Health Belief Model Effect On Nurses Hand Hygiene Adherence

Sri Lestari Ramadhani Nasution[1*], Tan Suyono[2], Adrian Khu[3], Hans Pangestu Simarmata[4], Happy[5]

[1,2,3,4,5] Magister Program of Public Health, Faculty of Medicine, Dentistry and Health Sciences, Prima Indonesia University; Jl. Sampul, Sei Putih Barat, Medan Petisah, Medan, Indonesia.
[*] Corresponding author:
Email:srilestariramadhaninasution@unprimdn.ac.id

Abstract.
Healthcare acquired infections/HAIs (nosocomial infection) is a growing problem in developing and developed country around the world and one of the contributing factors in the increasing of morbidity, mortality and cost of treatment in hospital. One way to prevent HAIs is by increasing adherence of hand hygiene practice in healthcare workers, including nurses, especially in rooms with high risk of HAIs incidents. This study aims to understand the effect of health belief model (HBM) on the adherence of hand hygiene practice of nurses in rooms with high HAIs risk. A total number of 170 nurses who worked in high HAIs risk enrolled in this study. All nurses then asked to fill questionnaire which consist of demographic factors, experience, personal beliefs, cue to action, and self-efficacy. During this study, all nurses hand hygiene practice also observed directly by researcher. This study found that demographic factor, personal belief, cue to action and self-efficacy have no significant relationship with hand hygiene practice adherence (p>0.05), whilst modifying factor like experience shown to have significant relationship with adherence of hand hygiene practice (p<0.05). Demographic factor, personal belief, cue to action, and self-efficacy component of HBM can't predict the adherence of hand hygiene practice. However, modifying factor in HBM such as experience can predict the adherence of hand hygiene practice.

Keywords: *Health Belief Model, Healthcare Acquired Infection, Nurses, Hand Hygiene.*

I.   INTRODUCTION

Healthcare acquired infections (HAIs)/ nosocomial infection is a growing concern in today's healthcare system because it can increase the morbidity, mortality and cost of treatment of patient in hospital. This increase in morbidity, mortality and cost of treatment are quite significant so that it become a new health problem both in developing and developed country [1][2]. A meta-analysis study in 2015 about HAIs shown that HAIs prevalence in Southeast Asia is around 9% with mortality between 7-46%, much higher compared to HAIs prevalence in mainland China, which only about 2.98% [3][4]. Meanwhile, WHO report in 2011 shown that Indonesia national HAIs prevalence is around 7.1% [5]. Even though most of HAIs happened to inpatient individuals, HAIs also can occur in healthcare workers [5].

Adaption of optimum hand hygiene practice can decrease the incidence of HAIs, even in a limited setting. A study conducted by Nasution et al in 2016 comparing hand hygiene practice by using soap and water method to hand hygiene practice using alcohol hand rub shown that both methods effectively reduce the number of total plates count up to 59.55% and 47.2% respectively [6].Health belief model is psychology model that developed to explain and predict behavior change related to health, in relation with healthcare [7][8]. The core of HBM is how individual perception towards their health situation and surroundings and how it affects their individual behavior [9]. HBM consist of three parts, modifying factors, personal beliefs and action. The modifying factors consist of demographic factors such as age, sex, education, personal experience etc. Meanwhile, the personal belief consists of 4 main components: perceived susceptibility, perceived severity, perceived benefit, and perceived barrier [9][10][11][12]. Self-efficacy also often grouped into the personal belief [10][11].

II.   METHODS
Study Design

This study is a quantitative analytic study with cross-sectional design and using survey approach. This study aims to understand the effect of demographic factors, perceived susceptibility, perceived severity, perceived benefit, perceived barrier, cue to action, and self-efficacy toward the adherence of hand hygiene practice in nurses in high HAI risk rooms. This study conducted between September and October 2021. This study and its procedures had been approved by Prima Indonesia University Health Research Ethical Committee.

Population and Sample

Population of this is every nurse whom worked in high HAI risks room such as isolation room, ICU, NICU, and other inpatient room in Dr. R.M. Djoelham General District Hospital Binjai, totaling 170 nurses. This study using total sampling method to determine the sample from population, hence the number of samples in this study is 170.

Data Collection

All subject in this study was asked to fill a questionnaire which consist of 3 instruments, namely demographic factors instrument, personal belief instrument, and hand hygiene adherence instrument.

III. RESULT AND DISCUSSION

This study shown that out of 170 nurses works in high HAIs risk rooms in Dr. R.M. Djoelham General District Hospital Binjai, 113 (66.5%) of nurses adhere To the Standard Operational Procedure (SOP) of hand hygiene practice, while the rest (33.5%) did not adhere to the SOP of hand hygiene practice adequately.Data of this study shown that most of nurses works in high HAIs risk rooms are female (76.5%) and in the 41-45 years old age range (27.6%).

