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Original Research

Murottal and Clasical Music Therapy Reducing Pra Cardiac Chateterization Anxiety

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Abstract

The high incidence of patients with coronary heart disease is directly proportional to the increase in cardiac catheterization. Many patients who experience anxiety pre heart catheterization will need nursing action. Relaxation with classical music therapy and or murottal therapy can reduce patient anxiety. The aim of this study was to determine the effectiveness of murottal therapy and classical music therapy to reduce the anxiety of patients pre heart catheterization in the Elang Installation of Dr. Kariadi Hospital Semarang. The study was a Quasi Experiment study with two group pre and post test design. The research sample consisted of 16 patients in the classical music therapy group and 16 in the murottal therapy group. The results of the study showed that there were differences in the effectiveness of murottal therapy and classical music therapy to decrease the anxiety of patients pre heart catheterization in the Elang Installation of Dr. Kariadi Hospital Semarang (p-value 0.028). Murottal therapy is more effective in reducing anxiety. Music therapy and murottal therapy given with a duration of 30 minutes creates a calm and comfortable atmosphere so that the body becomes more relaxed, blood circulation more smoothly, blood pressure and other vital signs will decrease and can reduce anxiety in patients pre cardiac catheterization. Murottal therapy is more effective in reducing anxiety. It is hoped that the results of this study will become the basis of hospital agencies in developing Standard Operating Procedure (SPO) management of anxiety in the provision of nursing care to patients cardiac pre-catheterization.

INTRODUCTION

The World Health Organization (WHO) reports that an estimated 17.9 million people died from Cardiovascular diseases (CVDs) in 2016, representing 31% of all global deaths. Of these deaths, 85% are due to heart attack and stroke.[1] Indonesia has a tendency to increase the incidence of cardiovascular disease. The national prevalence for heart disease in 2018 is 1,5% based on diagnosis by health professionals and symptoms.[2]

Cardiovascular disease is a public health problem in developed and developing countries, this disease is divided into 3 groups, namely heart function disorders, heart structure disorders, infections and non-inflammation, and disorders of the

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vascular system.[3] Based on the proportion of urban mortality in the 45-54 years age group, ischemic heart disease ranks third (8.7%) as the cause of death, first place is stroke (15.9%) and second place is diabetes mellitus (14.7%). The prevalence of coronary heart disease based on diagnosed doctor interviews in Indonesia increases with age by 0.5%, and based on diagnosed doctors or symptoms by 1.5%.[2] According to the Survey Sample Regristration System (SRS) at 2014 in Indonesia, it showed that coronary heart disease (CHD) was the highest cause of death in all ages after stroke by 12.9%.[4]

Various methods are used to recognize the diagnosis of coronary heart disease, ranging from non-invasive techniques such as electrocardiography (ECG) to invasive examinations such as coronary angiography (cardiac catheterization). Catheterization (derived from the word cardiac catheterization, or heart catheterization and abbreviated as catheterization) is the act of inserting a small tube (catheter) into the arteries and / or veins and tracing them to the heart, other blood vessels and / or other organs to which they are directed X-ray assistance.[5] Cardiac catheterization has therapeutic and diagnostic support functions but also has risks in the form of arrhythmias, emboli, nerve changes, vasovagal changes and other additional disorders that are ischemic, allergic and vascular complications.

A total of 2631 patients undergoing cardiac catheterization at RSUP Dr. Kariadi Semarang, among them 1,920 (73%) had coronary intervention (cardiac catheterization by stenting). Numerous studies shown that the action of cardiac catheterization can cause anxiety in patients, efforts to reduce anxiety can be given with nonpharmacological therapy.

Cardiac catheterization is an invasive procedure that for some people will have a psychological impact on the patient. Patients who will undergo invasive cardiac catheterization procedures will experience feelings of anxiety and stress. The magnitude of the impact caused by anxiety will affect the activity of the central nervous system to activate the hypothalamus pituitary adrenal axis and the sympathetic nervous system which is characterized by an increase in pulse frequency and blood pressure. This is very dangerous because the high heart rate and blood pressure will aggravate the cardiovascular system and increase oxygen demand and heart work.[6] Patient's anxiety needs to get special attention in nursing because every nursing action must quickly make effective coping of the patient in order to reduce perceived stress so that physiological and emotional balance is achieved.[7]

Preliminary study data at Dr. Kariadi Hospital Semarang in August 2018 showed that most patients who will undergo cardiac catheterization experience anxiety. It is not uncommon to delay catheterization because the patient's anxiety affects hemodynamics. Survey of 10 patients who will undergo cardiac catheterization found that 100% of patients expressed anxiety, 50% experienced moderate anxiety, 10% experienced severe anxiety and 40 people experienced mild anxiety. The results of interviews with the person in charge of the cardiac catheterization room, nurses and doctors in the cardiac catheterization room of Dr. Kariadi Hospital found that most of the patient's response when he entered the heart catheterization room, facial expressions looked scared, confused, some even had a sudden increase in blood pressure and increased heart rate.

Nurses must implement appropriate interventions to deal with patient anxiety. Various non-pharmacological measures of independent management based on Nursing Intervention Classification (NIC) can be done to overcome patient anxiety including relaxation therapy, guided imagination, increased safety, music therapy, counseling and meditation facilitation.[8]

Listening to music has a moderate effect on anxiety in people with coranary heart desease (CHD). Studies that used music interventions in people with myocardial infarction found more consistent anxiety-reducing effects of music.[9] Music stimulation increases endorphine release and this decreases the need for drugs. The release of endorphins also provides a distraction from pain and can reduce anxiety.[10] Religious therapy with murottal Al Qur'an verses can also speed healing. Study in s to determine the effect of murrotal audio therapy of Qur'an Surah Ar-Rahman to the level of anxiety in pre-surgery senile cataract patients showed there was the influence of anxiety differences of respondents before and after given audio therapy Qur'an Surah Ar-Rahman.[11] Research has shown the effect of murottal (Al-Qur'an) therapy on reducing anxiety levels of patients who will undergo laparatomy surgery.[12]

The use of murotal music therapy and classical music both can significantly reduce the anxiety of patients with various cases of the disease, including in patients who will undergo surgery. It is necessary to examine which interventions are better and more effective in reducing the anxiety of patients undergoing cardiac catheterization. Researchers interested in examining the effectiveness of murottal therapy and classical music therapy on reducing anxiety of patients pre cardiac catheterization at the Elang Installation of Dr. Kariadi General Hospital Semarang.

METHODS

The research method used was quasy experimental (quasy experiment) with the research design is two group pre and post test design. The target population in this study were all patients who will undergo cardiac catheterization at the Elang Installation of Dr. Kariadi General Hospital Semarang with the sampling technique in this study using purposive random sampling. The research sample calculated using the Federer formula obtained a sample of 16 people as a group who were given classical music therapy and 16 people as a group who were given murottal therapy selected according to the inclusion criteria, namely patients treated in the Eagle Room of RSUP Dr. Kariadi Semarang, the first Iscemic Heart Disease (IHD) patient who will undergo a cardiac catheterization program, more than 30 years old and cooperative, muslim, patients with mild to severe anxiety, male sex, minimum education at primary school.

The study was conducted in February - May 2019 in the Elang Installation of Dr. Kariadi General Hospital Semarang by paying attention to research ethics including the principle of benefits, the principle of respecting human rights (respect human dignity) and the principle of justice (right to justice). An ethical clearancec letter issued by the Medical Research Ethics Commission Diponegoro University.

Data collection instruments in this study were carried out using an anxiety measurement tool which in its use of the interview method. Anxiety level measurement tool is the Numeric Rating Scale (NRS) for anxiety. Anxiety score is assessed based on the range of intensity of anxiety felt by the client with a zero score category said there is no anxiety, a value of 10-30 mild anxiety, a value of 40-60 moderate anxiety, a value of 70-90 severe anxiety, and a value of 100 panic. The instrument of classical was performed using a *Mozart Clarinet Concerto In A Major K 622 Adagio* classical music by using smart phone. Murottal therapy surah Ar-Rahman sung by Muzammil Hasballah with a medium timbre, 44 Hz pitch, regular harmony and consitent, rhythm andate lilting, volume 60 decibels, medium intensity amplitude with a time duration of 30 minutes. The intervention was carried out by giving classical music and murottal surah Ar Rahman to each group, listening by lying down for 30 minutes using headphones. Anxiety scale is measured

before and after the intervention in each group.

Data were analyzed by univariate and bivariate tests. Analysis of differences in anxiety levels in patients pre cardiac catheterization before and after given murottal therapy and classical music therapy using the Wilcoxon test. Analysis of the differences in murottal therapy and classical music therapy on the reduction in anxiety of patients pre cardiac catheterization at the Elang Installation of Dr. Kariadi Semarang Hospital uses *the Mann-Whitney Test.*

RESULTS

The results showed the average age of respondents in group I (classical music therapy) is 44.25 years and the oldest age is 56 years. Group II (murottal therapy) obtained an average age of respondents was 45.38 years and the oldest age was 56 years.

