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Error Rate Factor In Malaria Microscopic Examination By The Health Analyst Students

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Abstract: Microscopic examination of malaria is needed to help diagnosis for a symptom of malaria. Standard error rate of malaria examination is the amount of ≤ 5% [5]. This study aims to determine the error rate factors that occurs in malaria microscopic examination by students' Health Analyst Department Health Polytechnic Surabaya. This study is an observational descriptive study of qualitative analysis techniques and methods of this study is cross sectional. The number of sample in this study were 62 D3 and D4 degree fourth semester students' Health Analyst Department Health Polytechnic Surabaya. This Research was done on the implementation of the pre-analysis (election unfit microscope for use and preparations are well preserved); the analysis (Reading preparation on Plasmodium falciparum tropozoites and gametocytes stadiums) and the post-analysis (microscopic examination results of Plasmodium Falciparum malaria tropozoites and gametocytes stadiums). The error rate of reading microscopic examination malaria Plasmodium Falciparum gametocytes and tropozoites stadium is 4.83% ≤ 5%. The microscopic examination of Plasmodium falciparum malaria tropozoite has higher error rate than; it is about 3.22% ≤ 5%. By Chi-Square Test, the use of the microscope has a relationship with readings examination plasmodium falciparum tropozoites and gametocytes stadiums as much as p=26,172a> 13.964 (α = 0.05).

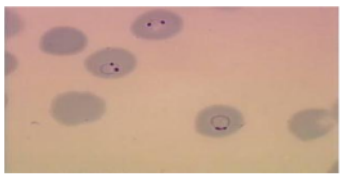
Index Terms: Malaria Plasmodium Falciparum, error rate factors, microscope examination, pre-analysis, analysis, post-analysis, error rate.

1. Introduction

Achievement of competence in a microscopic practice of malaria requires skills and tools that meet the standards. The factors causing misdiagnosis could be happened in pre-analysis, analysis and post-analysis. The research has been done to indentify error rate factors of malaria examination for examiners of laboratory. Error rate of malaria examination still happens especially in remote area namely Borneo, Sulawesi and East Southeast Nusa. Belu Regency of East Southeast Nusa province occured error rate with Kappa value (0,00-0,20) as much as 35,2% on microscopic examination of malaria[6].

2. Literature Review

A microscope is an essential tool for the diagnosis of a disease. The microscope has precision components and requires careful care to prevent damage to mechanical and ocular components and to stop the growth of fungus that can blur the lens [2]. A microscope is an instrument that is filled with the smallest part that is apparent. The microscope performs three tasks: generating magnification, separating the smallest part of the image (resolution), showing visible parts of the eye, camera or other imaging tools (contrast).[1] Malaria is still a serious public health problem worldwide. Malaria is caused by parasites in the blood, the parasite is very small and can only be seen with high magnification.[8] Error rate is the number of laboratory errors that states the percentage of error readings / slides made by the first examiner of laboratory after cross check by other referral laboratories. This figure describes the quality of microscopic slide reading directly to the first examiner laboratory [5]



