical analysis of the correlation between IL-6 with NLR and clinical severity can be seen in Table 2.

Discussion

The lung is one of the main targets of SARS-CoV-2 infection; the virus binds to alveolar ACE-2 receptors, triggers the release of inflammatory factors, then activates the immune system, leading to a cytokine storm.[8,9] Acute systemic pathological inflammation is characteristic of COVID-19 infection with a high level of circulating pro-inflammatory cytokines.[10] Severe cases of COVID-19 have significantly decreased lymphocyte counts and increased neutrophil counts. Severe patients experience a significant increase in IL-6.[9] Precise and accurate identification of severe and critical cases is needed to provide appropriate management for high risks patients.[8] This study evaluated the correlation between IL-6 value and NLR and disease severity in COVID-19 patients.

This study showed that geriatric patients dominated the critical group. Some people may be more likely to have severe illnesses, including older age and certain underlying diseases.[11] Geng et al.[12] reported that with the increase in age, the severity of risk was gradually higher.

IL-6 value in the critical group is higher than in the other groups. COVID-19 patients with severe respiratory distress experience various immune dysregulation mediated by elevated IL-6. IL-6 is the strongest predictor of hypoxemic respiratory failure requiring oxygen therapy. A meta-analysis of 9 studies explains that elevated IL-6 was strongly correlated with severe cases. A study by Sabaka et al.[13] reported that severe COVID-19 patients had a mean IL-6 value of 58 pg/mL compared to 17 pg/mL in mild cases; IL-6 values >80 pg/mL predict the incidence of respiratory failure and require mechanical ventilation assistance in COVID-19. Another study by Galván-Román et al.,[14] showed that IL-6

Table 1 Characteristics of Demographic and Clinical COVID-19 Patients

Variables		Results
Age (years) (mean±SD)	Asymptomatic	33.50±13.78
	Mild	43.18±17.28
	Moderate	55.11±6.57
	Severe	43.75±20.71
	Critical	74.50±14.85
Gender	Male	33 patients
	Female	33 patients
IL-6 (pg/mL) (mean±SD)	Asymptomatic	10.58±5.66
	Mild	19.37±16.63
	Moderate	40.33±50.20
	Severe	19.07±22.08
	Critical	121.33±27.14
NLR (mean±SD)	Asymptomatic	2.49±1.91
	Mild	5.10±4.62
	Moderate	6.70±4.50
	Severe	2.95±0.86
	Critical	4.20±4.07
Outcome		
Survive (mean±SD)	IL-6 (pg/ml)	18.93±24.00
	NLR (cells/uL)	4.00±3.76
	Male	30 patients
	Female	32 patients
Death (mean±SD)	IL-6	46.42±64.92
	NLR (cells/uL)	3.61±2.48
	Male	3 patients
	Female	1 patient
Comorbid	Asymptomatic	DM (0 patient), HT (2 patients)
	Mild	DM (3 patients), HT (7 patients)
	Moderate	DM (2 patients), HT (4 patients)
	Severe	DM (1 patient), HT (0 patient)
	Critical	DM (1 patient), HT (1 patient)

Note: DM: diabetes mellitus, HT: hypertension, SD: standard deviation

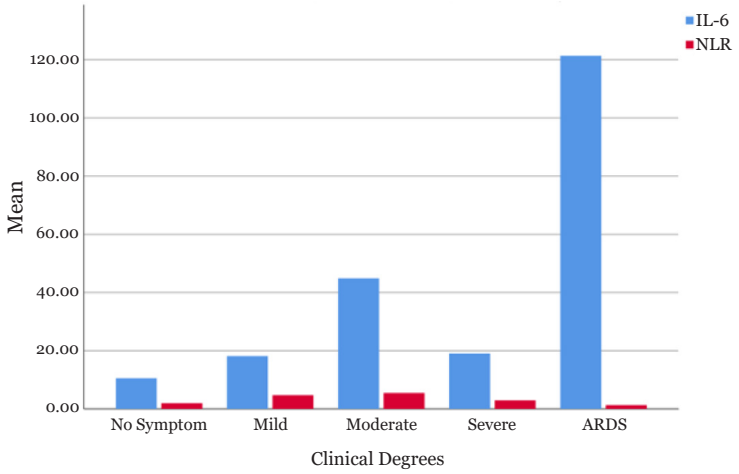

Figure Correlation between IL-6 and NLR to Clinical Severity

Table 1 Correlations between Serum IL-6 with NLR and Clinical Severity

Variables	r	p
IL-6 with NLR	0.08	0.56
IL-6 with clinical severity	0.45	0.00*

Note: r: coefficient correlation; *Pearson's correlation, p<0.05 significant

level >30 pg/mL predict the need for invasive mechanical ventilation.

This study found the highest NLR value in moderate groups, 6.70±4.50, compared to 2.95±0.86 in the severe group and 4.20±4.07 in the critical group. NLR describes the compatibility between the degree of inflammation and the immune system and can be used as an important marker of systemic inflammatory response. A high NLR shows an imbalance in the inflammatory response and is a marker of disease severity.[15] NLR was positively associated with age, and geriatric had a higher value than the younger, and also slightly positively associated with systolic and diastolic pressure.[16] In this study, the moderate group has a higher NLR value than the critical group. Several possible reasons are that the moderate group had older age and more hypertension as comorbid than the critical group.

In this study, there was no correlation between IL-6 and NLR value. This result does not follow a study by Sayah et al.[17] that reported IL-6 positively correlated with NLR. When the number of neutrophils in the body is significantly reduced, the immune system is compromised and causes a significantly increased risk of infection. The number of lymphocytes in the body is associated with the immune system and the body's resistance to pathogenic microorganisms, and it has a negative correlation with the severity of inflammation.[18] Lymphocyte count below normal value associated with disease progression. SARS-CoV-2 may act on T lymphocytes, and T lymphocyte destruction is an important factor that causes deterioration of the patient's condition.[13] Based on this, we believe that severe COVID-19 infection causes significant systemic inflammation, characterized by elevated NLR, so that NLR can predict the severity of infection.[17] In this study, several reasons for no correlation between IL-6 and NLR are an equal distribution of comorbid factors and unequal population numbers in each group.

This study showed a significant correlation between IL-6 and clinical severity (r=0.45, p=0.00). IL-6 is a cytokine produced by macrophages that induces a pro-inflammatory response and is often elevated in COVID-19 patients.[19] IL-6 upregulation in COVID-19 lead to acute lung injury and acute systemic inflammatory response, which can be used as a predictor of an early marker of severe disease.[13,20] Study in Palembang, Indonesia, showed a correlation between IL-6 levels in COVID-19 with chest X-rays and clinical features.[21] A study by Guirao et al.[22] also showed that IL-6 could better predict COVID-19 disease severity. IL-6 level correlates with other clinical parameters to evaluate the severity of COVID-19. Overexpression of IL-6 is essential in increasing and spreading the cytokine storm leading to ARDS. The direct role of IL-6 in the pathogenesis of COVID-19 is further supported by the existence of the administration of therapy that inhibits IL-6 will improve the prognosis of severe COVID-19.[13]

Conclusions

The clinical severity of COVID-19 is related to high peripheral blood immune-inflammatory markers. IL-6 and NLR values affect the clinical severity of COVID-19 patients and are important markers to evaluate the severe form and fatal development of COVID-19 in the context of hyperinflammation caused by cytokines. IL-6 can be an excellent marker to evaluate COVID-19 patients and provide appropriate treatment. However, NLR is a low-cost and accurate marker to predict clinical severity.

