

Hand hygiene compliance and decreased incidence of multidrug-resistant organisms

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Abstract: The incidence of multidrug-resistant organisms (MDROs) is found increasing in hospitals, in which this case causes an increase in healthcare-associated infections. Healthcare-associated infections (HAIs) or nosocomial infection is an infection obtained in a hospital after more than 72 hours of being admitted to the hospital. This infection transmission by multidrug-resistant organisms is caused by the health workers' hand hygiene. One of the most effective prevention is to do proper hand hygiene, which results in breaking the chain of the multidrug-resistant organism incidence. Therefore, hand hygiene compliance may reduce healthcare-associated infection. This study aims to discover the relationship between hand hygiene and the multidrug-resistant organism incidence. This study was a descriptive research conducted by utilizing surveillance data of multidrug-resistant organisms in the intensive care unit (ICU) and the hospital ward in 2018, and the audit of WHO's protocols for hand hygiene was collected by the infection prevention and control committee from January to December 2018. The result showed that the rate of hand hygiene compliance in 2018 at the ICU was 66% while at the hospital ward, on average, was about 52%. There was a decrease in the multidrug-resistant organism incidence in 2018 compared to 2017; in the ICU, the highest percentage reduction was multidrug-resistant *Acinetobacter baumannii* (54.5%), and the lowest was extended-spectrum *beta-lactamase* (5.5%). Meanwhile, in the hospital ward, the highest percentage reduction was multidrug-resistant *Acinetobacter baumannii* incidence (50%), and the lowest was extended-spectrum *beta-lactamase* (4%). Therefore, the trend patterns show an inverse correlation between hand hygiene compliance and multidrug-resistant organism incidence in the ICU and the hospital ward.

Keywords: *hand hygiene, infection, multidrug-resistant organism*

1. INTRODUCTION

Hospital is a healthcare institution that organizes individual health services comprehensively that provides inpatient, outpatient, and emergency services [1]. Hospital is one of the most likely places to get infected since it contains a high microorganism population with virulent species that may be resistant to antibiotics [2].

Infection is still one of the health problems in the world, including Indonesia. Judging from the origin or acquisition of infection, it can derive from the community (community-acquired infection), or from the hospital environment (hospital-acquired infection), which was previously known as nosocomial infection. Since the infection origin often cannot be determined, the term nosocomial infection (hospital-acquired

infection) nowadays is replaced by a new term, that is healthcare-associated infections (HAIs) with a broader understanding, not only derive from hospitals but also from other health care facilities [3].

Infection is the term for the germ entry to the body so that they can replicate and cause damage to body tissues. Infection is one of the leading causes of death in the world. Based on the data of WHO in 2008, infections were among the top 10 causes of death in the world, with around 10.9 million deaths per 57 million people in the world. The percentage of HAIs was 9 % (the average range of 3-21 %) in hospitals around the world or more than 1.4 million inpatients in hospitals throughout the world [4].

The US Centers for Disease Control and Prevention (CDC) defines HAI as an infection that starts at or three days after hospitalization (day of hospital admission is day-1), as well as on the day when or after returning home [5].

For epidemiological purposes, multidrug-resistant organisms (MDROs) are defined as microorganisms, especially bacteria, which are resistant to one or more classes of antimicrobial agents. Although certain MDRO names describe resistance only in one agent (for example MRSA and VRE), these pathogens are often resistant to most of the available antimicrobial agents. These highly resistant organisms need a special attention in health care facilities. In addition to MRSA and VRE certain GNBs including those that produce expanded spectrum beta-lactamase (ESBL) and others that are resistant to some antimicrobial classes of agents, are of particular concern. In addition to *Escherichia coli* and *Klebsiella pneumoniae*, this includes a strain of *Acinetobacter baumannii* that is resistant to all antimicrobial agents. There is a lot of epidemiological evidence that MDROs infect from one person to another through the healthcare people's (HCP) hands. Hands are easily contaminated during the administration process or from contact with the environment surface near the patients. It is very important to know that without compliances, the recommendations issued for hand hygiene and the use of HCP gloves are more likely to dispatch MDROs to patients. Thus, a strategy to improve and monitor compliance is an important component of the MDRO control program [6].