The results showed that patients who will undergo cardiac catheterization more in the respondents with undergraduate education by 62.5% in group I and 43.8% in group II. Occupational respondents the majority work as private employees as many as 6 people (37.5%) group I (classical music therapy) and 5 people (31.2%) in group II (murottal therapy). Length of stay was 1 day for 8 people (50%) in group I and 9 people (56.2%) in group II.

Table 1
Distribusi Responden Berdasarkan Pekerjaan, Pendidikan dan Lama Hari Rawat

Characteristik	Group I (Clasical Music Therapy)		Group II (Murottal Therapy)	
	f	%	f	%
Job				
Not working	2	12,5	2	12,5
Private	2	12,5	1	6,2
employees	6	37,5	5	31,2
Laborers	4	25,0	5	31,2
Entrepreneur	2	12,5	3	18,8
Civil servants				
Education				
Junior High	1	6,2	2	12,5
School	10	62,5	7	43,8
Senior High	5	31,2	7	43,8
School				
College				
Length of stay				
1day	8	50,0	9	56,2
2 days	5	31,2	5	31,2
3 days	3	18,8	2	12,5
Total	16	100	16	100

The results showed that before being given classical music therapy the majority of respondents experienced moderate anxiety, namely as many as 10 people (62.5%). After being given classical music therapy there was a decrease in the level of anxiety in respondents, the majority (56.2%) experienced mild anxiety.

Table 2
Anxiety Level Before and After Being Given Classical Music Therapy (n = 16)

Anxiety level group I (Classical Music Therapy)	Before Classical Music Therapy		After Classical Music Therapy	
	f	%	f	%
Mild anxiety	4	25,0	9	56,2
Medium anxiety	10	62,5	7	43,8
Severe anxiety	2	12,5	0	0,0
Total	16	100	16	100

The anxiety level of respondents after being given murottal therapy decreased with an average decrease in anxiety level score 20.62 compared to before being given murottal therapy and the majority after

being given murottal therapy experienced mild anxiety by 13 people (81.2%) compared to before being given music therapy, the majority (75.0%) experienced moderate anxiety.

Table 3
Anxiety Level Before and After Being Given Murottal Therapy (n = 16)

Anxiety level group II (Murottal Therapy)	Before Murottal Therapy		After Murottal Therapy	
	f	%	f	%
Mild anxiety	2	12,5	13	81,2
Medium anxiety	12	75,0	3	18,8
Severe anxiety	2	12,5	0	0,0
Total	16	100	16	100

The results of statistical analysis with Wilcoxon test showed that in group I (classical music therapy) decreased anxiety levels of 12 people (75.0%) and increased and remained as many as 2 people each (12.5%). Group II (murottal therapy) showed that as many as 15 people (93.75%) had decreased anxiety levels and only 1 person (6.25%) with a fixed anxiety level.

Table 4
Differences in Anxiety Levels Before and After Being Given Classical Music Therapy and Murottal Therapy (n1 = n2 =16)

Variabel	Respons	f	Mean Rank	p-value
Anxiety level before and after classical music therapy	Increase	12		
	Decrease	2		
	Not change	2		
Anxiety level before and after murottal therapy	Increase	15	8	0,001*
	Decrease	0		
	Not change	1		

*Wilcoxon test**

The results showed that the average decrease in anxiety levels in group II (murottal therapy) was higher at 19.97 compared to group I (classical music therapy) by 13.03. Research shows that there is a difference between murottal therapy and classical music therapy to decrease patient anxiety before cardiac catheterization at Elang Instalation of Dr. Kariadi Hospital Semarang.

Table 5
Differences in the Effectiveness of Murottal Therapy and Classical Music Therapy Against Decreased Patient Anxiety Before Cardiac Catheterization (n1 = n2 =16)

Decrease of anxiety level	Mean Rank	p- value
Group I (Clasical Music Therapy)	13,03	
Group II (Murottal Therapy)	19,97	0,028

DISCUSSION

The results of this study indicate that the average patient who will undergo cardiac catheterization is an adult age. Cardiac catheterization patients tend to increase in adulthood. This is due to lack of awareness of running healthy habits. Coronary heart disease arises due to abnormal accumulation of lipids or levels of fat and fibrous tissue in the walls of blood vessels that result in changes in the structure and function of the arteries caused by ateroslerosis. Atherosclerosis causes inadequate blood supply to the heart and heart muscle cells to lack blood components. This causes ischemia in the heart muscles so that the patient will experience chest pain and in more severe ischemic conditions can be accompanied by damage to heart cells that are.[3] The patient's age also influences the type of relaxation therapy that will be given. Adult patients tend to prefer relaxation therapy that is self-approach to God, so that the provision of nursing interventions that are in accordance with the patient's age criteria will help in the success of the patient's health and care program.

The results showed that patients who will undergo cardiac catheterization more in the respondents with undergraduate education by 62.5% in group I and 43.8% in group II. One of the trigger factors that can cause

anxiety is education status. The higher a person's education, the level of anxiety tends to decrease compared with people who have a low level of education. Low educational levels were significantly associated with both anxiety and depression.[13] The level of anxiety is closely related to the level of education, where someone will be able to find information or receive information well. A high level of education will quickly understand the conditions and circumstances that will cause increased anxiety in the person.

The work of respondents in this study found that the majority worked as private employees as many as 6 people (37.5%) group I (classical music therapy) and 5 people (31.2%) in group II (murottal therapy). Work is one of the reasons for patients experiencing anxiety when a heart catheterization will be performed. This is due to the patient's concern for the safety of the soul and the patient's ability to perform work after the action. Patients who have jobs that require physical exertion will experience a decrease in the ability for patients to do so so that they appear worried about the threat of continuing their work and have an effect on the socio-economy of the family.[14]

The results of this study showed that the majority of days of treatment were 1 day as many as 8 people (50%) in the classical music group and 9 people (56.2%) in the murottal therapy group. Length of stay related to the patient's experience of the heart catheterization to be performed. Previous experience of surgery and information obtained by the patient on the first day through the explanation of informed consent will affect the knowledge of the patient about the procedure for cardiac catheterization to be performed so that it will reduce anxiety and anxiety in patients.[7]

After being given classical music therapy there was a decrease in the level of anxiety in respondents where the majority experienced mild anxiety by 9 people (56.2%) with the lowest value of 20 and the highest of 50, and an average level of anxiety of 34.38. The results of research on the level of anxiety experienced by patients before undergoing cardiac catheterization increased with the approaching time of action, moreover cardiac catheterization has been known to have various kinds of possible complications during the process of action. Psychological preparation is needed by patients who will undergo cardiac catheterization.

The results of this study are in line with the results of several existing studies. Other research in patients with preoperative laparotomy shows that before being given murottal (Al-Qur'an) therapy, moderate anxiety was 56.2% and severe anxiety was 43.8%. After being given murottal (Al-Qur'an) therapy, most (65, 6%) experienced mild anxiety.[12] The systematic review indicates that music listening may have a beneficial effect on preoperative anxiety. These findings are consistent with the findings of three other Cochrane systematic reviews on the use of music interventions for anxiety reduction in medical patients.[9]

Anxiety is an obscure and pervasive concern, which is related to feelings of uncertainty and helplessness. This anxiety does not have a specific object, which is experienced subjectively and communicated interpersonal.[15] One of independent nursing intervention to overcome anxiety is to provide classical music therapy and murottal therapy. Classical music and murottal therapy provides a relaxing and calming effect so that it can reduce anxiety in patients. The sound of clasiccal music and the Qur'an creates a group of frequencies that reach the ear and then moves to the brain cells and influences them through the electromagnetic fields this frequency is produced in these cells. The cells will respond to these fields and modify their vibrations. This change in vibration can make the brain relax and calm.

The results showed a decrease in anxiety levels after given murottal therapy. Murrotal auditory stimulation has a relaxing effect increase the formation of endorphins in the control system descent and make relaxation.[16] Listening to the verses of the Qur'an has a calming effect and makes the patient closer to His creator. Based on this, the patient can surrender and surrender all the conditions set by God for the heart catheterization that will be undertaken by the patient, so that the patient can become more relaxed and reduce anxiety on the patient.