Conflict of Interest

All authors state that there is no conflict of interest in this study.

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RESEARCH ARTICLE

Soil-Transmitted Helminth Eggs Contamination on Fresh Vegetables in Medan Indonesia

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Abstract

Indonesian people habitually consume fresh vegetables as companions to other foods. We can find soil-transmitted helminths (STH) eggs in fresh vegetables that are not washed clean. This study determines whether there was STH egg contamination in fresh vegetables in several stalls selling fried chicken in Medan. This study was a descriptive study with a cross-sectional design. Research samples were four types of fresh vegetables: lemon basil (*Ocimum africanum*), lettuce (*Lactuca sativa*), cucumber (*Cucumis sativus*), and cabbage (*Brassica oleracea* var. *capitata*) collected from 88 fried chicken stalls in Medan in January 2019. All samples were examined by the sedimentation method to ensure STH egg contamination at the Parasitology Laboratory of the Faculty of Medicine Universitas Muhammadiyah Sumatera Utara. The types of fresh vegetables that were most contaminated by STH eggs were lemon basil leaves (*Ocimum africanum*), and the most abundant STH eggs found were *Ascaris lumbricoides* eggs. In conclusion, there is egg contamination in fresh vegetables in several stalls selling fried chicken in Medan.

Keywords: Fresh vegetables, soil-transmitted helminths eggs

Introduction

Soil-transmitted helminths (STH) are intestinal nematodes that require soil in their life cycle for the maturation process to change from the non-infective stage to the infective stage.[1] *Ascaris lumbricoides*, *Trichuris trichiura*, and hookworms are STH that often infect humans. Infection of STH is widespread in the tropics and subtropics region. The World Health Organization estimates that more than 1.5 billion people (24% of the world's population) are infected with STH.[2]

Indonesia is a tropical country with high humidity, so it's a suitable environment for STH breeding. The prevalence of helminth infections in Indonesia is still relatively high, especially among the poor living in densely populated environments with poor sanitation, restrooms, and inadequate clean water facilities. According to the Ministry of Health Republic of Indonesia, in several provinces, the prevalence of helminthiasis for all ages in Indonesia ranges from 40–60%.[3]

Sources of STH transmission can be water and soil used in vegetable cultivation. Using human feces as fertilizer for the vegetable plant is essential in spreading STH infection. In addition, defecating on the ground can cause soil and the plants that grow around it to be contaminated with STH eggs.[1,2]

Indonesian people habitually consume fresh vegetables as companions to other foods. Before consuming fresh vegetables, they must be washed carefully so that there are no STH eggs in the vegetables. Previous studies found no parasites were observed in standard-washed samples, but STH contamination was in the unwashed vegetables.[4]

This study determines whether there was STH egg contamination in fresh vegetables in several stalls selling fried chicken in Medan.

Methods

This study is a descriptive study with a cross-sectional design. Research samples were four types of fresh vegetables: lemon basil (*Ocimum africanum*), lettuce (*Lactuca sativa*), cucumber (*Cucumis sativus*), and cabbage (*Brassica oleracea* var. capitata) collected from 88 fried chicken stalls in Medan in January 2019. All participants provided written informed consent before their participation. The Health Research Ethics Committee, Faculty of Medicine, Universitas Muhammadiyah Sumatera Utara,

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has approved this research (approval number 276/KEPK/FKUMSU/2019).

The sedimentation method examined the fresh vegetables to ensure the presence of STH eggs contamination. The examination was carried out in the Parasitology Laboratory of the Faculty of Medicine Universitas Muhammadiyah Sumatera Utara. The examining procedure of STH eggs in fresh vegetables is as follows: the vegetables were cut into small pieces, then 60 grams of that vegetables were soaked in 600 mL of 0.2% NaOH solution in a beaker for thirty minutes, stirred, and then we removed the vegetables. The soaking water was filtered, put into a beaker glass, and left for one hour. Then we removed the water from the surface of the beaker glass. The water at the bottom of the beaker glass containing the sediment was taken 10 mL using a pipette and put into a centrifugation tube. We were then centrifuged at 1,500 revolutions per minute for five minutes. After that, we discarded the supernatant, and the precipitate was taken with a pipette, placed on a glass object covered with a cover glass, then examined using a microscope.

Results

From 88 fried chicken stalls whose fresh vegetables were taken as research samples, we found that seventeen (19.3%) stalls were contaminated with STH eggs in the vegetables (Table).

Discussion

Several researchers have published research about the contamination of STH eggs in fresh vegetables. Similar studies were conducted in several regions of Indonesia using vegetables sold in the traditional and modern markets and the food stalls that provided fresh vegetables.[5–8]

This study showed that there was STH egg contamination in fresh vegetables. The vegetables most contaminated with STH eggs were lemon basil, where we found ten *Ascaris lumbricoides* eggs, two *Trichuris trichiura* eggs, and one hookworm egg. The second type of vegetable containing STH eggs was lettuce, where we found two *Ascaris lumbricoides* eggs and one *Trichuris trichiura* egg. The next vegetable contaminated with STH eggs was cabbage, where we found one *Ascaris lumbricoides* egg. At the same time, we did not find cucumbers in STH eggs.

The results of this study were in line with the results of previous studies, which found contamination of STH eggs in vegetables. The previous research results found that STH eggs contaminated fresh vegetables in Bekasi.[5] Likewise, the research conducted in four traditional markets in Padang showed that 24.1% of fresh vegetable samples were contaminated with STH eggs.[6] Similarly, a study conducted in Lampung on the fresh vegetables in the food stalls and campus canteens found contamination of STH eggs.[7,8] The results of this study are also the results of research conducted at Lorok Pakjo village, Palembang, in 2021.[9]

In this study, it was found contamination of *Ascaris lumbricoides* eggs more than other types. The results of this study are the same as those of research conducted in several other areas.[8–11] This is because the *Ascaris lumbricoides* egg has three layers of skin (hyaline, vitelline, and albuminoids), so it has better environmental resistance than other STH eggs.[11] *Ascaris lumbricoides* eggs are also resistant to chemical disinfectants, and against temporary immersion in various chemical materials.[12] *Ascaris lumbricoides* can also be due to high egg production. *Ascaris lumbricoides* female worm can produce 200,000 eggs each day, which is present in the feces and can contaminate the environment.[13]

Table Distribution of 88 Fresh Vegetables with STH Eggs Contamination

Types of Fresh Vegetables	Negative Results n (%)	Positive Results		
		Ascaris lumbricoides Eggs n (%)	*Trichuris trichiura* Eggs n (%)	Hookworm Eggs n (%)
Lemon basil	75 (85.2)	10 (11.4)	2 (2.3)	1 (1.1)
Lettuce	85 (96.6)	2 (2.3)	1 (1.1)	0 (0)
Cabbage	87 (98.9)	1 (1.1)	0 (0)	0 (0)
Cucumber	88 (100)	0 (0)	0 (0)	0 (0)

