PRECISION AND ACCURACY ANALYSIS OF FORWARD METHOD PIPETTING AND REVERSE METHOD PIPETTING BY TECHNOLOGY OF MEDICAL LABORATORY STUDENTS PONTIANAK

✉ **Hendra Budi Sungkawa, Reni Endiani**

Departement of Medical Laboratory Technologi, Poltekkes Kemenkes Pontianak

E-mail : hendrabudis.budis@gmail.com

Abstract

Pipetting process of using standard pipetting and procedures greatly affect the precision and accuracy of the pipetting which have doneto get the right result and can be trusted then the result being must have lie within the control area and good in precision and accuracy. The purpose of this study is to know the difference of forward method pipetting and reverse method pipetting by Technology of Medical Laboratory Pontianak. The both of methods are have done and then have seen the difference. While the research design which have used in this research is observational analytics with comparative study. Based on the result of the research got result average precision of forward method is 99,25344% and average accuracy value of forwrd method is 96,5983% and average precision of reverse method is 99,65003% and average accuracy value of reverse method is 95,9493%. Of the results values then analyzed with statistic is Wilcoxon test and got result p = 0,000 (p<0,05) then Ha accepted, so there is a difference of forward method pipetting and reverse method pipetting by Technology of Medical Laboratory Pontianak.

Keyword : Pipetting, Forward method, Reverse method, Precision, Accuracy

INTRODUCTION

One of the efforts to fulfill the need for adequate health services by the government is by providing health care facilities in both diagnostic and medicinal areas. So with the availability of services is expected to support the improvement of people's welfare. The existence of qualified health personnel resources is one of the elements that are very necessary in the provision of health services (Riyono, 2007).

Quality assurance is a term used to describe a test method that can determine whether the method used has conformed to a predefined specification. Known two kinds of quality consolidation, namely internal quality and external quality. A test is said to be accurate when it is close to or equal to a true biological value, whereas precision is the possibility of recovering the price/value of laboratory tests performed repeatedly on the same material (Kosasih, 2008). In the processon laboratory work has three stages of the pre analytical stage, analytical stage and post analytical stage. To ensure that each stage takes place the

process well should be done to stabilize the quality of each stage (Riswanto, 2010). According to The Decree of the Minister of Health of the Republic of Indonesia (2007) Medical Laboratory Technology Experts are professionals who play an important role in health laboratory analysis. Medical Laboratory Technology Experts have Professional Standards in their field, one of which is pipetation.

One factor of error in the examination is that the laboratory officers pay less attention to the Operational Standards of the use and the procedure of the insertion so as to affect the results and also cause the results to be varied. There are two methods of piping forward Pipetting and Reverse Pipetting. Forward pipetting is a way of siphoning by sucking the liquid at the first suction pressure button, releasing fluid at the pressure of the second suction button. Reverse pipetting is a way of siphoning by sucking the liquid at the pressure of the second suction button, removing the liquid/control material at the first suction button pressure and then the remaining liquid at the tip tip is discharged to the disposal tip which is already avail-

able. At the use of this pipetting method forwarding is used when performing calibration on the tool, so the method of forward pipetting is used by laboratory personnel (J.P.Siregar, 2007).

RESEARCH METHODS

The research design used was observational analytic with comparative study design that is comparing the result of analysis with the actual value (Notoatmojo, 2010). Population in this research is student of Medical Laboratory Technology Pontianak semester 8 (eight) who got the value of A in the course of instrument. The sample is a student of Medical Laboratory Technology Pontianak who has met the criteria that have been determined.

Sampling technique used is Purposive Sampling that is sample determination technique with certain consideration (Sugiyono, 2015) with sample criteria willing to be respondents.

Determination of the number of samples by using Slovin sampling formula, is; n= $N/(1+N (e)^2)$.

Information:

n : number of samples
N : number of population
e : limit tolerance error

The total population is 41 people with a fault tolerance limit of 5%. So the sample is 38 peoples. Tools used in this research are watch glasses, mikropipet, analytical balance, blue tips and materials used in this research is mineral free water. Make sure that the balance sheet has been on for 30 minutes. Make sure the balance sheet shows zero. Locate the watch glass as a container of the sample. Revert to position zero again by pressing the tare button on the balance sheet. Perform sample sampling with forward method microphone. Remove the pinned liquid into the watch glass that is already on the analytical balance slowly. Read the scale shown on the digital display according to the unit of the balance sheet. Record the scale shown (do the same procedure for reverse method pickup).

RESULT AND DISCUSSION

Scraping is done with two different methods which first is the forward method and the second is the reverse method which is then the result of packing of each method in doing the weighing to know the weight of the results of the packet. The results of forward method piping has an accuracy of 96.5983% and on reverse method pickup has an accuracy of 95.9493%. The results of forward method piping is done has a precision of 99.25344% and reverse method pickup has a precision of 99.65003%. The normality test of the data used is by testing the skewness val-

ue divided by the standard error value of the skewness value. study program D IV Department of Medical Laboratory Technology, Poltekkes Kemenkes Pontianak.