Hand hygiene is the most important measure to prevent infection transmission based on infection prevention and control. The original study in this field was conducted at a maternity hospital in Vienna, Austria, in 1847. This study showed that mothers' mortality rates were significantly lower when health workers cleaned their hands with antiseptic agents. Some other studies have shown that health workers become contaminated during patients' routine care and transmit infectious diseases from patients to patients [7].

Proper hand hygiene can prevent the microorganism transmission and reduce the HAI frequency. Failure to do good and proper hand hygiene is considered as the main cause of HAIs and the MDRO spread in health care facilities. It has been recognized as an important contributor to the emergence of outbreaks. Based on the premise above, the Infection Prevention and Control Committee (PIRS) of PHC Hospital Surabaya has initiated a program to monitor the actual practice of existing standards. The program is in the form of internal audits, including hand hygiene audits using the principle of the five moments of hand hygiene. The principle comprises observations of officers' compliance with the five moments of hand hygiene implementation as long as the officers are in the patient's area and contacts in each health service activity. Therefore, the objective of this research is to know the relationship between hand hygiene and the MDRO incidence.

2. METHODS

2.1 Research design, population, sample, and variables

This study was conducted utilizing surveillance data of MDROs in the ICU and the hospital ward in 2018 and the audit of WHO's protocols for hand hygiene was collected by the infection prevention and control committee from January to December 2018

The location of the research was all wards and the ICU of PHC Surabaya Hospital. The population in this research was the officers of PHC Surabaya Hospital from various professions who make contact with patients and in an area with high risk of infection. The study sample was chosen by taking the random sampling of the officers each month alternately. Another activity is to record the MDRO incidence at the hospital both in the ward and in the ICU.

The research period was January-December 2018, and the observations were executed for 10-20 minutes or where there is a potential activity of contamination from the officers' hands.

2.2 Instruments

The instrument used in this study was the Handwashing Audit Data Collection Form.

RS PHC SUKARAYA													DATA COLLECTION FORM - AUDIT OF WASHING HANDS				
Unit / Room :						Date :						FIVE MOMENTS :					
Observer :						Start time :						Finish Time:					
Opp = opportunity /Hand washing requirement						Put the √ mark as appropriate.						1. Before making contact with patients					
												2. Before the aseptic procedure					
												3. After being exposed to the patient's body fluids					
												4. After making contact with the patient					
												5. After being exposed to the patient's environmental area					
Profession:				Profession:				Profession :									
Opp	Moment	Action	Gloves	Opp	Moment	Action	Gloves	Opp	Moment	Action	Gloves						
	1				1				1								
	2	Rub	on		2	Rub	on		2	Rub	on						
1	3	Air M	off	1	3	Air M	off	1	3	Air M	off						
	4	No	Terus		4	No	Terus		4	No	Terus						
	5				5				5								
Opp	Moment	Action	Gloves	Opp	Moment	Action	Gloves	Opp	Moment	Action	Gloves						
	1				1				1								
	2	Rub	on		2	Rub	on		2	Rub	on						
2	3	Air M	off	2	3	Air M	off	2	3	Air M	off						
	4	No	Terus		4	No	Terus		4	No	Continue						
	5				5				5								
Opp	Moment	Action	Gloves	Opp	Moment	Action	Gloves	Opp	Moment	Action	Gloves						

Figure 1. Data Collection Form - Audit of Washing Hands

2.3 Methods

The method employed was direct observation using guidelines based on the latest references according to the hand hygiene promotion recommended by WHO. It used the audit form following the Hand Hygiene guidelines in 2009 and could only be applied by the trained or knowledgeable PPIRS Committee who understood the methods and observation devices.

The observers made observations on the officers when doing five moments of contact with patients as follows.