This study found hookworm eggs to contaminate fresh vegetables the least. Hookworm infections often occur where human feces are used as fertilizer or where defecation onto soil happens.[14] After leaving the patient's intestine, hookworm eggs that fall on the ground within two days will grow into rabbit-form larvae that can live freely in the soil so that hookworm eggs are no longer found again in the soil.[15,16]

Contamination of STH eggs in fresh vegetables can occur due to the lack of management knowledge and preventive measures from the farmers to consumers. At the farmer level, factors that can affect the contamination of STH eggs in vegetables are using organic fertilizers derived from human feces as a medium for fertilizing vegetables. If the human feces contain STH eggs, they will contaminate the soil and move quickly to the leaves of vegetables in contact with the ground.[17,18] At the consumer level, STH eggs in vegetables bought from traditional and modern markets may be caused by improper vegetable washing techniques. Vegetables sold in the current markets look cleaner, and no soil or sand is stuck to them because they have been washed first. Vegetables soaked in large quantities in a bucket at once allow soil or sand to be released from the vegetable leaves, but the STH eggs can remain tucked between sheets of the vegetable leaves.[5,6] The correct vegetable washing technique is to wash the vegetables under running tap water, wash the leaves of vegetable sheets per sheet, then briefly dip them in warm water or rinse using cooking water so that the STH eggs that may be attached to the vegetable leaves can be removed along with the flow of water. The proper washing procedure before consuming the vegetable is essential to avoid the transmission of STH infection.[19]

This study found STH egg contamination most commonly found in lemon basil, followed by lettuce and cabbage. The morphology of fresh vegetables also played a role in STH egg contamination. Basil has small leaves and many branches on a stalk, making cleaning difficult. In addition, washing basil with water before storing can cause the leaves to rot quickly, so basil is usually washed immediately before serving. Lettuce and cabbage have serrated leaves that allow STH eggs to attach and hide in their leaves. Another possibility is that cabbage and basil have short stems, so the leaves are close to the soil surface and have very curved and uneven leaf surfaces so that worm eggs are easy to stick and difficult to clean.[9] The results of this study are the same as a study conducted in Makassar, where no contamination of STH eggs was found in cucumbers at food stalls.[20] Cucumbers have smooth skin, making them easier to wash or peel before eating.

Conclusion

There is egg contamination in fresh vegetables in several stalls selling fried chicken in Medan.

Conflict of Interest

The authors want to state that this study has no conflicts of interest.

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RESEARCH ARTICLE

Comparison of the Effectiveness between Oral NSAIDs and Dextrose Prolotherapy in Knee Osteoarthritis

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Abstract

Non-steroidal anti-inflammatory drugs (NSAIDs) are the first treatment choice for pain relief in osteoarthritis (OA). However, known to have an 85% risk of side effects on the gastrointestinal and a 40% chance of cardiovascular complications. In addition, in certain classes of NSAIDs, the risk of chronic kidney disease increases due to long-term consumption. On the other hand, dextrose prolotherapy is a regenerative therapy. This study aimed to compare the effectiveness of oral NSAIDs with dextrose prolotherapy in knee OA based on clinical features. This study used an observational method (cross-sectional) conducted in three locations; Jember Clinic Hospital, Balung Hospital, and Harapan Mulya Kertonegoro Jenggawah Clinic from September 2021 to March 2022. Of the 75 population, 23 patients with mild to moderate knee OA were divided into two groups; 15 samples of dextrose prolotherapy and eight samples of oral NSAIDs. Data in the study showed the mean WOMAC score in the dextrose prolotherapy group was 12.4±11.7, while the oral NSAID group was 34.75±17.6. A total of 14 samples experienced a decrease in scores after switching from oral NSAIDs to dextrose prolotherapy. Bivariate analyses were performed using Mann-Whitney and Wilcoxon tests. Both statistical tests show a p=0.001 (p<0.05). Thus, this study concluded that dextrose prolotherapy was more effective than oral NSAIDs in knee OA.

Keywords: Dextrose prolotherapy, knee osteoarthritis, regenerative therapy

Introduction

Research on Osteoarthritis or Osteoporosis Against Disability (ROAD) by Muraki et al.[1] stated that knee OA was significantly associated with the onset of pain and physical functional disability. In Indonesia, osteoarthritis (OA) is the most common arthritis.[2] Recent research in a book by Rodríguez-Merchán and Gómez-Cardero[3] states that acetaminophen and non-steroidal anti-inflammatory drugs (NSAIDs) are the first-line pharmacological therapy for OA. On the other hand, NSAIDs are known to have an 85% risk of side effects on the gastrointestinal tract and more than 40% risk of cardiovascular complications.[4–7] Furthermore, a study by Zhang et al.[8] stated that the likelihood of acute kidney injury increased by more than 50% in people exposed to NSAIDs.

Meanwhile, injection is another safe option for OA therapy and has a high satisfaction rate.[9,10] Types of injection tested for efficacy and often used for OA treatment are corticosteroids, hyaluronic acid, and platelet-rich plasma (PRP).[9] PRP is an injection therapy with a tissue regenerative mechanism of action. However, the cost of the procedure tends to be expensive.[11]

Tissue regenerative therapy that is less expensive than PRP is dextrose prolotherapy.[11] Dextrose prolotherapy has been tested in a randomized controlled trial and meta-analysis, showing improved knee pain and function.[12,13] Hypertonic dextrose solutions act by dehydrating cells, causing transient sterile inflammation, attracting granulocytes and macrophages, and inducing healing. This phase is similar to the body's natural healing process, which triggers the release of growth factors and collagen deposition.[14] Dextrose solution has proven effective in treating chronic pain so that it can treat pain.[13] The Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) was used to detect patients for OA. The WOMAC index is the best validated and most widely used outcome measure in subjects with knee osteoarthritis.[15,16] Rabago et al.[17] report decreased WOMAC scores in the last four weeks after the first injection session and continued improvement up to 52 weeks on dextrose prolotherapy.

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Studies on dextrose prolotherapy in treating knee OA have only compared with injections. Studies are comparing oral medication, especially NSAIDs, as the first treatment for OA in the community. Oral NSAIDs were compared with injectable hyaluronic acid in a meta-analysis. There was no significant difference between the continuous use of oral NSAIDs and the injection of hyaluronic acid in knee OA.[18] Further studies that treat OA causatively should be developed to prevent continued exposure to NSAIDs. This study aims to compare the effectiveness of oral NSAIDs with dextrose prolotherapy in knee OA patients.

Methods

This study used an analytical observational method with a cross-sectional design conducted in three locations; Jember Clinic Hospital, Balung Hospital, and Harapan Mulya Kertonegoro Jenggawah Clinic from September 2021 to March 2022. The ethical review has been submitted to the Health Research Ethics Committee, Faculty of Medicine, Universitas Jember. Therefore, it has been declared feasible based on number: 1571/H25.1.11/KE/2022. From the 75 population, 23 patients with mild to moderate knee OA who met the eligibility criteria were divided into two groups, with 15 dextrose prolotherapy samples and eight oral NSAIDs.