Most of the nurses have associate's degree qualification (54.7%), was a contract employee (67.6%), and work in Dr. R.M. Djoelham General District Hospital Binjai for 11-15 years (48.2%). (Table 1)Data on table 2 show that majority of nurses in high HAIs risk rooms never take part in nosocomial infection prevention training (74.1%), have sustain sharp object injury while working (58.2%), and contracted nosocomial infection from work (77.6%). But, most of the nurses never have direct contact with patient's blood or other bodily fluid.

Table 1. Demographic Factors and Hand Hygiene Practice Adherence

Variable	Adhere		Don't Adhere		Total (n/N)		p
	n	%	n	%	n	%	
Age							
20-25 years	11	91,7	1	8,3	12	7.1	
26-30 years	24	64,9	13	35,1	37	21.8	0,392
31-35 years	24	61,5	15	38,5	39	22.9	
36-40 years	24	68,6	11	31,4	35	20.6	
41-45 years	30	63,8	17	36,2	47	27.6	
Sex							
Male	30	75,0	10	25,0	40	23.5	0,251
Female	83	63,8	47	36,2	130	76.5	
Education							
Associate's Degree	64	68,8	29	31,2	93	54.7	0,535
Bachelor's Degree	46	65,2	24	34,8	69	40.6	
Master's Degree	4	50,0	4	50,0	8	4.7	
Employment Status							
Civil Servant	35	63,6	20	36,4	55	32.4	0,606
Contract employee	78	67,8	37	32,2	115	67.6	
Career							
1 – 5 years	29	67,4	14	32,6	43	25.3	0,878
6 – 10 years	31	68,9	14	31,1	45	26.5	
11 – 15 years	53	64,6	29	35,4	82	48.2	

This study in shown that the majority of nurses work in high HAIs risk in Dr. R.M. Djoelham General District Hospital Binjai have good and great perceived susceptibility, perceived severity, perceived benefit, and perceived barrier. Most of the nurses also have great self-efficacy and cue to action.

Table 2. Nurses Experiences and Hand Hygiene Practice Adherence

Variable	Adhere		Don't Adhere		Total (n/N)		p
	n	%	n	%	n	%	
Take part in Nosocomial Infection Prevention training							
Never	76	60,3	50	39,7	126	74,1	0,005
Once or more	37	84,1	7	15,9	44	25,9	

Variable	Adhere		Don't Adhere		Total (n/N)		p
	n	%	n	%	n	%	
Sustain sharp object injury while working (needle/ampule glass/scalpel/etc.)							
Never	59	59,6	40	40,4	99	58,2	0,032
Once or more	54	76,1	17	23,9	71	41,8	
Direct contact with patient's blood or other bodily fluid							
Never	77	61,1	49	38,9	126	74,1	0,015
Once or more	36	81,8	8	18,2	44	25,9	
Contracted nosocomial infection while working in hospital (chicken pox, TBC, hepatitis, typhoid fever, influenza, etc.)							0,031
Never	31	81,6	7	18,4	38	22,4	
Once or more	82	62,1	50	37,9	132	77,6	

On table 1-3, according to chi-square test, there are no significant relationship between hand hygiene practice with age, sex, education, employment status, career, perceived susceptibility, perceived severity, perceived benefit, perceived barrier, self-efficacy, or cue to action (p>0.05). But, personal experiences, such as take part in nosocomial infection prevention training, have sustain sharp object injury, have direct contact with patient's blood or bodily fluid, or have contracted nosocomial infection, have significant relationship with hand hygiene practice adherence (p<0.05).Overall Model Fit test result shown that addition of the independent variable to this study can improve the fitness of this model ($\chi2$⎯value>$\chi 2$table). Further test using Hosmer and Lemeshow's Goodness of Fit shown that this model is not poor fit (p>0.05).Determination coefficient test using Nagelkerke's R square value of 0.297 indicated that 29.7% of the hand hygiene practice adherence of nurses in high HAIs risk rooms can be explained by the independent variables of this study, while the 70.1% affected by factors which not observed in this study.