Al-Qur'an reading murottal has a constant rhythm, regular and no sudden changes. Murottal al-Qur'an's tempo and low notes have a relaxing effect and can reduce stress and anxiety.[17] Murottal therapy will increase one's awareness of God, whether that person knows the meaning of the Qur'an or not. This awareness will lead to totality surrender to Allah, in this state the brain in alpha waves in the form of brain waves creates optimal brain energy so that it can relieve stress and reduce anxietyn.[18]

The results of this study indicate a p-value of 0.007 in group I and 0.001 in group II $<\alpha$ (0.05), it can be concluded that there is a significant difference between anxiety levels in patients pre-cardiac catheterization before and after classical music therapy and murottal therapy at RSUP dr. Kariadi Semarang. Classical music therapy and murottal therapy are both sounds that can provide a therapeutic effect by providing relaxation to the patient so as to reduce the anxiety experienced by patients pre cardiac catheterization. Music therapy and murottal therapy given with a duration of 30 minutes creates a calm and comfortable atmosphere so that the body becomes more relaxed, blood circulation more smoothly, blood pressure and other vital signs will decrease and can reduce anxiety in patients pre cardiac catheterization. However, interventions with classical music therapy still found patients with increased anxiety levels after being given classical music therapy. This is because the music therapy given is less favored by the patient, so the patient's concentration cannot focus on the music given and still imagine the heart catheterization action to be performed.

Murottal therapy in this study can reduce the level of anxiety of patients pre cardiac catheterization. This is because essentially murottal Al-Qur'an therapy with regular rhythm and correct reading is also a music. The Qur'an is able to bring calm and minimize anxiety. Murottal therapy works on the brain, wherewhen driven by external stimulation (therapy Al-Quran) then the brain produces chemicals that are called neuropeptide.[17] These molecules transport their existing receptors in the body so the body gives bait behind a sense of comfort.The administration of murottal Al-Qur'an therapy has been proven to be effective in increasing *β-endorphin*e levels in patients who are sung with slow, gentle, full-of-depth tempers that can cause a relaxation response. Auditory (sound) therapy can reduce stress hormones, activate natural endorphins, increase feelings of relaxation, and divert attention from fear, anxiety and tension, improve the body's chemical system so that it lowers blood pressure and slows down breathing, heart rate, pulse, and brain wave activit.[10]

Murottal therapy can reduce anxiety scores by 42.8% while classical music therapy can reduce anxiety scores in preterm cardiac catheterization patients by 23.6%. This study showed 93.75% of respondents experienced a decrease in anxiety scale and only 1 respondent (6.25%) did not experience a change in anxiety scale. The decrease in anxiety occurs because the murottal therapy given is more understandable by the respondent. Murottal therapy in the form of chanting Al-Qur'an verses of the Ar-Rahman letter can be felt soothing to the heart, calming and getting closer to God so that patients are more relaxed and reduce the level of anxiety pre cardiac catheterization.

The Qur'an has a great influence on a person's psyche. listening to the Qur'an will give you the effect of peace in the body because of the elements of meditation, autosuggestion and relaxation. This sense of calm will then provide a positive emotional response that is very influential in bringing about positive perception.[18] Researchers used Ar-rahman's letter because of the surah contains a great wisdom for humanity in general and for Muslims in particular. This is related to the degree of thankfulness in the broadest sense of the meaning of the disobedience of the giver (Allah Almighty). Surah Arrahman is preceded by a statement about the nature of Allah, the Beneficent God. His generosity is the source of all the gifts given to all mankind.

Research showed using murottal therapy is more effective in reducing anxiety levels in patients pre cardiac catheterization compared to classical music therapy. This is possible because murottal therapy has an indispensable aspect in overcoming anxiety, namely its ability to form new coping to overcome anxiety before undergoing cardiac catheterization. Other studies also support the findings of this study. Research in postoperative patients shows that murottal therapy has been shown to be more effective in reducing anxiety compared to other music therapies urottal therapy has been proven to be more effective in reducing anxiety compared to other music therapies Murottal therapy has an indispensable aspect inovercoming anxiety, murottal has the ability to form a new coping to overcome anxiety. Murottal therapy has two important points, has a beautiful rhythm and also can psychologically motivate and provide encouragement in facing the problems being faced.[10] Whereas in music therapy, it only has one point, which has a beautiful tone. Murottal also increases calm because there is a spiritual closeness to God.

We recommend that nurses can apply the provision of murottal Qur'an and classical music therapy to overcome the anxiety of patients who will undergo cardiac catheterization surgery. To reduce the anxiety of Muslim patients, nurses can apply murottal Al Qur'an.

CONCLUSION

Murottal therapy and classical music in reducing anxiety in patients pre cardiac catheterization. Nurses can apply classical music therapy and murotal therapy to reduce the anxiety of patients who will undergo cardiac catheterization.

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CONFLICTS OF INTEREST

Neither of the authors have any conflicts of interests that would bias the findings presented here.

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Original Research

Analysis of Factors Adherence to Safe Injection Practice Procedures among Nurses Healthcare Center Qatar

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Abstract

Injection practices was common medical procedure done by nurses according doctor's prescription. In nursing process, injection practice is part of nursing intervention, but injection practices was risky for the health care workers. Needle stick injury was happened to the nurses, 18% due disposal of the needle, and 15% while draw the blood for laboratory study. Adherence to the work procedure influence by few behavior factors. Aim of research of the research were to finding out of the factors influence of adherence to safe injection practice among the nurses at healthcare center X Qatar. Type of the research was observational analytic quantities of the analytic description, using cross sectional approach. 9 variable latent with 56 variable indicator. Size of sample were 114 nurses. Data analytic with using PLS-SEM. T-statistic value on variable culture 2.94; environment 1.99; work procedure 3.81 and supervisory 3.10. T-statistic of Individual characteristic, work facility, attitude, and knowledge bellow 1.96. R2 variable adherence were showed 96.05% with Q2 87.07%. Culture, environment, work procedure and supervisory influenced of the adherence safe injection practice among the nurses. (96.05%) variable independent influence of the adherence safe injection practice among the nurses, within 87.07% showed good predicted.

INTRODUCTION

Injection practices was common medical procedure done by nurses according doctor's prescription. Doenges M.E., Moorhouse M.F., Murr A.C., (2014) stated in nursing process, injection practice is part of nursing intervention, but injection practices was risky for the health care workers. Mandal J., (2013) reported needle stick injury was happened to the nurses, 18% due disposal of the needle, and 15% while draw the blood for laboratory study. Gholami, et al., (2013) result studied at Iran, 32% health care worker had experience with the needle stick injury, 45% experience more than twice. 9.7% needle stick injury had reported to the supervisor, with odd ratio 2.4 within shift duty. If the incident of needle stick injury not reportable, will be miss to be investigation and monitoring and also the hepatitis B and HIV exposed from the needle could not be follow up. Some reasons why the incident of needle stick injury not

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reported due to work fatigue and high workload among nurses.

Amira C.O., and Awobusuyi J.O., (2014) reported at Nigeria, incident needle stick injury 24.5%/years. Causes of the needle stick I injury due recapping of the needle (45%), while disposed of the needle (30%), and while inserted the intravenous infusion (27.5%). Needle stick injury reported to the superior (37%). Study reported by Kaphle, et al.,(2014) at the Nepal, 30.5% nurses had training of safe injection practice, had vaccination anti Hepatitis B (76,8%), awareness to the needle stick injury (57,7%), had experience needle stick injury (71,8%), needle stick injury (55,1%), while recapping the needle (94,1%). Conclusion from there studied needle stick injury incident due of lack of awareness, lack of skill on the safe injection practice.

Study reported done by Holla, et al., (2014) incident rate needle stick injury at India 71.9% (n 136), correlated to the long hour duty. Long hour duty can be caused of the fatigue, fatigue had rick of the needle stick injury. Reported by Jahangiri, et al., (2016) needle stick injury in Iran, (76%) to the nurses, while dealing with the needle before the injection procedure (85.5%), recapping the needle (41.4%), and not reported (46,7%), significant due long hours duty and shift work. Reported by Gyawali, et al., (2016) at Nepal 75.6% nurse's rural hospital, 39.2% nurses city hospital had developed with the sign and symptom of hepatitis. 13.3% nurses at city hospital had hepatitis B positive, 37.3% nurses from rural hospital had hepatitis B positive. 33.3% rural nurses, 21.6% nurses for the city hospital had needle stick injury.

DC (2013), predicted health care worker has no hepatitis B vaccination, exposed by hepatitis B 6%-30%, hepatitis C 1.8% and exposed by HIV 0.3%. Papadakis M., and McPhee, SJ., (2015), stated that Hepatitis B is infectious disease at the liver by the virus of hepatitis type B. Dafaalla M.D., et al., (2016) reported that Sudani nurses, 2.3% not wearing hand glove while injection procedure, 95.9% believed inf had needle stick injury will hepatitis infected, 99% believed needle stick injury high risk HIV infected, 83% nurse feeling worry exposed by HIV and hepatitis if had needle stick injury, 77.8% hand wash when had needle stick injury, 36.5% stated sharp box not enough stock, 31.8% believe needle stick can be prevented. Bijani, et al., (2017) reported the impact the safe injection practice training for nurses, incident needle stick injury reduced from 15% became 10% with significant (P=0,002). Conclusion these study, safe injection practice training can be prevent of incident of needle stick injury among the nurses.