The method of determining this sample is by making all members of the population that meet the criteria into a model (total sampling). Patients ≥40 were diagnosed with mild to moderate knee OA based on Kellgren and Lawrence or ultrasound. The patient had a history of taking oral NSAIDs, then continued one type of therapy, switched to prolotherapy, or remained oral NSAIDs. All samples had a history of taking oral NSAIDs. In the dextrose prolotherapy group, the sample switched to dextrose prolotherapy by receiving one injection within 4–52 weeks, while the oral NSAID patient group continued to take the drug continuously. The assessment carried out in this study came from the WOMAC for each study sample. This instrument is a questionnaire to measure functional impairment and pain associated with lower extremity OA. There were five questions related to pain, two to joint stiffness, and seventeen to functional activities. In this questionnaire, a total score of 0–24 has an interpretation of the clinical picture as mild, 24–48 is interpreted as moderate, 48–72 is interpreted as severe, and 72–96 is interpreted as very severe.

Descriptive statistical univariate analysis was carried out to describe the entire sample taken, the description in the form of a graph of age, gender, body mass index (BMI), degree of OA based on Kellgren and Lawrence, and the type of oral NSAID used. In addition, bivariate analysis was carried out using the Mann-Whitney comparison and Wilcoxon tests. The Mann-Whitney test is a non-parametric test with two independent samples; in this case, it compares the WOMAC score of the sample taking oral NSAIDs with the WOMAC score of the sample who switched to dextrose prolotherapy. The Wilcoxon test is a dependent paired non-parametric test to see the decrease or increase in WOMAC scores in the dextrose prolotherapy group.

Results

A total of 23 samples met the eligibility criteria, with details of 15 samples receiving dextrose prolotherapy with a history of taking oral NSAIDs. The eight others never received dextrose

Table 1 Characteristics of Respondents

Characteristics	n=23
Gender	
Male	7
Female	16
Age (years)	
40–50	3
51–60	9
61–70	10
>70	1
BMI (kg/m^2)	
Normal (18.5–24.9)	7
Overweight (25–29.9)	14
Obesity (≥30)	2
OA degree	
Mild	4
Moderate	19
Therapy	
Dextrose prolotherapy	15
Oral NSAIDs	8
Oral NSAIDs	
Ibuprofen	2
Mefenamic acid	4
Meloxicam	7
Sodium diclofenac	9
Celecoxib	1

Table 2 WOMAC Score of Prolotherapy Dextrose Group

WOMAC Interpretation	Pre-injection n=15	Post-injection n=23
Mild (0–24)	0	13
Moderate (24–48)	8	2
Severe (48–72)	6	0
Very severe (72–96)	1	0

Table 3 Comparison of WOMAC Score

WOMAC Interpretation	Oral NSAIDs n=8	Dextrose Prolotherapy n=23
Mild (0–24)	3	13
Moderate (24–48)	3	2
Severe (48–72)	2	0
Very severe (72–96)	0	0

prolotherapy; they only consumed oral NSAID therapy; all respondents completed the WOMAC questionnaire face-to-face and online.

Table 1 describes the characteristics of the research sample. The description is in the form of a distribution table of sex, age, BMI, the degree of OA based on Kellgren and Lawrence, and the type of therapy. The characteristics of the sample are female (16 of 23 respondents), aged 61–70 years (10 of 23 respondents), and the criteria for BMI overweight (14 of 23 respondents) dominate the study sample. Age is a risk factor for various diseases, including knee OA. The aging process is a risk factor related to the pathophysiology of cartilage damage in the knee joint structure; regarding gender, differences in height, weight, and bone size cause women to have lower knee cartilage volumes than men.[19] In knee OA, mechanical overload on the joint causes the knee to hold more weight, contributing to joint damage.[19,20] Researchers do not limit the type consumed. The most commonly used type of NSAID is diclofenac sodium. According to da Costa et al.,[21] diclofenac sodium 150 mg/day is more effective than other NSAIDs.

Table 2 shows a significant difference in the WOMAC scores of the pre-injection sample compared to the post-injection sample. The WOMAC score of this is because thee-injection patients is an assessment when the sample is still taking oral NSAIDs, has a moderate to severe interpretation. Conversely, the WOMAC score interpretation was mild to moderate after switching to dextrose prolotherapy.

When the two groups were compared, the WOMAC scores of the groups continuing oral NSAID therapy were more variable. The data shows that the sample has light, moderate, and heavy interpretations. Meanwhile, there were no samples with severe interpretation in the group that switched to dextrose prolotherapy (Table 3).

Table 4 shows that there are differences between the oral NSAID group and the prolotherapy group. The difference lies in the average WOMAC score. The average value of the

Table 4 Average WOMAC Score

Groups	Average±SD
Oral NSAIDs	34.75±17.6
Dextrose prolotherapy	12.4±11.7

Table 5 Mann-Whitney Test Analysis

Variables	n	Average	Total	U	p Value
Oral NSAIDs	8	17.94	143.5	12.500	0.001*
Dextrose prolotherapy	15	8.83	132.5		

Note: *p value<0.05 significant

Table 6 Wilcoxon Test Analysis

WOMAC Scores	n	Average	Total	Z	p Value
Increase	1	1.00	1.00	3.352	0.001*
Decrease	14	8.50	119.00		

Note: *p value<0.05 significant

oral NSAID group was 34.75±17.6. In contrast, the average value of the dextrose prolotherapy group was 12.4±11.7. Therefore, the mean WOMAC score in the dextrose prolotherapy group was lower.

Table 5 shows the Mann-Whitney test displays p=0.001 (p<0.05), so the hypothesis is accepted. Researchers then performed the Wilcoxon test to see if there was an increase or decrease in WOMAC scores in knee OA patients (Table 6).

Discussion

All samples initially used oral NSAIDs as first-line treatment. Knee OA patients perform this therapy because they cannot stand the perceived pain. Oral NSAID drugs were obtained from the practitioner in charge of the patient; then, the patient stored the drug to be consumed at any time when the pain recurred. Then, the fifteen samples switched to a different type of therapy, namely dextrose prolotherapy. Changes in the kind of therapy are based on the patient's dissatisfaction with oral NSAID treatment. The remainder continued oral NSAID therapy until now. Based on Table 6, one sample experienced an increase in WOMAC scores, while 14 samples experienced a decrease in WOMAC scores after switching to dextrose prolotherapy. A reduction in the WOMAC score means a decrease in the clinical picture based on symptoms of knee OA. Wilcoxon test results show p=0.001 (p<0.05). Based on the results of both statistical tests, the hypothesis in this study was accepted or concluded that dextrose prolotherapy was more effective than oral NSAIDs in knee OA patients.