Logistic regression test between dependent and independent variables shown that dependent variables have adverse relationship with the independent variables, such as age (B=-0,023, OR=0,978), career (B=-0,023, OR=0,978), take part in nosocomial infection prevention training (B=-1,599, OR=0,202), have sustained sharp object injury while working (B=-0,737, OR=0,478), have direct contact with patient's blood or bodily fluid while working (B=-1,069, OR=0,343), perceived susceptibility (B=-0,180, OR=0,835), and perceived benefit (B=-0,024, OR=0,976). What it means is, if the independent variable shifted by one unit, the adherence of hand hygiene practice shifted lower in accordance with the respective OR of the independent variable. Meanwhile, the dependent variable also has linear relationship with other independent variables such as sex (B=0,491, OR=1,633), education (B=0,184, OR=1,202), employment status (B=0,255, OR=1,292), have contracted nosocomial infection while working (B=1,640, OR=5,155), perceived severity (B=0,279, OR=1,322), perceived barrier B=0,337, OR=1,400), cue to action (B=0,597, OR=1,807), and self-efficacy (B=0,553, OR=1,739). This meant if the independent variable shifted by one unit, the adherence of hand hygiene practice shifted higher in accordance with the respective OR of the independent variable.

Table 3. HBM's Personal Belief and Hand Hygiene Adherence

Variable	Adhere		Not Adhere		Total (n/N)		p
	n	%	n	%	n	%	
Health belief							
Perceived Susceptibility							
Great	22	66,7	11	33,3	33	19.4	0,805
Good	79	67,5	38	32,5	117	68.8	
Poor	12	60,0	8	40,0	20	11.8	
Perceived Severity							
Great	59	74,7	20	25,3	79	46.5	0,105
Good	49	59,0	34	41,0	83	48.8	
Poor	5	62,5	3	37,5	8	4,7	
Perceived Benefit							
Great	49	72,1	19	27,9	68	40.0	0,235
Good	44	59,5	30	40,5	74	43.5	
Poor	20	71,4	8	28,6	28	16.5	
Perceived Barrier							
Great	7	87,5	1	12,5	8	4,7	0,342
Good	59	67,8	28	32,2	87	51,2	

Variable	Adhere		Not Adhere		Total (n/N)		p
	n	%	n	%	n	%	
Poor	47	62,7	28	37,3	75	44,1	
Self-efficacy							
Great	95	68,8	43	31,2	138	81,2	0,362
Good	14	58,3	10	41,7	24	14,1	
Poor	4	50,0	4	50,0	8	4,7	
Cue to action							
Great	96	70,1	41	29,9	137	80,6	0,085
Good	12	57,1	9	42,9	21	12,4	
Poor	5	41,7	7	58,3	12	7,1	

Hand hygiene practice is one of the simplest, yet the most important measure against infection transmissions in healthcare settings [13][14]. This is due to the fact that most of infection agent transmission in healthcare settings are healthcare workers hands [5]. World Health Organization report on the burden of endemic health-care associated infection in 2011 issues eight key solutions and perspectives for improvement and control of HAIs, one being improving staff (healthcare workers) education and accountability [5]. One of the indicators of accountability of healthcare workers in preventing HAIs is the adherence of good hand hygiene practice [5].The main finding of this study is the adherence of hand hygiene practice of nurses in high HAIs risk rooms. This study finds that 33.5% nurses in Dr. R.M. Djoelham General District Hospital Binjai did not adhere to hand hygiene practice adequately. This figure is relatively higher than study conducted by Ghanbari et al in 2013 in Arak Medical Science University where 28.4% did not adhere to hand hygiene practice, whether by flowing water and soap or by using alcohol rub [15]. Meanwhile, a multicenter study in Shanghai by Zhou et al in 2010 shown that 82.6% nurses adhere to hand hygiene practice while working [16], much higher compared to the findings of this study. Study conducted by Nasution et al in 2016 shown that adequate hand hygiene practice, either by using soap and water or by using alcohol rub are effective to reduce the number of bacteria up to more than 40% [6]. The adherence of hand hygiene practice is necessary in order to prevent microorganism transmission between patient and healthcare workers, thus prevent HAIs [17][18][19]. By minimizing the risk of HAIs, adequate hand hygiene practice can lower the morbidity, mortality, lengths of stay/LOS, and cost of treatment [20][18][21].

Analysis of modifying factors of HBM such as demographic factors in nurses in high HAIs risk in Dr. R.M. Djoelham General District Hospital Binjai shown that there is no significant relationship between nurses age and education and adherence of hand hygiene practice (p>0.05). These results are in concordance to study by Kim and Kwon, where the findings are age and education can't predict nurse adherence of hand hygiene practice [22]. But this finding is in conflict with findings of Lim's study in 2011 on dental hygienist in hospitals and dentist clinics in Seoul, which found that age and education can predict nurse's adherence to hand hygiene practice (p<0.05) [23]. Kim and Kwon study also shown that length of career, and sex cannot predict the adherence of hand hygiene practice by nurses (p>0.05) [22]. Kim and Kwon, and Rianita and Suryani findings support this study's findings, where nurse's length of career and sex can't predict their adherence of hand hygiene practice (p>0.05) [22][24]. This study also attempts to analyze relationship between hand hygiene practice adherence and employment status. This study found that there is no significant relationship between employment status and hand hygiene practice adherence (p>0.05). The different findings among this study, Lim's and Kim and Kwon's can be explained by the difference in data collection methods [22][23]. Lim's and Kim and Kwon's study collect data solely by using self-reporting questionnaire without observation by an observant. Meanwhile, data collection of this study conducted by self-reporting questionnaire for the demographic factors, experience, and personal belief factors component, while the adherence of hand hygiene practice is conducted by direct observation by observant. These different method in data collection, especially in hand hygiene practice very influential toward the result. This is due to hand hygiene practice are hospital policy, which make every hospital employee when asked if they adhere to hand hygiene practice, they will tend to answer to show that they adhere to hand hygiene practice.