Table 1. Test results Normality data by calculating the Skewness value

	Statistic Skewness	Standard error	Result
Result of forward method pipetting	-1,146	0,369	-3,0569
Result of reverse method pipetting	0,563	0,369	1,52575

From the results of normality test skewness data can be seen the results of comparison skewness and standard error obtained by the method of forward method of -3,10569 and reverse method of 1,52575 which the result exceeds -2 means the data is not abnormal distribution, then in the process of data processing used non test parametric ie Wilcoxon test.

The Wilcoxon test can be used to estimate or evaluate the frequency under investigation to analyze whether there are significant differences in the two dependent samples.

Table 2. Wilcoxon Test Results on SPSS program

	reverse_result-forward_result
Z	-4,633
Asymp. Sig. (2-tailed)	0,000

Table Test Statistics Wilcoxon test results are obtained by the value of significance (p=0,000<0,05) which means there is a difference piping forward method and reverse method by student of Technology Medical Laboratory Pontianak.

In theory the work process of the micropipet is very influential from the piston that is in the automatic pipettor that serves to pump the liquid to be moved with the volume that has been set. Furthermore, both of these methods have differences in the initial pressure applied to the piston so that it influences the volume of the fluid sucked and the second pressure applied to the piston so that it influences the volume of liquid released by the micropipette itself (University of Wisconsin, 2013).

Accuracy results in a study is strongly influenced by the value of inakurasi because the smaller the value of inakurasi the better the result, because this will result in greater accuracy value so that the level of accuracy will be higher. While the precision value is strongly influenced by the average value and standard deviation value, the smaller the standard deviation the better the research precision (Biohit, 2009).

Based on the DIN 12650 standard which is the basis for ISO standard manufacture, a standard that

regulates mechanical devices in the form of air-displacement and positive displacement of piston-operated pipettors and specific for accuracy and precision tests on volumetric devices, the maximum error for 100-1000 µl is +10 µl with a relative error of 1.0%.

Accuracy and precision are equally important, the results of measurements must be accurate and reproducible because accurate but non-reproducible results are also untrustworthy in an examination. The general relative accuracy in the piping is 1% or less, while the precision is less than 0.5% (J.P.Siregar, 2007).

Based on packet results both forward and reverse methods have accuracy values that are far from relative accuracy meaning error values in both methods are not within the maximum error value threshold, although the forward method has a higher accuracy value.In contrast to the precision value of the piping forward method and reverse method, reverse method has higher precision value and goes into the maximum threshold of the existing relative precision.

In accordance with previous research where the research examined the precision of forward method and reverse method, then it was found that there was a difference between the forward method and the reverse method with the result of reverse method having higher precision value than forward method. In this study also obtained the same results, that the reverse method has a precision value higher than the precision value of the forward method.

The result of accurate pipetting that is far from the relative accuracy is indicated from the average number of errors, deviation of repeated measurements to the regulated volume. This is due to uncontrollable disturbing factors in the study, temperature and electrical stability of the analytical balance used for weighing the results of the packet so that the value is systematically above the real value.

Biohit mentioned that some factors may affect the accuracy and precision of the micropipette, the first being the temperature. All pipettors are very sensitive to the temperature difference between the sample and the environment, the smaller the temperature difference between the pipettor, the tip and the sample to be piped the more accurate the result. Second is the viscosity of the liquid to be piped, in this study using aquadest so it does not cause problems when compared to fluids with high viscosity such as serum. The third factor is the experience of the pipette users, the more experienced the pipette users the more accurate and precise the results obtained. In addition to the temperature difference between the pipettor, tip and sample to be piped the air pressure and humidity differences in the environment also affect the accuracy and precision of the pipetting (Ylatufa, 1997).

CONCLUSION

Precision pipetting method forward by student of Technology Medical Laboratory Pontianak that is 99.25344% and accuracy 96.5983%, while precision pipetting reverse method by student of Technology Medical Laboratory Pontianak is 99.65003% and accuracy 95.9493%. From the statistical test results obtained significant value $p = 0.000$ ($p < 0.05$) so its means there is difference pipetting forward method and reverse method by student of Technology Medical Laboratory Pontianak.

REFERENCE

Biohit. (2009). *Akurasi dan Presisi pada Mikropipet.*

J.P.Siregar, C. (2007). *Praktik Sistem Manajemen Laboratorium Pengujian yang baik.* Jakarta: Buku Kedokteran EGC.

Kosasih, E. N. (2008). T*afsiran Hasil Pemeriksaan Laboratorium Klinik.* Tangerang: Karisma Publishing Group.

Notoatmojo, S. (2010). *Metodologi Penelitian Kesehatan*. Jakarta: Rineka Cipta.

Riswanto. (2010). P*emantapan Mutu Pra-Analitik Pemeriksaan Laboratorium.*

Riyono. (2007). *Pengendalian Mutu Laboratorium Kimia Klinik dilihat dari Aspek Mutu Hasil Analisis Laboratorium.* Surakarta: STIE AUB.

Sugiyono. (2015). *Metode Penelitian Pendidikan (Pendekatan Kuantitatif, Kualitatif dan R&D).* Bandung: Alfabeta.

The Decree of the Minister of Health of the Republic of Indonesia Number 370/Menkes/SK/ III/2007. Standar Profesi Ahli Teknologi Laboratorium Kesehatan Menteri Kesehatan Rebublik Indonesia (2007).

Ylatufa, S. (1997). L*iquid Handling Aplication Note.*