The interpretation of the respective WOMAC scores obtained was quite diverse in the sample who continued oral NSAID therapy until now. Three of 8 respondents had a mild WOMAC score, 3 of 8 respondents had moderate, and 2 of 8 respondents had severe. The patient stated that the recurrence was recurrent. The patient felt an improvement in his complaints. However, the symptoms reappeared after stopping consumption. Relapse did not occur in the sample group that switched to dextrose prolotherapy. Improvements are progressive. This can be illustrated by 13 of 15 respondents with a mild WOMAC interpretation, while the other 2 of 15 are moderate. Whereas 8 of 15 samples had a moderate interpretation, 6 of 15 were severe, and 1 of 15 had severe interpretations.

Prolotherapy is an injection therapy with long-term continuous improvement.[22,23] In the research of Rabago et al.,[22] a sample of mild to severe knee OA received three prolotherapy injections at weeks 1, 5, and 9. Patients were evaluated at weeks 12, 26, 52, and 2.5 years. The increase in the total WOMAC score was 20.9±22.6 points or 35.6% at 2.5 years. In addition, 40 of 65 participants increased by 12 points or more. Like that research, Sita et al.[13] studied injection therapy in moderate to severe OA (minimum three months) and compared dextrose prolotherapy and normal saline (NS) injected at weeks 0, 4, 8, and 16. As a result, dextrose prolotherapy reduced pain and improved function and quality. Survival compared with NS injection; the beneficial effect persisted for 52 weeks.

In this study, from 15 samples of mild to moderate OA who switched from oral NSAIDs to dextrose prolotherapy, 14 samples showed that prolotherapy with several injections once in 4–52 weeks could reduce WOMAC scores, found a reduction in clinical features based on knee OA symptoms. Prolotherapy can be the treatment for patients with mild to moderate knee OA.

Gallelli et al.,[24] who studied oral NSAIDs in OA, concluded that long-term NSAID treatment is not recommended in patients with OA. Treatment with oral celecoxib, ibuprofen, and diclofenac is effective in the short term to suppress proinflammatory cytokines, reduce pain, and improve function in patients with symptomatic knee OA without serious side effects. Wheaton and Jensen[25] concluded that NSAIDs' initial inhibition of the inflammatory cascade is short-lived in the healing of ligaments, tendons, and bones. interpretations OA of the knee is chronic

and progressive, causing COX-2 expression to occur continuously. COX-2 expression will recur after its inhibitory effect by oral NSAIDs decreases so that the recurrence of symptoms is recurrent.

Meanwhile, dextrose prolotherapy triggers the synthesis of inflammatory mediators that accelerate the regeneration process of damaged tissue, strengthen connective tissue, and improve surrounding tissue biomechanics.[26] The prolotherapy used was 40% dextrose diluted with lidocaine to 25%. The hypertonic fluid renders the inflammatory response sterile, leading to controlled acute inflammation and promoting proliferation.[27]

Further research on prolotherapy is needed, especially in clinical trials. The WOMAC score can be used serially in the same duration to determine the progression of improvement in the clinical features of patients with knee osteoarthritis. Radiographic evaluation of post-therapy assessment in OA can be done to strengthen the results of further studies.

Conclusion

This study concluded that dextrose prolotherapy was more effective than oral NSAIDs in knee osteoarthritis.

Conflict of Interest

The authors certify that they have no affiliation with or involvement in any organization or entity in the subject matter or materials discussed in this manuscript.

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RESEARCH ARTICLE

Relationship between Predisposing Factors and the Incidence of Contraceptive Dropout in West Java

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Abstract

The incidence of contraceptive dropout in West Java is still high. Analyzing the reasons would help to improve programs. This study explores the relationship between predisposing factors and the incidence of contraceptive dropout in West Java. The research was cross-sectional and conducted from August to December 2021, and the dataset came from Program Performance and Accountability Survey (*Survei Kinerja dan Akuntabilitas Program*, SKAP) 2019. The sample in the study were women of childbearing age 15–49 years with married status both ever and currently using contraception—a total of 338 samples with simple random sampling. This study used univariate, bivariate, and multiple logistic regression to analyze the discontinuation of contraception. A study has shown a relationship ($p<0.05$) between parity, education level, level of knowledge, and the incidence of contraceptive dropout. Furthermore, age and employment status did not affect them. In conclusion, a relationship exists between predisposing factors such as education, parity, knowledge, and contraceptive dropout. There is a need to emphasize the health promotion of contraception, especially for women of childbearing age with marital status, low education, fewer children than two, and inadequate knowledge level. In addition, contraceptive service standards should be implemented to prevent the incidence of contraceptive dropout.

Keywords: Contraceptive, dropout, knowledge

Introduction

National Population and Family Planning Board (*Badan Kependudukan dan Keluarga Berencana Nasional*, BKKBN) West Java needs to achieve the family planning target in 2024. However, the incidence of contraceptive dropout is still high. Based on BKKBN in 2019, the dropping out of contraception in Indonesia reached 29%. Besides it, the contraceptive dropout in West Java increased to 29%.[1] The incidence will impact the total fertility rate (TFR).[2] And then, it will affect the level of welfare, and decrease the quality of education and health, reducing the quality of a country's population. Furthermore, the risk of abortion maternal and baby death also increase.[3]

National researchers have researched East Kalimantan using the Indonesia Demographic and Health Survey 2017. The results show the correlation between age, education level, employment status, and parity with contraceptive dropout.[4] This differs from international researchers in Ethiopia who used the Ethiopian Demographic and Health Survey data in 2016, which showed a relationship between age, level of education, employment status, and knowledge with the dropping out of contraception.[5–7]

Besides, the research indicated a research gap because the result has contradictory. Moreover, contraceptive dropout is rarely researched, especially in West Java. The significant population, different characteristics, and high prevalence of contraceptive dropout provide good research opportunities. The best research for solving the problem is correlation.[8] This study explores the relationship between predisposing factors and the incidence of contraceptive dropout in West Java.

Methods

This research was an analytic correlative with a cross-sectional design, which the study conducted from August to December 2021. The study instrument used secondary data from Program Performance and Accountability Survey (*Survei Kinerja dan Akuntabilitas Program*, SKAP) 2019; hence no instrument validation was

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conducted.

The total population of women of childbearing age in West Java from SKAP 2019 is 2,804. The inclusion subject criteria are women of childbearing age who are married, aged 15–49 years, and have been using or have used contraception in SKAP 2019.

The sample size was calculated based on the formula Krecjie & Morgan, and the results were 338 respondents. The sampling has done by random sampling technique using Excel. The samples were analyzed statistically on IBM SPSS version 26.0. The analyzes were univariate to describe the distribution of each variable, bivariate using chi-square, and multivariate using multiple logistic regression. This research has been approved by the Research Ethics Committee of Universitas Padjadjaran, number 674/UN6. KEP/EC/2021.

Results

Table 1 shows that there is a relationship significantly ($p<0.05$) between education level, parity, knowledge level, and the incidence of contraceptive dropout. The value of r-correlation at education and knowledge levels is meager because the correlation coefficient is less than 0.199. The parity is low, with a correlation coefficient of less than 0.399 (Table 2). A highest risk of dropping out is the level of knowledge. The higher number of women with low knowledge can increase the risk incidence by 1.85 times (Figure).