According Strank, J., (2013) adherence to the work procedure influence by behavior factors, component the behavior included: 1. attitude; 2. motivation; 3. perception; 4. memory of procedure; 5. individual characteristics; and 6. social background. Based on the theory of Lawrence Green cite by Dafaalla, et al., (2016), and DiClemente, et al., (2013), behavior influence by 3 factors: 1. Predisposition factor such as attitude, skill, culture, believe and individual characteristics; 2. Enabling factor such as facility, and work environment; 3. Reinforcing factor such as rule and supervisory from the management, and written procedure have to in place.

Injection procedure is high risk become needle stick injury. When needle stick injury is happen, may infectious disease transmitted or exposed to the nurses. Nursing safe injection practice been implementation, but the incident of needle stick injury still happening. Lack of knowledge, negative attitude and unsafe behavior may influence to adherence to the safe injection practice. According the theory of infection prevention and control and also data empiric needle stick injury, what is contributing factors influence to adherence safe injection practice among nurses in Healthcare facility Qatar?

METHODS

Type of the research were used the quantitative observational analytics, within cross sectional approach. Venue of the research were the Healthcare Center Qatar, since March 1st up to September 1st 2019. Number of population of the nurses were there working at the Ras laffan City 91 nurses, Messahed City 35 nurses, dan Dukhan City 26 nurses within total 152 nurses, only 114 nurses were an acceptable to participated as responder in this research.

Questionnaire as the instrument to collecting data regarding of the characteristic individual, knowledge, attitude, culture, facility, supervisory, work environment, work procedure and adherence safe injection practice. Respondent will choose the answer following a Likert scale: 5=strongly agree, 4=agree, 3=neutral, 2=disagree, 1=strongly disagree.

Instrument validity a proof following convergent and discriminant of validity. Cut off the validity used were the loading factor value above 0.5 and the discriminant validity used were the *average variance extracted* (AVE) value above 0.5. (J. F. Hair, G.T.M. Hult, C.M. Ringle, M. Sarstedt, 2017). *Cronbach Alpha* used for the check the reliability of the construct. Good reliability of the construct must above the 0.7 (N.K Avkiran, C.M. Ringle 2018).

Analysis these data, we using the technic of Partial Least Square - Structural Equation Model (PLS-SEM). Steps of technic PLS-SEM following steps bellows:

1. First steps: Designing the Model of Structural (*inner model*).
2. Second steps: Designing the model of measurement (*outer model*).
3. Third steps: Construct the path *diagram*.
4. Fourth steps: Converse of the path diagram to the equation model: *Outer model* as the *outer relation or the measurement model* and the *Inner model,* as the relation between the variable latent or structural model.
5. Fifth steps: Do estimation of the parameter.
6. Six step: *Goodness of Fit analysis.*
7. Seven step: Hypothesis test

RESULTS AND DISCUSSION

Research had been completely at Healthcare Center Qatar supporting oil and gas operation. Research conducted since May 1st 2019 up to September 1st with number of responder were 114 nurses. Purpose of this research were to find out of factors influence adherence safe injection practice among nurses at Healthcare Qatar. Safe injection practice procedure been implemented in this healthcare to make sure all nurses, patient and community safe from the needle hazard. Safe injection practice procedure will guide the nurses to do prevention and control of exposure from the cross infection and prevention of needle stick injury among nurses and minimize abuse of needle by community.

Table 1 showed, most of the responder is male (83.3%). It is typical nurses hired by company were the male. Male nurses easy going to response any emergency at the site plant or inside industrial area. Healthcare in industrial area had the ambulance unit, an also sometime the occupational nurse will visit to the workplace to make sure the workplace were healthy condition.

Table 1 showed the level education of responder, majority were graduated from bachelor degree (52,6%). 43% still hold diploma level. According new policy from State of Qatar, minimal qualification for healthcare worker must be graduated from bachelor level. Bachelor level had ability to make decision with professionalism.

Table 1
Distribution frequency Sex Responder (n114)

Indicators	f	%
Sex		
Female	19	17
Male	95	83
Education		
Diploma	49	43,0
Bachelor degree	60	52,6
Master degree	5	4,4

Table 2 showed, age level of the responder, variation from 44.9 years old up to 60 years. Age above 30 years old had long enough exposed by work experience as the professionalism. The average of work experience were 21.3 year as nurses, 63% above 21 year experience. Minimal experience as nurse in this healthcare facility are 2 years.

Table 2
Distribution frequency Age level of Responder (n114)

Indicators	Mean (SD)	Min-Max
Age level	44.99 (4.831)	31-60
Work experience	21.28 (4.898)	9-31

Validity and reliability result

Result of study showed the result of the validity testes mostly above 70%, only the individual characteristics showed AVE value 0.51 but the Cronbach's Alpha showed 61.56%. According some researcher mention if AVE between 0.4 up to 0.7, make sure the validity test above 50% will consider accepted.

Significant level result

Table 6 showed the significant test showed if value t-statistic above 1.96 with alpha 0.5 we can conclusion this on significant level. From table no 6 we can see the variable work culture, supervisory, environment and work procedure showed the t-statistic above 1.96, we conclude these variables were significant influence to the adherence safe injection practice. T-statistic individual characteristic, knowledge, attitude and work facility were not significant (bellow 1.96).

Determinant Level

Work procedure contributed positive to adherence safe injection practice 57.04% (R2 05704, T-value 3.81), safety culture contributed positive to adherence safe injection practice 44,88% (R2 0,4488 T-value 2.95), supervisory contributed to adherence safe injection practice 26,09% (R2 0,2609 T-value 3.10), work environment contributed negative to adherence safe injection factor 24,56% (R2 0,2456 T-value 1.99). Characteristic individual, knowledge, attitude and facility not significant contributed (t-value < 1.96).

R2 variable adherence were showed 96.05% with Q2 87.07%. 96.05% variable of culture, environment, supervisory, and work procedure were influenced of the adherence safe injection practice among the nurses within predictive relative 87.07%.

CONCLUSION

Conclusion of this research had been proof, those variable work culture, supervisory, environment and work procedure showed the t-statistic above 1.96 we conclude these variables were significant influence to the adherence safe injection practice. Variable individual characteristic, knowledge, attitude and work facility were not significant influence to adherence of safe injection practice.

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CONFLICTS OF INTEREST

Neither of the authors have any conflicts of interests that would bias the findings presented here.

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Original Research

Intermittent Exercise Triggers Synthesis of CYP19 Aromatase as a Key Enzym for Estrogen Formation In Sprague Dawley Rat Bone Innovarectomy

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Abstract

Menopause is a permanent cessation of menstrual cycle due to reduced secretion of the hormone estrogen which can result in osteoporosis. Osteoporosis is characterized by the process of bone resorption faster than the process of bone formation, resulting in a decrease in bone mineral density and bone microarchitecture damage resulting in bones becoming brittle and easily fracturing. Physical exercise is a holistic intervention to prevent osteoporosis due to menopause. This study is a pure experimental study using a post-test only control group design research design. The subjects of the study were the 12-week-old Sprague Dawley rat. The number of groups is 5 with the number of rats per 6 animals. There was a significant difference between the ovarectomy group of rats and the ovarectomy group of mice and were given intermittent exercise treatment of CYP19 aromatase expression. Discussion: Muscle contractions that occur due to intermittent exercise treatment can produce large amounts of IL-6 and IL-6 mRNA which can stimulate estrogen production. Local estrogen production can reduce bone resorption and increase bone formation and bone density Intermittent exercise can trigger the process of the synthesis of the CYP19 aromatase enzyme in ovarectomy rat femur bones

INTRODUCTION

Menopause is defined as a state of permanent cessation of menstrual cycles due to reduced secretion of ovarian hormones that occur naturally or are caused by surgery, chemotherapy or radiation (Nelson, 2005). Women at menopause will experience symptoms of hot flushes or sensations of heat in the body radiating to the face, vaginal dryness, sleep disorders, cognitive changes, mood changes (Al-Azzawi, 2009), and those associated with long-term health problems that may be affected by the disease coronary heart disease and osteoporosis (Cutson and Meuleman, 2000).

Osteoporosis is a progressive chronic disease characterized by a process of bone resorption faster than the process of bone formation, resulting in decreased bone mineral density and bone microarchitecture damage resulting in bones becoming brittle and easily fracturing (Rizolli et al., 2008). The World Health Organization (WHO)

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defines osteoporosis as a disease characterized by reduced bone mass and bone tissue microarchitecture abnormalities due to increased bone fragility and the risk of bone fractures (Conference report, 1991). Osteoporosis or loss of bone mass in menopausal women and / or after ovarectomy is mainly due to estrogen deficiency (Doren, 2002).