Figur 1. *The young tropozoite form of Plasmodium falciparum [3]*

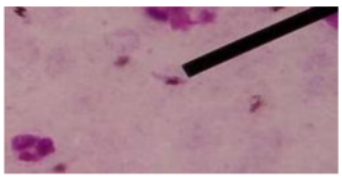


Figure 2. *Plasmodium falciparum macrogametocyte form [3]*

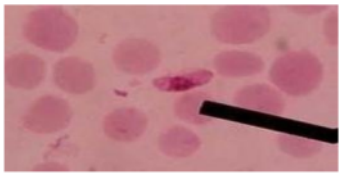


Figure 3. *Plasmodium falciparum microgametocyte for [3]*

3. Research Conceptual Framework

Factors can affect the error rate in 3 stages of pre analytic, analytic and post analytic. Pre-analytics include the characteristics of examiners (students), and laboratory facilities and infrastructure. Characteristics of the examiner include age, sex, education level, attendant slide load, eye health status and training status. The examiner's characteristic is not subject to treatment. Laboratory facilities and infrastructure are given treatment that is the selection of microscope quality and slide glass (preserved preparation malaria Plasmodium Falciparum stadium tropozoite and gametocyte). A good microscope is easily moved on the mechanical part and there is no fungus in the ocular and objective lens [4]. Preparations are made to be clean ie the preparations without precipitate staining substances. Preparations are also not too thick, thickness size can be assessed by placing a thick blood preparation on the watch. When the needle of a watch can still be seen vaguely indicate the exact thickness [8]. In addition to using a watch can also be by placing a thick blood preparation on the newspaper, if the writing under the paper preparat still read, meaning the drip was good enough [8]. Analysis includes work procedures ie reading of dosage (Plasmodium Falciparum at gametocyte stage and tropozoite), while fixation and staining are not

treated. The reading stages of the malaria examination include 9 steps including 1) checking the condition of the microscope before carrying out the inspection (such as a centralized mechanical board, 10x magnification position of nosepiece, board at the lowest position, free of immersion oil); 2) Adjust the light intensity; 3) Ensure the lens of enlargement 10 times in accordance with its position; 4) Placing the slide on the stage and pinning it with a right center clamp; 5) Adjust the slide position using stage controls; 6) Focusing the specimen using fine knob / macro focus rotation; 7) Rotating the nosepiece according to the desired magnification until the best focus is found; 8) Placing the koehler's illumination ie adjusting the diaphragm and high-low condenser; 9) When finished performing examination restores the focus knob position, mechanical board, nosepiece position, and light intensity position, and clean oil immersion [8]. Post analysis includes results and reporting results which are the result of microscopic examination of Plasmodium Falciparum malaria tropozoite stage and gametocyte. The tropozoite stages have the following features in the form of rings, there are two chromatins, marginal forms, red blood cells are not enlarged, and parasitic cytoplasmic parasite is located at the edges of the erythrocytes (accole or appliqué form). In advanced tropozoite form contains Maurer dots [3]. The gametocyte stages have the following characteristics of slim bananas, dense core in the middle, pigment around the core, gray blue cytoplasm (macrogametocyte) and fat banana, non-solid core, pigment around the core, pale red blue cytoplasm [3].

3 RESEARCH METHODS

This type of research is an observational description with qualitative analysis technique. The method of this research is cross sectional. The sample was taken from microscopic examination of fourth semester students of Prodi D3 and D4 Health Analyst who have obtained material of microscopic examination of malaria in Health Analyst Department Health Polytechnic Surabaya as many as 73 students. This research use formulation to determine the number of samples / participants from 73 students Health Polytechnic Surabaya. The calculation gave the number of research samples was 62 students. Equipments and materials used in this research include: microscope, preserved malaria Plasmodium Falciparum media stadium tropozoit and gametosit, ether alcohol, oil immersion, lens wipes, synthetic gloves and mask. Error rate is a reading error preparations / preparations made by students dengn calculation: the number of error readings multiplied 100% and divided by the number of readings that are read. The error rate factors for microscopic examination of malaria are 1) pre-analysis implementation (proper selection of microscopes and good preserved preparations); 2) analysis implementation (reading of media (Plasmodium Falciparum at gametocyte and Tropozoite stage) and 3) post-analysis implementation (microscopic examination of Plasmodium Falciparum Malaria tropozoite and gametocyte. Microscopic examination of malaria is a microscopic examination at 100x magnification to identify the presence of gametocytes and tropozoites in Plasmodium Falciparum.

1. Students were required to choose a suitable microscope and the qualified media for examination.
2. Observe the stages of microscope use by assessing the students in using the microscope, the use of ocular lens, objective lens, diaphragm, condenser, macro and micrometer use, the use of immersion oil. In addition, it assesses the cleaning of microscopes by students after the use of a microscope.
3. Observe and record the process of reading microscopic examination of malaria and reporting results of microscopic examination of malaria. Each student examined 2 plasmodium falciparum preparations. Each student performed a microscopic examination of gametocyte and tropozoite malaria stages of each preparation preserved Plasmodium Falciparum.
4. Recording time calculations starting from the microscope usage stage, performing microscopic malaria preparations to obtain the reading result, this is done within ± 10 (Ten) minutes [8].