Discussion

In this study, more than one hundred (39.35%) of the participants had dropped contraceptives. It shows the high incidence of contraceptive dropout in West Java because it has exceeded the maximum target expected by BKKBN, which is 24.6%.[1]

The first variable studied age. Age is the time lapse between the date of birth and the date of the study.[9] The more mature age, the better the strength and maturity of thinking were. It is expected that their perception and belief will mature to continue contraception. However, this study is not in line with the theory. The incidence of contraceptive dropout is prominent in high-risk ages (>35 years), with a presentation of 40.70%. This age is a vulnerable age for having children again because their reproductive organs are not as good as those aged 20–35.[10]

The researcher Anggraeni et al.[4] revealed that age is related to the incidence of contraceptive dropout. However, this study showed no relationship between them. This study is in line

Table 1 Relationship between Predisposing Factors and the Incidence of Contraceptive Dropout in West Java

Predisposing Factors	Incidence of Contraceptive Dropout			p Value*
	Yes n=133 (%)	No n=205 (%)	Total n=338 (%)	
Age				
High risk	81 (40.70)	118 (59.30)	199 (58.88)	0.54
Low risk	52 (37.41)	87 (62.59)	139 (41.12)	
Education level				
Low	88 (44.67)	109 (55.33)	197 (58.28)	0.02
High	45 (31.91)	96 (68.09)	141 (41.72)	
Employment status				
Not work	100 (38.61)	159 (61.39)	259 (76.63)	0.61
Work	33 (41.77)	46 (58.23)	79 (23.37)	
Parity				
Low	96 (43.05)	127 (56.95)	223 (65.98)	0.05
High	37 (32.17)	78 (67.83)	115 (34.02)	
Level of knowledge				
Poor	80 (46.51)	92 (53.49)	172 (50.89)	0.01
Good	53 (31.93)	113 (68.07)	166 (49.11)	

Note: *chi-square test, p value<0.05 significant

Table 2 Correlate between Predisposing Factors and the Incidence of Contraceptive Dropout in West Java

Predisposing Factors	Coefficient	p Value*	OR (95% CI)
Age	0.03	0.54	1.14 (0.73–1.79)
Education level	0.13	0.02	1.72 (1.09–2.70)
Employment status	−0.03	0.61	0.87 (0.52–1.46)
Parity	0.24	0.05	1.59 (0.99–2.55)
Level of knowledge	0.16	0.01	1.85 (1.19–2.88)

Note: *multiple logistic regression, p value<0.05 significant

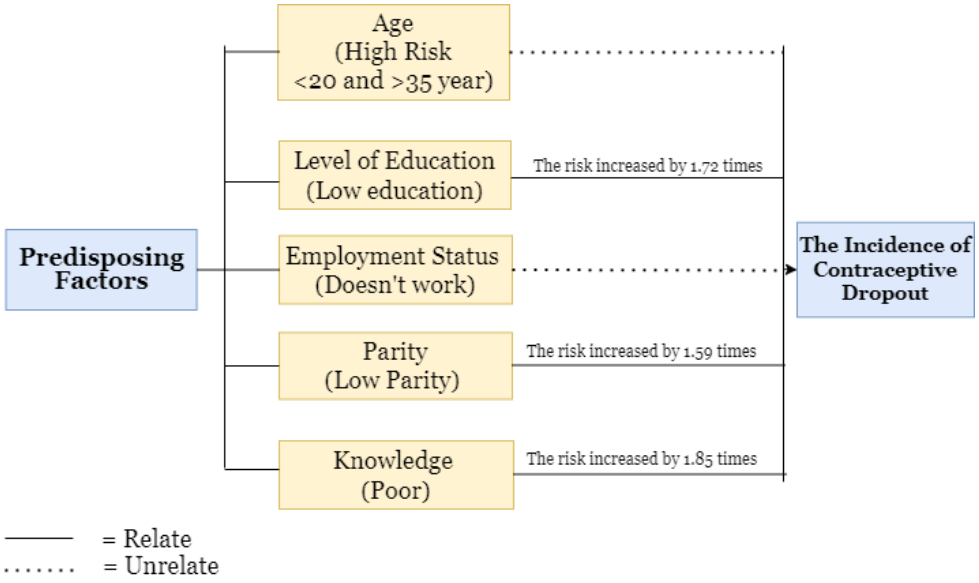

Figure Correlate between Predisposing Factors and the Incidence of Contraceptive Dropout

with the study of Sukardi et al.,[10] Afiati et al.,[11] and Ssebatta et al.,[12] who revealed that there was no relationship between age and contraceptive dropout. According to Chantal et al.,[13] it is influenced by the population's welfare, decision-making, and the lack of information provided by health workers.

From the respondent's education, the highest contraceptive dropout (44.67%) was found in low-education women. Setyawan[14] revealed that the higher a person's education, the easier it is to receive information and knowledge. Good knowledge will impact the length of a person in healthy behavior. Thus, someone with a high education level will not easily give up contraception without the need.[15]

The results of this study are in line with other studies, namely Safari et al.[16] and Kistiana et al.[17] The level of closeness in this relationship is 0.13. This value belongs to a very low correlation because the r-correlation is less than 0.199. However, the correlation is positive, which means that the higher the number of women of childbearing age with low education, the higher the incidence of dropping out of contraception. Low education can also increase the risk by 1.72 times in the incidence of dropping out of contraception in West Java.

According to Statistics Indonesia (Badan Pusat Statistik), employment status is the type of position a person has in doing work. A working person is defined when the activities he does earn income with a minimum of one hour of work without a break in a week.[18] Women who work also have a shorter time to go to health workers; hence, managing the pregnancy spacing is very

important because it is to maintain the carer and support the family's economy.[19]

In a study by Antarini,[20] family income has a huge influence on increasing health financing, including the cost of contraception. However, it can be influenced by the availability of mobile phones and the Internet, which helps non-working mothers find information to deal with contraceptive issues. This study is in line with Wijayanti,[19] Sappan et al.,[21] and Abraha et al.,[22] that employment status is not related to the dropping out of contraception.

Parity is the number of children born to women.[23] The parity is low if the mother has given birth fewer than twice, while the parity is high if the mother has given birth more than twice.[24,25] This finding found that low parity women (43.05%) experienced contraceptive dropout. This study is in line with the research of Anggraeni et al.,[4] Belete et al.,[26] and Weldemariam et al.[7]

This study indicates that mothers with fewer than two children are prone to dropping out of contraception because they want more children.[4] Meanwhile, high parity still uses contraception because they do not want to have more children and feel they are old. The closeness of this relationship is 0.24 or relatively low because the correlation coefficient range from 0.20–0.399. This value indicates a positive direction. The more mothers with the number of children fewer than two, the higher the incidence of contraceptive dropout in West Java. The risk increases by 1.59 times.

The last category is knowledge. Knowledge is the dominant factor that shapes one's actions. This study found that knowledge in West Java was lacking, namely by 46.51%. This study is in line with the researchers Amru[27] and Aladaham et al.[28] The better a person's knowledge about contraception, the more they want to use contraception. However, the lower the knowledge about contraception, the greater the tendency not to use or stop using contraception.[6] Moreover, the healthcare provider is the main source of information, and women significantly consult healthcare providers more than men.[28]

The closeness level of the relationship between knowledge and the dropping out of contraception is 0.16 or very low. However, this value provides a positive direction, meaning that the more mothers who have insufficient knowledge, the higher the incidence of dropping out of contraception. Insufficient knowledge also contributes 1.85 times to increasing the incidence of contraceptive dropout in West Java.