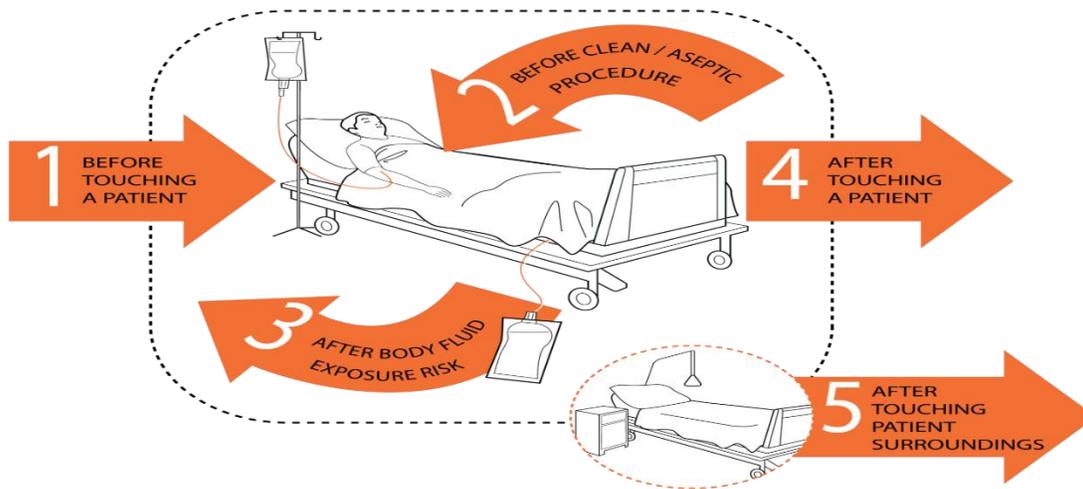


Figure 2. Five Moments of Hand Hygiene[9]

Besides, observations were also made on the patient zone, including the patients and objects around the patients, as well as to the treatment zone, which covered the entire surface in the treatment room outside a patient zone, including other patients and their own zones. There were many microorganisms, including the MDROs, in this treatment zone.

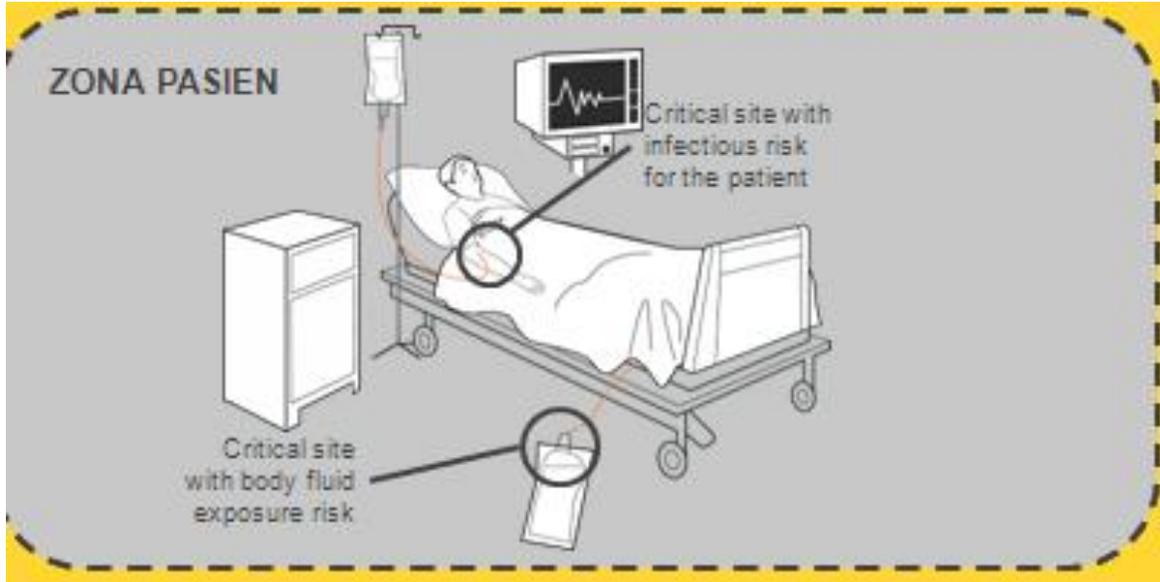


Figure 3. Microbe Transmission in the Patient Zone [9]

The method of calculating compliance value included collecting, tabulating, and analyzing the data employing the form of the handwashing audit activity. The observation recordings were filled out and written in the audit form column. Each row of the column was intended for one opportunity, namely the opportunity to do handwashing with five indicators recommended by WHO. During observations, if there was a handwashing act that was not following the actual indicators, it must not be recorded.