4 RESEARCH RESULTS & DISCUSSION

This study aims to determine the error rate factor that occurs on the examination of microscopic malaria by students in Health Analyst Department of Health Polytechnic Surabaya. Based on the research results of Diploma 3 and Diploma 4 students showed that 3 students (4.83%) found one stadium (tropozoite or gametocyte) and 59 (95.16%) students who could find both tropozoite and gametocyte. Error rate of tropozoite and gametocyte readings (4.83%) in accordance with the standard error rate ≤ 5%. According WHO where if the error rate ≤ 5% then the quality of malaria examination is considered good. With the implementation of cross check preparations it can be seen the quality of the examination results. Accuracy of Plasmodium Falciparum trial of tropozoite and gametocyte stadium is very important because it involves the accuracy of malaria diagnosis. The researchers also obtained data in the analytic implementation that 98.387% of students could (step 5) adjust the slide position using stage controls and 96.774% of students (step 9) when finished conducting the examination restore the focus knob position, mechanical board, nosepiece position, and light intensity position, as well as clean oil immersion. Overall the students who did all the steps of using the microscope correctly were 95.16% students or about 59 students. In this study also obtained the examination time data that 51.61% of students require examination time from 3.02 minutes to 4.57 minutes and 48.38% of students need examination time from 5.05 minutes to 6.53 minutes. The fastest time a student needs for examination is 3.02 minutes. The longest time that students need for examination is 6.53 minutes. The ability of microscope use also affect the result of microscopic reading, it is shown by Chi-Square test that is $p = 26.172 > 13.964$ ($\alpha = 0.05$). Students who use microscopes with a minimum microscopic examination time of 3 minutes 2 seconds, and a maximum of 6 minutes 53 seconds examination time indicates that students are able to find Plasmodium Falciparum tropozoite stage and gametocyte. This is in accordance with the time of examination of microscopic malaria preparations within a period of approximately 10 minutes [8]. Students who have ability to use microscope with score 9 for step 1,2,3,4,6,7,8 that is 62 student (100%). Student with score of 8 microscope usage is about 61 (98.38%) student for step 5 and 60 student step 9. Microscopic examination of the Plasmodium Falciparum gametocyte stadium is easier than tropozoite. It can be seen from the research data that readings microscopic examination gametosit stage has a error rate of 1.61% while the reading of microscopic examination stage tropozoite has error rate 3.22%. Plasmodium Falciparum stadium tropozoite ring-shaped, there are two chromatin, parasite partially located

at the edge of the erythrocytes (accole form or appliqué form). In advanced tropozoite stages containing Maurer dots. While the gametocyte-shaped stage is slim banana, solid core in the middle, pigment around the core, gray blue cytoplasm [3]. Although gametocyte stadium form is easily recognizable but tropozoite stages are more commonly found in microscopic examination. This microscopic microscopic error study is not affected by age, gender, education level, and daily slide load and training status. This is due to the nearly equal age of students between 19-22 years. Sex factors are also the same where the sex of students dominated female gender about 80%. The same level of education is the fourth semester that has received the material of malaria examination. The student's slide load is 6 to 10 slides per practice. Status of training, almost all students have not received training on microscopic examination of malaria. The reading time of the examination has no relationship with the microscopic readings. Meanwhile, the examination reading time also has no connection with the use of a microscope. Error rate on microscopic reading of gametocyte malaria stage. Plasmodium falciparum is lower than tropozoite stage.

4 Conclusion

Error rate of microscopic examination of students of Diploma 3 and Diploma 4 of Health Analyst on Plasmodium Falciparum stadium tropozoite and gametocyte is 4.83 %≤ 5%. A higher error rate occurred in microscopic examination of Plasmodium Falciparum malaria stadium tropozoite by students of D3 and D4 Health Analyst at Health Analyst Department of Health Polytechnic Surabaya that is 3.22% ≤ 5%. Pre-analytic and analytic factors do not cause error rate on Plasmodium tropozoite and gametocyte stage trials. The factor causing the error rate is post-analytic execution which shows the student's ability to recognize the morphology of Plasmodium Falciparum tropozoite and gametocyte.

Acknowledgment

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