The high incidence of contraceptive dropout still needs attention and must be addressed immediately. Mothers with low education, having children fewer than two, and less knowledge will have the opportunity to stop using contraception. It shows the importance of promoting contraception to women of childbearing age between 10–49 years with marriage status, low education, having children fewer than two, and low knowledge level.

The role of midwives can be to motivate the importance of using contraception and provide informed choices regarding its types and side effects, respectively. And then providing counseling to guide clients to get suitable contraceptives for themselves. Regarding and guiding how to handle side effects so that mothers are convenient and continue to use contraception. Therefore, contraceptive service standards should be implemented to prevent the incidence of contraceptive dropout.

As for suggestions to BKKBN of West Java is still increasing women's knowledge through media. Based on research SKAP in 2019 that the most accessed media by targets are television, posters, and banners. Therefore, it can be used in the media for the health promotion of contraception. In addition, insert key messages related to knowledge of contraception in the community. Hence the family planning information in these communities can increase.

This study uses secondary data from the SKAP 2019, so the data cannot explore the use of contraceptives every month, and the independent variables were limited. Therefore, it recommends further study to use SKAP 2019 data as the basis for research and primary data to explore the use of contraceptives every month. In addition, it can explore other predisposing factors, such as income levels and attitudes, and explore reinforcing and enabling factors. Also, there is a need to emphasize the health promotion of contraception, especially for women of childbearing age with marital status, low education, having children fewer than two, and low knowledge level. In addition, contraceptive service standards should be implemented to prevent the incidence of contraceptive dropout.

Conclusions

There is a relationship between predisposing factors such as education, parity, and knowledge

with contraceptive dropout. Meanwhile, age and employment status have no relationship.

Conflict of Interest

There was no conflict of interest.

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RESEARCH ARTICLE

Effect of Internet Self-Efficacy on the Adherence of Middle Adulthood M-Health Users with Online Trust Behavior

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Abstract

Adherence to treatment regimens is a significant challenge faced by patients with chronic illnesses and healthy individuals, including through m-Health—a new model of remote health delivery via mobile phones. Middle-aged adults often need more internet skills, especially concerning internet self-efficacy and online trust behavior in health services. This study aims to elucidate the relationship between internet self-efficacy and adherence to medical advice among middle-aged m-Health users, mediated by online trust behavior. A cross-sectional study was conducted from 4 July to 4 September 2022, involving 214 respondents selected through convenient sampling from various cities and regencies in Indonesia. Data were collected using online forms distributed to the participants. The statistical analysis employed a structural equation model (SEM) with the LISREL version 8.7. The results showed a chi-square value of 438.61, df=187, p=0.00000, RMSEA=0.079, NFI=0.93, NNFI=0.95, CFI=0.95, and IFI=0.95. These findings indicate that online trust behavior successfully mediates the relationship between internet self-efficacy and adherence. However, internet self-efficacy does not directly affect adherence. This means that adherence will increase when trust in health services.

Keywords: Adherence, internet self-efficacy, m-Health, online trust behavior

Introduction

The utilization of m-Health technology holds the potential to enhance access to better and more affordable healthcare, even for patients residing in remote areas or those with low socioeconomic status. Recognizing the significance of health, there is an increasing need to seek health information through the internet. With the rapid proliferation of mobile phones, the use of long-distance health information delivery via cell phones, such as m-Health, is becoming increasingly prevalent.[1–5]

In Indonesia, digital health services have experienced significant growth, particularly in the last two years, with a notable increase in users. According to a survey conducted by Deloitte Indonesia, approximately 84.4% of digital health service users expressed satisfaction with the provided services. The satisfaction reported encompassed practicality, convenience, affordability, and the availability of a wide range of features for users to choose from.[6] As the number of users of digital health services continues to rise, it can be observed that health application users are increasingly being recognized within the community.

Research on adopting the Western m-Health application has shown its popularity and usage across different age groups. A study examined m-Health users in middle age in China.[7] The findings indicated increased adoption of m-Health usage, which decreased physiological conditions. However, the study also identified a lack of hospital service support, positively influencing the intention to use m-Health.

In Indonesia, the use of m-Health, particularly among individuals above the age of 45, shows lower rates compared to younger age groups.[8]

Trust in health application services becomes crucial as online health services continue growing. Trust plays a significant role in helping individuals overcome perceptions of uncertainty and risk.[9] When individuals trust online health information and find it high quality, they are more inclined to seek online health information again in the future.

The utilization of m-Health among individuals in middle adulthood is less prevalent than in the younger age group. This is attributed to declining physical condition, affecting internet usage skills and lowering internet self-efficacy.[10,11] With the

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advancement of technology that provides online health services, self-efficacy has become a crucial factor in technology and information system usage.[12]

Internet self-efficacy is a construct developed by Eastin and LaRose,[13] rooted in Bandura et al.'s[14] self-efficacy theory. Internet self-efficacy refers to an individual's belief in their ability to manage and utilize the internet to achieve desired outcomes effectively. The correlation between internet experience, expectations, internet use, and internet self-efficacy ratings was significant.[13]

In this study, researchers employed the self-determination theory to explain adherence to medical advice. This theory elucidates the role of intrinsic motivation in guiding individuals toward activities that can enhance their well-being.[15] This study aims to elucidate the relationship between internet self-efficacy and adherence to medical advice among middle-aged m-Health users, mediated by online trust behavior.

Methods

A cross-sectional study was conducted from 4 July to 4 September 2022 by distributing questionnaires via Google Forms. The respondents who were willing to complete the research questionnaire and met the research criteria totaled 214 respondents from 39 cities/districts in Indonesia. They consisted of 121 women and 93 men, with the majority having an undergraduate level of education. This research has been approved by the Research Ethics Committee of Konsorsium Psikologi Ilmiah Nusantara, number 047/2022.

All the questionnaires utilized in this research are reflective, and three scales were employed. The Health Care Climate Questionnaire (HCCQ) was used to measure adherence.[16] It comprises 15 items that assess three dimensions: autonomy, competence, and relatedness. The scale uses a Likert scale format for self-reporting. The reliability test on this scale yielded a coefficient of 0.890, indicating high reliability.

To assess the ability to navigate the internet, the researchers utilized the internet self-efficacy scale developed by Eastin and LaRose[13] and adapted it for this study. This unidimensional scale consists of eight items. The reliability test on this scale yielded a coefficient of 0.754, indicating good reliability.