The handwashing act could be in the form of hand rub or handwash. If it was not done as indicated, then it was recorded as "No" washing hands. In the handwashing audit record form, it observed the proper utilization of gloves while evaluated the audit of the handwashing facility.

The results of the assessment using the handwashing compliance formula (%) were as follows:

$$\frac{\text{Number of times to handwashing (x 100)}}{\text{Opportunity amount}}$$

The calculation results for the expected quality indicators were above 85%.

2.4 Research framework

Surabaya PHC Hospital officers from January to December 2018 came to fill out the handwashing audit data collection form. The data obtained were then analyzed data related to hand hygiene compliance and Multidrug-Resistant Organism Incidence. The results of both will be drawn in conclusion.

3. RESULTS AND DISCUSSION

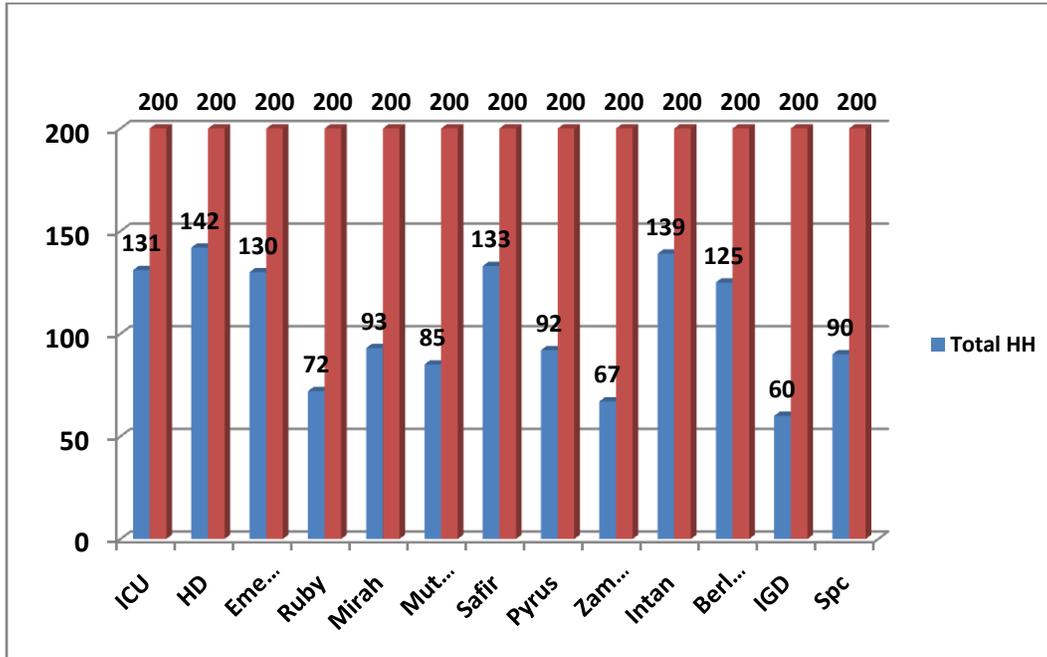


Figure 4. The Number of PHC Hospital's Hand Hygiene Implementation in 2018

Figure 4 illustrated the number of hand hygiene compliance compared with opportunity according to WHO criteria.