Hormone replacement therapy is believed to reduce menopausal symptoms and prevent osteoporosis, cardiovascular disease and Alzheimer's type dementia at menopause (Hanafiah, 1999). However, prolonged administration of hormone replacement therapy to women will increase the risk of developing breast cancer (Ross, 1997), the risk of getting endometrial cancer (Grady, et al. 1995) and the risk of ovarian cancer (Rodriguez, et al. 2001). Giving estrogen alone or a combination of estrogen and progestin increases the risk of stroke by 40%. Progestin supplemented estrogen also increases the risk of coronary disease, pulmonary embolism and breast cancer (Women's Health Clinical Research Center, 2006).

Controversy and the many complications resulting from hormone replacement therapy at menopause have led to the development of a holistic and natural approach to managing menopause including regulating diet, physical exercise or sports, skills in regulating body and brain rhythms, supplementation and herbal (McKee and Werber, 2005).

Research on the effect of exercise in overcoming menopausal symptoms has been carried out among them, stating that physical exercise or exercise is useful to prevent osteoporosis, obesity, depression and cardiovascular disease (Slaven and Lee, (1997). The effect of exercise on osteoporosis among others, stated that running sports during 9 weeks has an impact on increasing bone mineral content and bone mineral density of vertebrae and tibia in adult mice (Yeh et al., 1993). Isometric exercise performed by rotating movements without displacement or weight gain can have an impact on increasing bone formation with increased ability bone reconstructs or improves bone shape for bone strength requirements (Yeh et al., 2001). Running sports with a slope of 11% and a speed of 21 meters / minute performed as many as 40 sets of intervals 1 minute running and 1 minute rest for 4 weeks can prevent the process of bone loss in ovarectomy rats by suppressing the process of bone resorption (Wong et al., 2006). Running sports can prevent the total decrease in strength of the femur, tibia and humerus bones so that it is useful to eliminate the effects of ovarectomy on bone (Peng et al. (2009). Running sports contribute to the degree of protection against cartilage degeneration in mice after ovarectomy (Chang et al., 2010).

Running sports with a slope of 11% and a speed of 20 meters / minute carried out as many as 40 sets of intervals 1 minute running and 1 minute rest for 4 weeks and administration of Genistein can prevent the process of bone loss in ovarectomy rats (Nakajima et al., 2001). Regular exercise with moderate zone intensity can increase serum estrogen levels in postmenopausal women (Agustingsih, 2006). The effect of exercise in overcoming the symptoms of menopause, probably due to the effect of exercise on estrogen and estrogen levels is most likely derived from extragonadal aromatization, this is given in women after menopause all estrogen and almost all androgens are made locally in the peripheral tissues of DHEA (dehydroepiandrostenedion) (Liben, 2006).

Research relating to the effect of exercise on the formation of extragonadal estrogens has also been carried out among them, stating that the expression of CYP19 aromatase in adipose tissue is higher due to regular exercise in ovarectomy rats (Bebasari, 2010). CYP19 aromatase expression in the adrenal cortex is higher due to regular

exercise for 8 weeks in ovarectomy mice (Asnawati, 2010). Exercise prevents the accumulation of fat in the liver and increases the expression of α (alpha) estrogen receptors in rats that are ovarectomized or not ovarectomized and whether or not estrogen therapy is given (Hao et al., 2010). Has not been studied about the effect of intermittent exercise on the expression of CYP19 aromatase in the femur bone.

METHODS

This research is a pure experimental study using a post-test only control group design research design. This study was conducted to determine the effect of intermittent exercise on the expression of CYP19 aromatase, in ovarectomy femur bones. The research variables included independent variables namely intermittent exercise which is a treatment of running sports with a slope of 11% and a speed of 21 meters / minute conducted 40 times intervals 1 minute running and 1 minute resting, a total time of 80 minutes per day as much as 5x in one week for 4 weeks. The dependent variable was the level of CYP19 aromatase expression which was the percentage of cells from the observation of 10 field views of fragments of femur bone tissue after immunohistochemical staining using CYP19 primery antibody kit using 400x magnification in brown.

The subjects of this study were female Sprague Dawley rats aged 12 weeks or ± 3 months with a body weight of 140-186 grams. Rat animals were obtained from the Experimental Animal Maintenance Unit (UPHP) of the Integrated Research and Testing Laboratory (LPPT) Unit IV of the Gadjah Mada University (UGM) in Yogyakarta. The number of groups was 5 with the number of rats in each group being 4 and added 2 for each so that each group became 6.

The research materials used were catgut, cotton, xylazine and ketamine HCL sewing threads for rat anesthesia, 70% alcohol, povidone iodine, gloves, small pots as samples to be examined, saline, 1.5 ml microtube, microhematocrit tubes, buffers 10% formalin, 5% formic acid as a decalcification agent, calcium obtained by mixing and heating CaCO3 powder in CMC. Standard rat feed in the form of AD II pellets with water content of 12% crude protein 15%, crude fat 3-7%, crude fiber 6%, ash 7%, calcium 0.9-1.1%, phosphorus 0.6-0, 9%, antibiotics and coccidiostats. Preparation ingredients are alcohol with various concentrations (30%, 40%, 50%, 60%, 70%, 80%, 90%, 96% and 100%) for dehydration and rehydration, xytol, phosphate buffer saline (PBS) , buffer citrate. Immunohistochemical staining of rabbit serum, primary antioby, bioetynilated secondary antibodies, streptavidine peroxidase, diaminobenziydine (DAB), hematoxylin mayer, Mounting with E.Z Mount goat and Canada Balsam.

The tools used in research; special treadmills for rats (Gama-tread 2006), minor surgical instruments for ovarectomy (scapel, scissors, sewing thread, sewing needles, needle holders and tweezers), injection syringes, digital scales, mouse cages with rat eating and drinking equipment and digital cameras . Histological preparations, slices of rat femur bone tissue, namely microtome, staining jar, microwave, poly-lysine coated slides microscope, coverslip, timer and SSA tool; homogenizer to destroy rat bone tissue. To observe preparations that have been colored using a light microscope and micrographic tools.

RESULTS

The results of this study relate to the parameters measured in this study, namely the expression of CYP19 aromatase using a sample of rat femur bone tissue. Observation and evaluation of CYP19 aromatase expression was carried out on immunohistochemical preparations with CY19 aromatase antibodies that would

show a cytoplasm of cells that were brown or positively painted (expressing CYP19 aromatase) and cell cytoplasm which did not express CYP19 aromatase in dark blue or purple. Each preparation was observed and examined as many as 10 visual fields. The percentage of CYP19 aromatase expression can be done by counting the number of cells that express CYP19 aromatase and cells that do not express CYP19 aromatase in each slice. The percentage of CYP19 aromatase expression was done by counting the number of cells expressing CYP19 aromatase and those not expressing CYP19 aromatase in each field of view as the total number of cells. Calculate the percentage of CYP19 aromatase expression by counting the number of cells expressing CYP19 aromatase multiplied by 100% divided by the total number of cells. An example of a description of CYP19 aromatase expression in a preparation is shown in Figure 1.

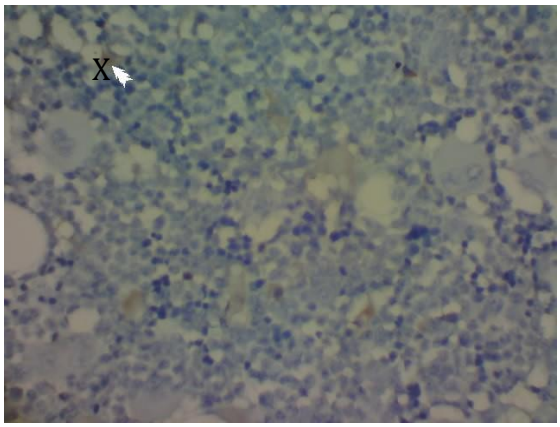

Figure 1
Picture of CYP19 Aromatase Expression on IHC painting on observation of Olympus light microscope at 400x magnification
Description: X. Cells that express CYP19 aromatase

The average description of CYP19 aromatase expression, osteoclast counts and calcium levels in ovarianectomized femur bones of 12 samples with observations of each sample of 10 visual fields grouped into five treatment groups, are shown in Table 1.

Table 1
Mean ± standard deviation of parameters for all treatment groups

Parameter	Mean ± standard deviation of all parameters in all treatment groups	
	X1	X2
Ekspresi CYP19 aromatase	0.15±0.36[a]	7.57±3.34[ab]

Information:
a, b = the same letter in one line shows that there are significant differences between treatment groups
X1 = Ovarectomy group of rats
X2 = Group of rats that were ovarekotmi and treated with intermittent exercise

The mean levels of CYP19 aromatase expression showed different values in the group of ovarectomy rats and the group of rats that were ovarectomized and treated with intermittent exercise. The ovarectomy group of rats obtained a mean CYP19 expression level of 0.15 standard deviations of 0.36. In the group of ovarectomized rats and treated with intermittent exercise, the mean CYP19 expression level was 7.57 with a standard deviation of 3.34.