The researchers employed the online trust behavior scale adapted from McKnight and Chervany[17] to measure trust in online health services.This scale encompasses three components: integrity (four indicators), benevolence (two indicators), and competence (three indicators). After conducting a reliability test using Pearson's correlation, it was determined that five items out of the initial 44 were invalid, resulting in a final set of 39 items. The proposed model was tested using structural equation model (SEM) analysis, utilizing the LISREL version 8.7.[18]

Data collection for this study involved conducting surveys among middle-aged adults residing in various regions of Indonesia who use health applications (m-Health). The health applications available for access in Indonesia include Alodokter, Halodoc, GrabHealth, SehatQ, Alomedika, Konsuldok, Go-dok, KlikDokter, YourDoctors, MySiloam, and YesDok.[8]

In this study, a non-probability sampling technique was used.[19] The inclusion criteria for the research subjects in this study were as follows: (1) 45 to 60 years old who actively use m-Health applications; (2) Minimum of high school level; (3) Have downloaded an m-Health application for the purpose of consulting with doctors regarding their health conditions; (4) Are general patients who are not currently undergoing long-term treatment and do not have comorbidities.

Before data collection, the ethical principles of research were communicated to the participants, starting with the provision of an informed consent form. The participants were provided with clear and easily understandable information about the nature and purpose of the research. The participants were also assured that their personal and demographic information would be treated confidentially, maintaining their privacy and anonymity throughout the study.

Results

Table 1 shows that most respondents using m-Health based on gender are female (56.54%), the application is Halodoc (72.9%), and the reasons are convenience and practicality (61.21%). Respondents revealed that transactions through health applications (m-Health) were safe (91.12%). Meanwhile, the adherence level of middle-aged users is moderate (72.9%).

The results of a confirmatory factor analysis (CFA) test and the loading factor for each variable are shown in Table 2. Results show the t count value exceeds the t table value. This indicates that

Table 1 Frequency Distribution of Respondent Characteristics

Characteristics	n=214 (%)
Gender	
Male	93 (43.46)
Female	121 (56.54)
m-Health used	
Halodoc	156 (72.90)
Alodok	17 (7.94)
Mobile JKN	13 (6.07)
Telemedicine	12 (5.61)
BNI-Life	2 (0.93)
Garda medika	1 (0.47)
Grab-health	1 (0.47)
Klikdokter	6 (2.80)
Mi-health	1 (0.47)
RS Avisena	1 (0.47)
Samsung health	2 (0.93)
Yakes mobile	1 (0.47)
We+	1 (0.47)
Reasons for using health service	
Convenience and practicality	131 (61.21)
Other people's → recommendations	36 (16.82)
Reliability	8 (3.74)
Completeness of features	9 (4.21)
Health information	30 (14.02)
Transactions through health applications (m-Health)	
Safe	195 (91.12)
Unsafe	19 (8.88)
Adherence level of middle-aged users	
High	30 (14.02)
Moderate	156 (72.90)
Low	28 (13.08)

online trust behavior has a significant effect on adherence behavior, and internet self-efficacy has a significant influence on online trust behavior. In contrast, internet self-efficacy has an insignificant effect on adherence behavior.

The LISREL section 8.7 statistical test shows the following values: chi-square=438.61, df=187, p=0.000, and the root mean square error of approximation (RMSEA)=0.079. The calculated value of the model fit index is obtained (Table 3).

Table 4 shows that online trust behavior significantly mediates the effect of internet self-efficacy on adherence behavior.

Discussion

The theoretical model of adherence behavior in middle-aged m-Health users in this study aligns with the empirical data. Both internet self-efficacy and online trust behavior, acting as mediator variables, were predictors of adherence behavior. The purpose of testing this theoretical model in the study was to explain the mechanism of the relationship between the independent variable (internet self-efficacy and online trust behavior) and the dependent variable (adherence behavior).

Based on the study results, it was discovered that the adherence components of middle-aged m-Health users fell into the moderate category. This indicates that most m-Health users exhibited moderate compliance with medical advice. Despite being in the moderate category, this finding suggests that these m-Health users were willing to modify their behavior and adhere to medical advice. Furthermore, the study revealed that the users internalized the care environment, serving as a support to fulfill their psychological needs. These psychological needs include autonomy, competence, and relatedness.[20]

The study results demonstrate that the adherence behavior model aligns with the empirical data. This model explains that adherence is a behavior that can be predicted to either increase or not increase, both directly and indirectly, while individuals are within and after

Table 2 Direct Effect of the Independent Variable on the Dependent Variable

Direct Effect	Coefficient Score	Standard Error	t Count × t Table	R^2	Results
Internet self-efficacy → adherence	0.043	0.067	0.65<1.97	0.48	Insignificant
Online trust behaviour → adherence	0.61	0.069	8.88>1.97	0.48	Significant
Internet self-efficacy → online trust behavior	0.37	0.070	5.24>1.97	0.15	Significant

Table 3 Model Fit Index

Fit Index	Fit Value	Criteria	Conclusion
RMSEA	0.079	<0.08	Fit
Normal fit index (NFI)	0.91	>0.90	Fit
Non-normal fit index (NNFI)	0.93	>0.90	Fit
Comparative fit index (CFI)	0.95	>0.90	Fit
Incremental fit index (IFI)	0.95	>0.90	Fit

Table 4 Indirect Influence

Indirect Effect	Coefficient Score	z Sobel × t Table	p	Results
Internet self-efficacy → online trust behavior → adherence	0.37×0.61=0.226	4.54>1.96	0.000	Significant

leaving the online healthcare environment.

The direct relationships with adherence behavior were tested through multiple pathways: (1) Internet self-efficacy was found to have a direct effect on adherence behavior; (2) Online trust behavior was found to have a direct effect on adherence behavior; (3) Internet self-efficacy was found to have a direct effect on online trust behavior; (4) Internet self-efficacy was found to have an indirect effect on adherence behavior, which was mediated by online trust behavior.[21]

This research integrates self-determination theory with health behavior and supports consistent findings. It suggests that when individuals, in this case, patients, have psychological needs for autonomy, competence, and relatedness supported in the healthcare process, they are more likely to actively engage in their treatment and achieve better outcomes over time.[20]

This study also investigates the role of trust in online health services in influencing patients or users to utilize medical applications, emphasizing the significance of trust for patients. Patients who do not trust online health services may be reluctant to use them, even if these services are beneficial. Therefore, trust is a crucial factor that needs to be fostered and supported to ensure the continued utilization of online health services.[22,23]

From the study results, it is evident that online trust behavior serves as a mediator variable between internet self-efficacy and adherence behavior. The findings also emphasize the importance of trust in online health services, particularly when seeking online health information. This indicates a positive relationship between patient/user trust and the website. Trust plays a crucial role in online health services in the context of the intention to use health applications. The study reveals a positive relationship between benevolence and trust in the competence of the website.[24]

Expanding on previous research, this study provides insights into how user trust influences intrinsic motivation and the intention to continue using online health services. Competency beliefs, which reflect the users' perception of the website's ability to provide relevant information and assist in solving health-related problems, play a significant role in this relationship. These findings are consistent with the perspective put forth by McKnight and Chervany,[17] suggesting that online health service providers, or websites, should prioritize user beliefs regarding the competence of the website.

Conclusions

This study concluded that middle-aged m-Health users with a higher belief in their abilities and skills to use the internet tend to be more diligent in searching for the health information they require. The study also indicates that individuals who have had negative or unpleasant experiences with digital technology may display less willingness to actively involve themselves and take responsibility for their health.

Conflict of Interest

There is no conflict of interest in this study.

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