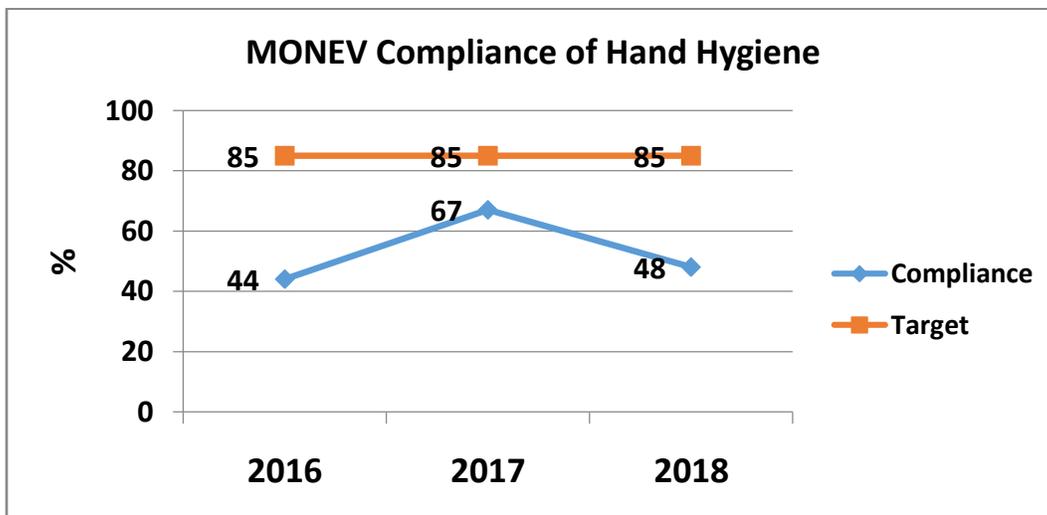


Figure 5. Monitoring and Evaluation Compliance of Health Officers' Hand Hygiene, PHC Hospital in 2016-2018

Figure 5 displayed the officers' hand hygiene compliance was still below the WHO target of 85%.

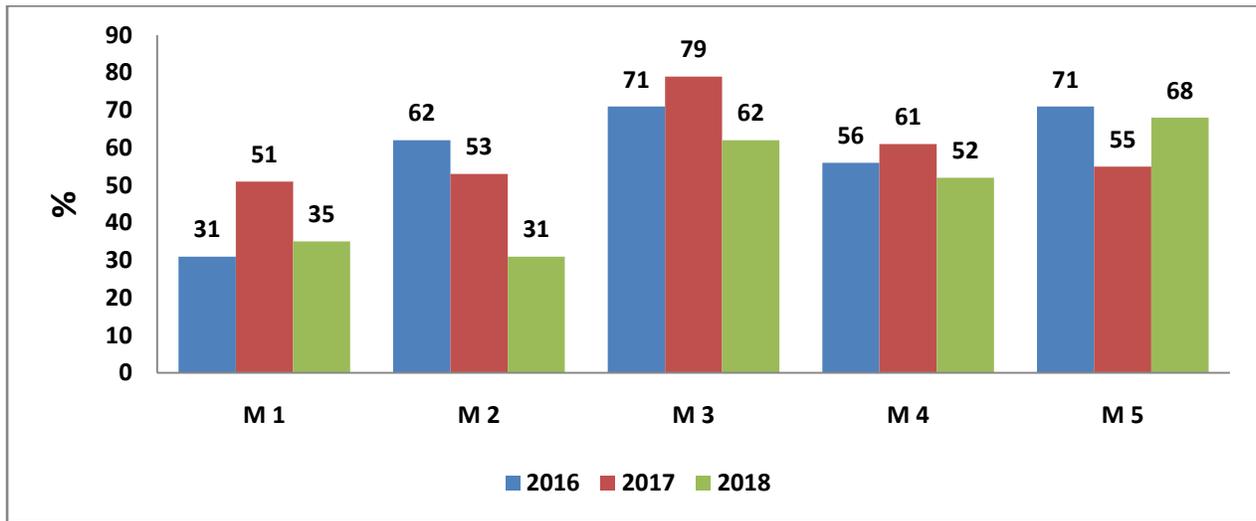


Figure 6. The Health Officers' Five Moments of Hand Hygiene Compliance at PHC Hospital in 2016-2018

Figure 5 shows the compliance of hand hygiene officers in 5 moments hand hygiene according to WHO criteria. Average below the WHO target of 85%. In Graphic 3, M 1 indicated the condition before the health officers making contact with the patients. Then, M 2 demonstrated the condition before the aseptic procedure was performed. Meanwhile, M 3 was the condition after the officers being exposed to the patients' body fluids. Also, M 4 showed the condition after the officers making contact with the patients. Lastly, M 5 was the condition after the workers being exposed to the patients' environmental areas.