Statistical analysis of the effects of intergroups on CYP19 aromatase expression was analyzed using the Mann-Whiteney test. Mann-Whiteney test results between the ovarectomy group of rats and the ovarectomy group of rats treated with intermittent exercise related to their effect on CYP19 aromatase expression obtained mean levels of 3.50 and mean levels of 9.50, with a p value of 0.003 ($p \leq 0.05$). This shows a significant difference between the ovarectomy group of rats and the ovarectomy group of rats who were given intermittent exercise treatment related to their effect on the expression of CYP19 aromatase, which means that the intermittent exercise treatment in ovarectomy rats gave a significant increase in the level of CYP19 aromatase expression

in ovarectomy femur bone with a difference in mean level of 6.00.

DISCUSSION

This research is a pure experimental study using a post-test only control group design research design. The study was conducted using 30 experimental female white mice (Rattus Norwegicus) Sprague Dawley strain aged 12 weeks (3 months). Some of the reasons why using mice as experimental animals in this study are because they have the same analogy as humans, have conditions or information that can be transferred / transmitted, have genetic similarities that can be applied to all living things, have a common background behind knowledge related to biological processes, available and affordable in terms of cost or price, easy and able to adapt to research treatments and have ethical and social code implications (Davidson et al., 1987). The existence of comfort and relevance or can be compared with conditions in humans (Rodger et al., 1993). The advantages of using mice as experimental animals include cheap or inexpensive, easy to maintain and are commonly publicly used rats for research (O'Brien et al., 1997).

Rats are used as experimental animals aged 12 weeks (3 months) with the consideration that mice reach the maturity of sexual organs at 2.5 months (Jee & Yao, 2001) or 3 months (Kalu, 1991), so according to the research design that makes rats in menopausal conditions induced by ovarectomy surgery. This is because age is closely related to bone mass and bone strength in both humans and mice (Martin, 2002). Twelve rats were divided into two treatment groups, each group consisted of six samples which included the X1 treatment group namely the ovarectomized rat group and were given a standard feed-drink which was at the same time a negative control group from the X2 treatment group namely the ovarectomy rat group, fed with standard drinks and treated with intermittent exercise.

The reason for ovarectomy is because the ovarectomy mouse model is well known to be used in postmenopausal osteoporosis research. After ovarectomy the process of bone resorption exceeds the process of bone formation resulting in loss of bone mass (Wronski et al. 1989). Ovarectomy was agreed to have the same effect of histological changes on rat bone and human bone so that this could provide benefits related to information about bone mass loss in menopausal humans (Kalu, 1991). Ovarectomy is a method used to produce menopausal conditions artificially (Wronski & Yen, 1992). Ovarectomy is a potential factor that can induce the process of bone matrix deminaralization in mice (Cesnjaj et al. 1991). The ability of bones to repair damage due to ovarectomy in mice is the same as the ability of bones in humans (Abee et al. 1993).

Osteoporosis is a chronic progressive disease characterized by bone resorption process faster than bone formation process, resulting in decreased bone mineral density and bone microarchitecture damage resulting in bones becoming brittle and easily fracturing (Rizolli, et al., 2008). Osteoporosis or loss of bone mass in menopausal women and / or after ovarectomy is mainly due to estrogen deficiency (Doren, 2002). The research sample used is femur bone tissue, this is based on consideration that the strength of mechanical stress in the femur bone in the neck is a very sensitive indicator of bone loss due to ovarectomy, orchidectomy and immobilization (Peng et al., 1994). It also relates to osteoporosis predilection areas that often occur in the femur, vertebrae, pelvis and forearm bones (Sherwood, 2001).

The results of statistical analysis using the Mann-Whitney test obtained p value of 0.003 ($p \leq 0.05$), which means that intermittent exercise treatment in ovarectomy rats had a significant effect on increasing the expression of CYP19 aromatase in the ovaryectomy of the rat

bone. An increase in the expression of CYP19 aromatase in ovarectomy rat femur bone in this study, is in line with the concept that regular exercise with a moderate zone can increase serum estrogen levels in postmenopausal women (Agustiningsih, 2006). Regular exercise is likely to reduce the degree of perimenopausal estrogen deficiency, at least activating estrogen production which does not originate in the ovaries or extragonadal regions (Asnar, 2005).

More specifically in line with the concept that estrogen biosynthesis by extragonadal tissue; adipose, bone, mammary and brain tissue are highly dependent on the presence of circulating steroid C19 precursors (Labrie et al. 1997). Synthesis of the hormone estrogen can occur in osteoblasts or bones (Bruch et al. 1992, Bayard et al. 1995). Estrogen biosynthesis by extragonadal tissue; adipose, bone, mammary and brain tissue are highly dependent on the presence of circulating steroid C19 precursors (Labrie et al. 1997). CYP19 aromatase is a key enzyme in the process of estrogen synthesis in peripheral / extragonadal tissue, especially in bone tissue (Watanabe, et al. 2004). This enzyme is expressed in response to catalyzing aromatization processes for transformation from C19 androgens to C18 estrogens such as estradiol to estron transformation (Simpson et al. 1994; Conley & Hinshelwood, 2001; Kamat et al. 2002; Bulun et al. 2005). This CYP19 aromatase parameter is certainly appropriate as an indicator for assessing the effect of a combination of measured exercise exercise and calcium supplementation as an effort to prevent or manage osteoporosis during menopause and / or after ovarectomy which is mainly caused by estrogen deficiency (Doren, 2002). The CYP19 aromatase enzyme is expressed as a response in catalyzing the aromatization process for the transformation from androgen or testosterone to estrogen and from androstenediol to estron (Simpson et al. 1994;).

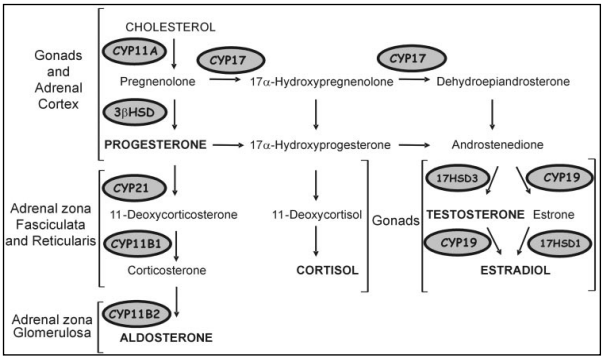

Figure 2
The Role of Aromatase in the Biosynthesis of Steroid Hormones in the Adrenal and Gonad Glands (Payne and Hales, 2004)

The mechanism of the occurrence of CYP19 aromatase expression in ovarectomy rat femur bones due to intermittent exercise in this study is most likely because the muscle contractions that occur due to intermittent exercise treatment can produce large amounts of IL-6 and IL-6 mRNA. Muscle biopsy after exercise shows an increase in IL-6, this indicates that muscle contraction is a stimulus for IL-6 production by muscles (Toft et al., 2002). Interleukin-6 is thought to work like a hormone, carrying out metabolic control by increasing energy supply during exercise. With increased glucose uptake by muscles, hepatic glycogenolysis must be activated. The content of muscle glycogen affects the release of IL-6 during exercise (Steinacker, 2004)., States that the expression of aromatase in bone osteoblasts can be triggered by several cytokines including IL-6 (Pedersen, 2004). Increased aromatase activity in bone osteoblast cells triggers an increase in local estrogen production which can decrease bone resorption and increase bone formation and bone density will be maintained because of the role of estrogen produced by the activation of aromatase induced by IL-6 (Purohit et al., 1992) This is in accordance with the theory that cytokines, especially IL-6 can increase aromatase expression (Shozu & Simpson, 1998). Running sports with a slope of 11% and a speed of 21 meters / minute

conducted as many as 40 sets of intervals 1 minute running and 1 minute rest for 4 weeks can prevent bone loss in ovarectomy rats by suppressing the process of bone resorption (Wong et al., 2006). Running sports with a slope of 11% and a speed of 20 meters / minute carried out as many as 40 sets of intervals 1 minute running and 1 minute rest for 4 weeks and administration of Genistein can prevent the process of bone loss in ovarectomy rats (Nakajima et al., 2001).

CONCLUSION

The level of CYP19 aromatase expression of femur bone tissue in rats that are ovarectomized and given intermittent exercise treatment is higher than the level of CYP19 aromatase expression in rats that are only ovarectomized. Intermittent exercise can trigger the process of the synthesis of the CYP19 aromatase enzyme as a key enzyme for the formation of the hormone estrogen in the ovaryectomy of the femur bone.