However, analysis of experience modifying factor of HBM shown that experience can predict hand hygiene practice adherence (p<0.05). Experience such as take part in nosocomial infection prevention

training; or have sustained sharp object injury while working; or have direct contact with patient's blood or bodily fluid; or have contracted nosocomial infection while working are significant predictors of hand hygiene practice adherence ($p<0.05$).Analysis of personal belief component of HBM effect on hand hygiene practice adherence shown that perceived susceptibility, perceived severity, perceived benefit, and perceived barrier cannot predict the adherence of hand hygiene practice in nurses in Dr. R.M. Djoelham General District Hospital Binjai ($p>0.05$). These finding are in concordance with findings by Ghanbari et al, and partially with Kim dan Kwon, Gunarni and Aziz, and Jeon [15][25][26][[22]. Ghanbari et al study found that all personal belief component of HBM cannot predict adherence of hand hygiene practice in nurses in hospital ($p>0,05$). On the other hand, Kim dan Kwon found that only perceived susceptibility and perceived severity that cannot predicted the adherence of hand hygiene practice ($p>0,05$), while perceived benefit and perceived barrier can predict adherence of hand hygiene practice in nurses in hospital ($p<0,05$). Gunarni and Aziz study found that only perceived susceptibility and perceived barrier can affect the adherence of hand hygiene practices, while perceived severity and perceived benefits cannot [25]. On the other study in South Korea, only perceived susceptibility and perceived benefits are found to be a great predictor of good hand hygiene practices [26]. Meanwhile, Kouhi et al study found that perceived severity, perceived benefit and perceived barrier can predict the adherence of hand hygiene practice, and perceived susceptibility is the only aspect that cannot predict the adherence of hand hygiene practice [27].

This study also found that, cue to action and self-efficacy cannot predict the adherence of hand hygiene practice in nurses in Dr. R.M. Djoelham General District Hospital Binjai ($p>0.05$). This finding is in conflict with finding of Kouhi et al study which found that cue to action and self-efficacy can predict hand hygiene adherence in nurses working in hospital ($p<0,005$) [27]All these findings are in contrast with findings by Ernawaty et al., which found that personal belief (all components) significantly influence the compliance of health protocol enacted by authority [28]. Study by Arini totally contradict Ernawaty et al. findings, where Arini found that none of personal belief factor can predict the adherence of hand hygiene practices [29]. The difference in findings among these studies possibly linked to the sample of the study, while the subject of this study and study by Kim and Kwon, Ghanbari et al., and Kouhi et al. are healthcare workers, the subject of the study by Ernawaty is general public [29][28][15][22][27].This study also found that all participant of this study adheres strictly towards the 5 moments of hand hygiene. These findings are shown by the percentage of participants who adhere to hand hygiene practice at the 5 moments are more than 98%. Study by Kingston, O'Connell, and Dunne in Department of Nursing and Midwifery at University of Limerick, Ireland found that the compliance rate in hand hygiene practice only high at moment 2 and 3 of 5 moments of hand hygiene, with compliance rate of 98,5% and 99,5% respectively, while the compliance rate at moment 1, 4, and 5 are rather lower at 85%, 87%, and 61% respectively [14].Hand hygiene, as the simplest, cheapest and most important prevention measure against the transmission of infection in healthcare settings, must be adhere by everyone who work in healthcare settings. Care and meticulous hand hygiene practices are one of the core measures to reduce contamination and transmission of diseases [30][31].

IV.   CONCLUSION

In health belief model of hand hygiene adherence, demographic factors such as age, sex, education, employment status, and length of career, along with personal belief factor, cue to action, and self-efficacy cannot predict the adherence of hand hygiene practice in nurses. But experience as modifying factor of health belief model, such as taking part in nosocomial infection prevention training, sustaining sharp object injury while working, having direct contact with patient's blood or other bodily fluid while working, or contracting nosocomial infection while working can predict the adherence of hand hygiene practice in nurses.

Conflict of Interest Statement

The authors declare that there is no potential conflict of interest in connection with the writing and publication of this article.

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