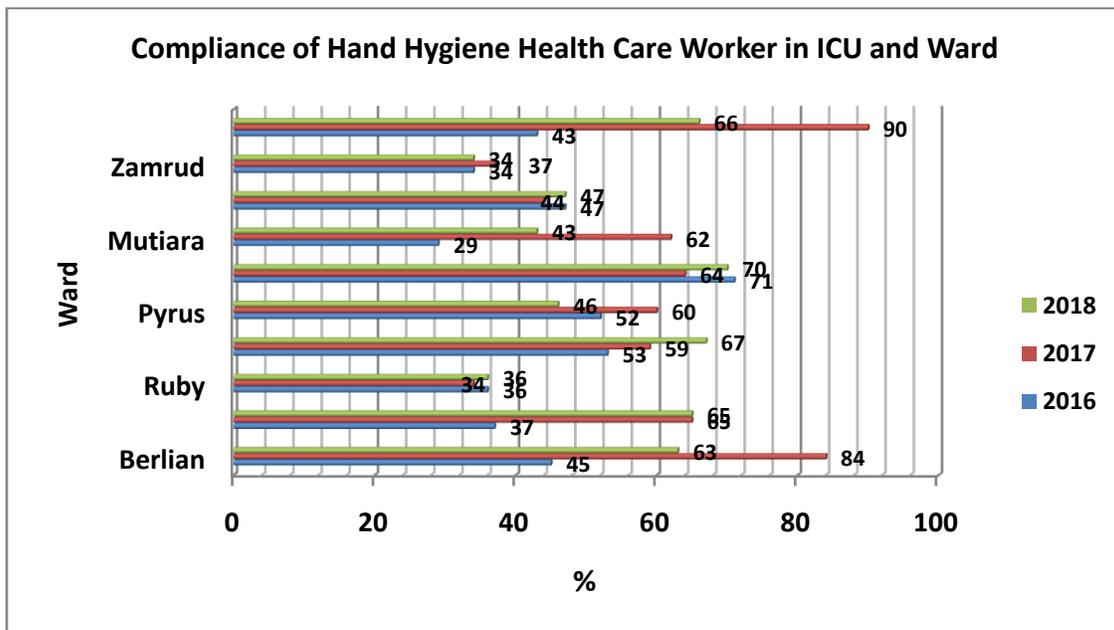


Figure 7. The Health Officers' Five Moments of Hand Hygiene Compliance in the ICU and Hospital Ward in 2016-2018

Figure 7 demonstrated that the handwashing compliance rate in 2018 in the ICU and the hospital ward, respectively, were 66% and 52%.

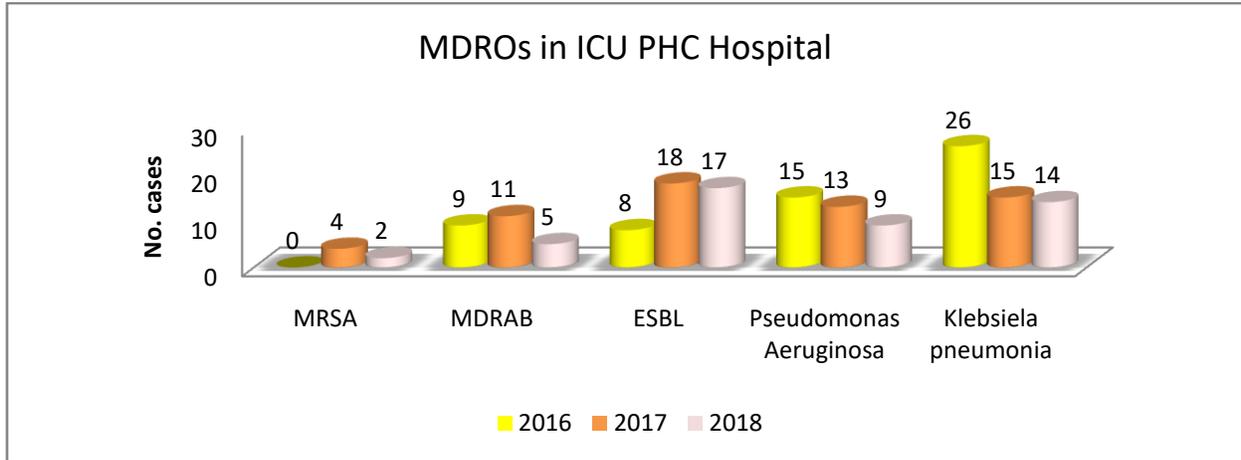


Figure 8. The Multidrug-Resistant Organisms in the ICU of PHC Hospital in 2016-2018

Figure 8 indicated a decrease in the MDRO incidence in 2018 compared to 2017 in the ICU. In this graphic, the organisms recorded were Methicillin-resistant *Staphylococcus aureus* (50%), *Acinetobacter baumannii* (54.5%), extended-spectrum *beta-lactamase* (5.5%), *Pseudomonas aeruginosa* (31%), and *Klebsiella pneumonia* (7%).