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CONFLICTS OF INTEREST

Neither of the authors have any conflicts of interests that would bias the findings presented here.

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Original Research

Change of Consciousness Through Oxygen Supply in Head Injury

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Abstract

Head injury is one of the main causes of death and disability in the productive age group and most occur due to traffic accidents. Patients with a head injury can experience permanent damage to brain tissue or secondary injuries such as brain ischemia due to hypoxia, hypercapnia, hyperglycemia or electrolyte imbalance, even respiratory failure and heart failure. The head injury patients are initially examined using a standardized scoring system to assess the consciousness level of patients with impaired consciousness, namely the Glasgow coma scale (GCS). One of the possible treatments for decreasing intracranial pressure (ICP) and cerebral perfusion managements to position the patients with a head elevation of 15˚-30˚. This treatment aimed to increase venous drainage from the head and to reduce systemic blood pressure that may be compromised by cerebral perfusion pressure. This study aimed to determine the effect of giving oxygen through a simple mask and the 30˚ head elevation position to the changes of the consciousness level for the patients witha head injury in the emergency department at Dr. Kariadi Hospital, Semarang. This study was quasi-experimental research without control with pre-test and post-test one-group design with used a sample of 23 respondents. The instrument used an observation sheet containing the GCS examination results and analyzed using the Wilcoxon test. Based on the results of the bivariate analysis using the Wilcoxon correlation test, a p-value of 0,000 <0,05 was obtained so it could be concluded that the H0 is accepted. Therefore, giving oxygen through simple masks and patient positioning with 30˚ head elevation affect the consciousness level of head injury patients at Dr. Kariadi Hospital, Semarang.

INTRODUCTION

Head injury is a series of pathophysiologic events that occur after head trauma which involve severe head component, ranging from the scalp, bones, and brain tissue or a combination. Head injury is one of the leading causes of death and disability in the productive age group and most of it occurs due to traffic accidents.[1]Poorly treated head injury patients tend to have a secondary brain injury in addition to primary brain injury which will result in brain ischemia.[2]

Patients with a head injury can experience permanent damage to brain tissue or secondary injuries such as brain ischemia due to hypoxia, hypercapnia, hyperglycemia

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or electrolyte imbalance, or even respiratory failure and heart failure.[3] As a result of trauma, the patient experiences physical and psychological changes. Severe head injury often resulting in secondary brain injury, cerebral edema, airway obstruction, increased intracranial pressure, vasopasm, hydrocephalus, metabolic disorders, infections, and seizures.[4] Patients who experience decreased consciousness generally experience airway disorders, respiratory problems and circulatory disorders.[5]

The brain is a vital organ for all activities and functions of the body, because there are various control centers such as physical, intellectual, emotional, social, and skill control in it. Eventhough the brain is in a closed space and protected by strong bones, it can also experience damage. One of the causes is a head injury that can cause damage to brain structure that leads to disruption of brain function.

Normally, the brain requires 30-40% oxygen of the total body's oxygen needs. Since the brain does not have oxygen reserves, the incoming oxygen supply will be used up. To maintain adequate brain oxygenation, a balance is needed between oxygen supply and brain oxygen demand. Brain oxygen balance is affected by cerebral blood flow, which ranges from 15-20% of cardiac output. Good management of head injury must begin from the scene of injury, during patient transportation, at the emergency department until definitive therapy is performed. Correct and proper management will affect the patient outcomes. The initial examination performed on patients with head injury using the Glasgow coma scale (GCS) which is a standardized assessment system used to assess the level of awareness in patients with impaired consciousness. It includes the numerical calculation of cognitive, behavioral, and neurological functions. The results can be used to measure the level of awareness of head trauma patients, which is one of the components used as a reference for treatment and the basis for general clinical decision making for patients.[6]

Based on the results of the Riset Kesehatan Dasar (RISKESDAS) in 2013, from 1,027,758 people of all ages, there were 84,774 injured respondents and 942,984 people not injured. The national injury prevalence is 8.2% and the prevalence of head injury in Central Java is 8.3%. The highest injury prevalence based on the characteristics of respondents is in the age group of 15-24 years (11.7%), and in men (10.1%).[8]

Based on the data from RSUP Dr. Kariadi Semarang in 2017, there were 189 patients who suffered a head injury. The data from the General Hospital Dr. Kariadi Semarang showed that there were 168 patients with a head injury from 612 case of traffic accidents recorded from January to August 2018. Every time an accident occurs and the victim experiences a collision in the head, especially if it causes the patient to become unconscious, must be considered a serious and dangerous accident with the suspicion of brain concussion. Likewise, every victim who is fainted and thought to have suffered a head injury must be treated carefully.[3]

In the study conducted by Febriyanti, et al (2017), which used paired t test SaO2 before and after the first 10 minutes, p-value = 0.000 <α 0.05 were obtained in the first 10 minutes and the second 10 minutes tests. The tests between the second 10 minutes and the third 10 results in p-values = 0.005 <α 0.05 and repeated ANOVA tests. These results showed that there is an influence of prong nasal oxygenation therapy on the changes in oxygen saturation of head injury patients in the Emergency Department of Prof. RSUP Dr. R. D. Kandou Manado.

A preliminary study was carried out on 28 September2018 at Dr. Kariadi Semarang within the period of January - August 2018.There were 150 head injury patients and head injury were the most common

diagnosed case in the surgery. Head injury will provide a more complex disorder when compared to the trauma on other body organs. This is due to the anatomic and physiological structure of the skull contents, which are brain fluid, brain membranes, nerve tissue, blood vessels and bones, having the consistency of liquid, soft solid and dense solid. Patients with head injury require early diagnosis so that therapeutic measures can be taken immediately to produce a precise, accurate and systematic prognosis. Because of the high number of head injury incidents, the writeris interested in researching about changes in signs of increased intracranial with the title "The Effect of Oxygen Administration Through Simple Masks and 30º Head Position to the Changes in Awareness Levels of the Patients with Mild and Moderate Head Injury.

METHODS

This study uses the quantitative research methods with quasi-experiment research. The research design used was pre-test and post-test one group design. The subjects were head injury patients in the ER of RSUP Dr. Kariadi Semarang with a total sample of 23 respondents using purposive sampling. Data collection was done by observation and using the Consciousness Level. It is used to assess the patient's level of consciousness and neurological status. Data analysis was performed using univariate analysis, normality test and bivariate analysis (Non-Parametric Test i.e.Willcoxon Test). The inclusion criteria in this sample were all head injury patients recorded in the medical record, head injury patients who had been examined for consciousness level, patients with injury classification. Severe head injury, moderate head injury and mild head injury. The research process includes selecting head injury patients used Glasgow Coma Scale (GCS) score results by looking at inclusion and exclusion criteria, taking GCS assessment data for subjects that have the inclusion criteria, providing oxygen through a simple mask for 6 hours and head elevation position 30˚ for 2 hours, and re-evaluating the subjects GCS assessment results after the treatment.

RESULTS

The result of this study shows that the majority of E values (eye) with a score of 3 are 17 people (73.9%), V values (verbal) with a score of 5 are 8 people (34.8%), M scores (motoric) with a score of 5 are 11 people (47.8%). Based on Table 1, most of the E (eye) scores with a score of 4 were 14 people (60.9%), V (verbal) with a score of 5 were 13 people (56.5%), M (motorik) with a score of 6 a total of 16 people (69.6%).

Tabel 1
GCS Assesment Distribution Before and after Intrevention

Indicator	Score	f	%
Before intervention			
Eye	1	1	4,3
	2	4	17,4
	3	17	73,9
	4	1	4,3
Verbal	1	1	4,3
	2	6	26,1
	3	1	4,3
	4	7	30,4
	5	8	34,8
Motorik	2	1	4,3
	4	1	4,3
	5	11	47,8
	6	10	43,5
After intervention			
Eye	2	1	4,3
	3	8	34,8
	4	14	60,9
Verbal	2	1	4,3
	3	4	17,4
	4	5	21,7
	5	13	56,5
Motorik	3	1	4,3
	5	6	26,1
	6	16	69,6

Based on the analysis using the Wilcoxon correlation test (table 2), a p-value of 0,000 <0.05 was obtained so that it can be concluded that the H_0 was accepted. This means that there is a significant difference in the level of awareness between before and after administering oxygen through a simple mask and 30˚ head elevation

position in the head injury patient in the emergency room (ER) of RSUP Dr. Kariadi Semarang.