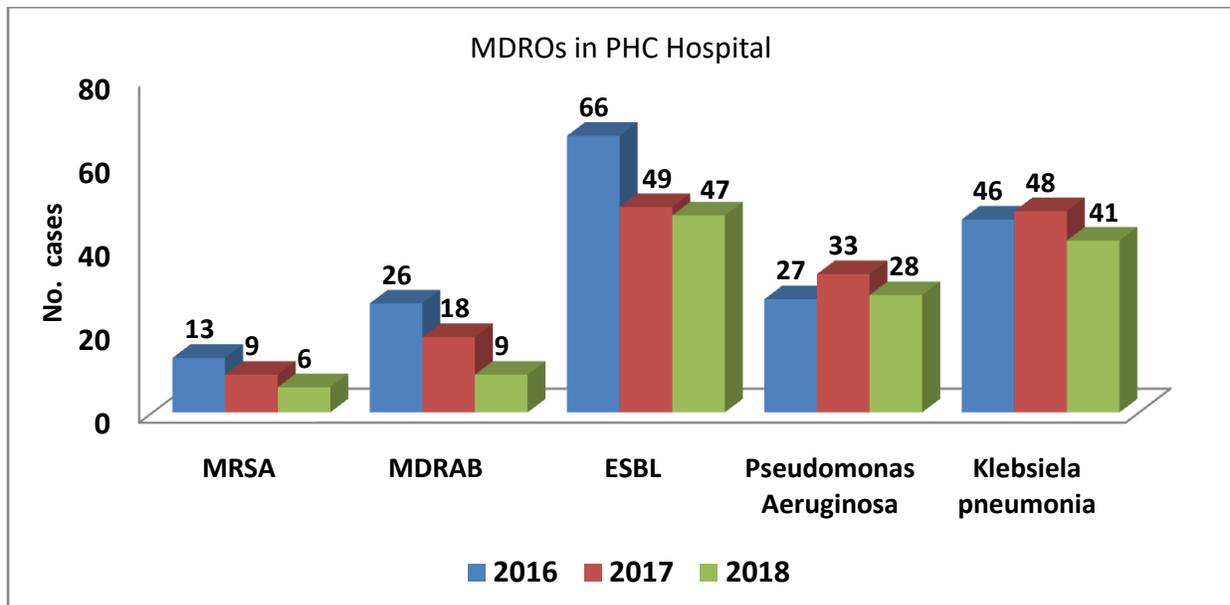


Figure 9. The Multidrug-Resistant Organisms in the Wards of PHC Hospital in 2016-2018

Figure 9 showed that there was a decrease in the MDRO incidence's overall cases in the PHC Hospital. In this graphic, the organisms were Methicillin-resistant *Staphylococcus aureus* (33%), *Acinetobacter*

baumanii(50%), extended-spectrum *beta-lactamase*(4%), *Pseudomonas aeruginosa*(15%), and *Klebsiella pneumoniae*(15%).

Another thing related to MDRO data in hospitals was a non-cheap cost factor for examining antibiotic resistance cultures for patients. Real effort needed to address non-compliance with hand washing. Other research indicated that reaction of the participants were positive for training, secondly they had applied skills and knowledge which they had learnt from training[8]. In this case, hand hygiene compliance status need for cooperation of all sectors within the hospital to prevent MDRO incidents.

4. CONCLUSION

The trend pattern shows the relationship between hand hygiene compliance and MDRO incidence both in the ICU and in the hospital ward.

5. RECOMMENDATION

The results of this study are preliminary data for hospitals in the Infection Prevention and Control division.

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