Table 2
TheAwareness Level Before and After Oxygen Administration Through Simple Mask and 30o Head Elevation Position of Head Injury Patient in the ER of RSUP Dr. Kariadi Semarang (n= 23)

Indicators	Pre Intervention	Post Intervention	p
GCS Levels, Mean(SD)	11.70 (2.54)	13.57 (1.92)	0,000*
Min-Max	6-14	9-15	

*Wilcoxon test

DISCUSSION

Based on the results of the study, we found the average size of the GCS score before being given oxygen through a simple mask and 30˚ head elevation position was 11.70, while the average size of the GCS score after being given oxygen through a simple mask and 30˚ head elevation position was 13,57. From the test results using the Wilcoxon Test, the p value of 0,000 <0.05 was obtained so that it can be concluded that H_0 is accepted. This means that there is an influence of oxygen delivery through simple masks and 30˚ head elevation position to changes in the level of consciousness in head injury patients in the ER of Dr Kariadi Hospital Semarang.

Head injury is damage to the head that is neither congenital nor degenerative, but is caused by an attack or physical impact from the out side which can reduce or change in consciousness and causing damage to cognitive abilities and physical function. A head injury can occur as a result of collisions on the head in 3 types of conditions,which are a stationary head being hit by a moving object, a moving head hit by a stationary object, and a head that cannot move because it rests on another object hit by a moving object. Based on the severity of head injury, it can be classified into mild head injury(GCS 13-15, amnesia less than 30 minutes), moderate head injury (GCS 9-12, loss of consciousness 30 minutes - 24 hours), and severe head injury (GCS 3-8, a decrease in consciousness of more than 24 hours to days).[10]

An increase in ICP is an emergency that must be dealt with immediately. When the pressure rises, the brain substance is suppressed. Secondary phenomena are caused by circulatory disorders and edema can cause death. Intracranial enhancement occurs when the value of intracranial pressure is more than 15 mmHg which is characterized by clinical syndromes indicated by an increase in blood pressure, decreased pulse, changes in respiration and changes in pupils. The impact of increased intracranial pressure on cerebral circulation will cause an increase in intracranial pressure and decreases cerebral blood flow resulting in ischemia. 3-5 minutes of ischemia will cause irreversible brain damage so that it stimulates the vasomotor center and systemic pressure increases to maintain the blood flow such that the pulse slows, breathing becomes irregular and blood pressureincreases.[12]

Head up sleeping position allows the chest cavity to develop widely and increase the lung complaints. This condition will cause oxygen intake (oxygenation) to improve and the respiration process returns to normal. Positioning the patient with a slight head elevationof 30˚ to increase venous drainage from the head and head elevation can cause a decrease in systemic blood pressure which may be compromised by cerebral perfusion pressure. Head up sleeping position arrangement allows the chest cavity to expand widely and increase lung complaints. This condition will cause oxygen intake (oxygenation) to improve so that the respiration process returns to normal.[39]

This is related to low GCS which is a predictor of death in head injury patients. Measuring GCS is an important intervention that must bed one by nurses in the ER room when providing nursing care to patients

with a head injury. In severe head injury, GCS values tend to be quickly decreased due to the compensation mechanism of the human body when the reisan increase in intra-cranial pressure. Head injury patients require adequate oxygen supply to meet the brain's metabolic needs. Oxygen saturation observation is carried out to prevent and recognize the risk of tissue hypoxia. Tissue hypoxia will cause a risk of secondary trauma to brain tissue which will result in the death of the patient. Peripheral oxygen saturation below 90% indicates hypoxemia condition.[14]

Low oxygen saturation significantly increases the risk of death, patients with the saturation <80% have a threefold increased risk of death. Hypoxia is a predictor of poor outcomes in patients with a moderate and severe head injury as a result of the additional risk of secondary brain injury experienced by the patient.As much as 27-55% recorded hypoxia can originate from the scene, in the ambulance / when transportation, or upon arrival at the emergency department.

The level of awareness of head injury patients assessed by the GCS score is a measure of the clinical condition of the head injury patients examined when the patient arrives at ER. The level of awareness evaluated with GCS score has a strong influence on the life chances and recovery of the head injury patients. The GCS score is one of the mandatory examinations in patients with head injury at the time of hospital admission. A low initial GCS score indicates a severe disturbance in the brain function associated with the risk of the death of the patient. Brain disorders that continue with brain tissue death are important, because the nature of brain tissue tends to be irreversible in the event of death.[40]

Disorders and damages that occur in the brain will disrupt the work of the body vital systems, such as breathing and cardiovascular, systems, and result in the threat of death. Attention to the patient's family must also be given to provide emotional and spiritual support. The treatment for the head injury patients with low GCS will get a priority, this is indicated by the use of the level of awareness as a component in triage that serves to prioritize patient management. Patients with low awareness will fall into the first priority category. Priority is done to prevent worse complications and even death in patients.[39]

The main focus of head injury patient's management is to prevent secondary brain injury. Providing oxygenation and maintaining good and adequate blood pressure to fulfill brain perfusion is the most important factor, especially to prevent and limit the occurrence of secondary brain injury which will ultimately improve the patient's end result. This is in accordance with Patria (2012) that head injury patients should be given oxygen therapy using masks or reservoir masks with oxygen concentrations of 40-80%.[16]

Hypoxia is a condition inadequate tissue oxygenation at the tissue level which occurs due to deficiency of oxygen delivery or the use of dicellular oxygen. Oxygenation is the most basic human needs. The existence of oxygen is a component of gas and a vital element in the metabolic process and to maintain the survival of all body cells. Maslow's Hierarchy theory is a theory that nurses can use to understand the relationship between basic human needs when providing care. Physiological needs are important for survival, one of which is oxygenation needs. Christopher etal. (2012) concluded that the oxygenation of brain tissue is closely related to several parameters of patient outcome and prognosis. The application of intervention therapy to maintain oxygenation of brain tissue above a certain threshold can improve mortality and neurological outcomes in the head injury patients. Head elevation based on physiological response is a change in position to increase blood flow to the brain and prevent an increase of ICP.

Some clinic nurses perform bedrest with a head elevation not more than 30 °, rationally preventing the increased risk of decreasing cerebral perfusion pressure and further worsening cerebral ischemia if vasospasm is present.[43]

This is in line with the research conducted by Lesko (2012) which states that the total GCS score is a good predictor of death for head injury patients. GCS is related to a disturbance in brain structure or tissue. According to Maas, Engel, and Lingsma (2011), there are several studies that showed an association between lower scores on GCS and worse outcomes. In patients with severe head injury, the motor component of GCS has the greatest predictive value because eye and verbal responses are generally absent in patients. The GCS score in this study uses an interval scale, with a middle value of 10, a minimum value of 6 and a maximum value of 15. The results of this study are consistent with research conducted by Emery, Durward and Fieldman (2003) who found that the head position up to 15˚ significantly reduced the intracranial increase which is due to the effects of jugular venous system pressure and there was a decrease in heart rate from 0.76% to 5.6%. Another similar research was conducted by Setterval, Souza and Silva (2011) where GCS scores were assessed three times during 72 hours after injury. The findings of this study showed that GCS has a relationship with the outcome of head injury patients. Research conducted by Duward et al. and Lee et al. also states that a head up position of 15 to 30 head was progressively reducing arterial pressure and decreasing CVP ($p < 0.05$) within the ranges of 0.12 to 1.8 cm.

CONCLUSION

The result of this research describe that there is an influence of oxygen supply through simple masks and the 30^0 head elevation position to the changes in the awareness level of head injury patients at Dr Kariadi Hospital Semarang.

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Original Research

Nursing Lecturers' Transformasional Leadership In Classroom Management At Nursing And Health Faculty Of Muhammadiyah University Of Semarang

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Abstract

A nursing lecturer is an individual responsible for learning process management of nursing students who are expected to professionally provide health services (care provider) in the forms of biological, psychological, social, and spiritual services to individuals, families, and communities in the future. A nursing lecturer is expected to have competences as a classroom management leader who gives opportunities for students to properly actualize their emotions, the one who effectively utilizes resources, and who does not only focus on the working results (Cummings et al., 2010 and Wong, 2012) known as transformational leadership. Transformational leadership is widely acknowledged as one leadership model which improves human resources. This research aims to figure out the lecturers' transformational leadership in classroom management at Nursing and Health Faculty of Muhammadiyah University of Semarang. This non experimental (descriptive) research is conducted with a survey approach on a population of 24 nursing lecturers fulfilling inclusion criteria. Result of the reseacrh showed that 79.2% of nursing lecturers are females with an average of 42 years old. 93.9% are master graduates. 54.2% of lecturers have good transformational leadership while the other 45.8% still have poor transformational leadership. 70% of lecturers have charismatic competence while the other 30% have less charismatic competence. 62.5% of lecturers have idealistic persuasive competence while the other 37.5% have less idealistic persuasive competence. 54.2% of lecturers have good inspirational motivation competence while the other 45.8% have less inspirational motivation competence. Most transformational leadership components in classroom management are classified into the good category. However, 45.5 % of them tend to be poor.

INTRODUCTION

A nurse is an individual who professionally provides health care (*care provider*), in the forms of biological, psychological, social, and spiritual services to individuals, families, and communities. A nurse is expected to be professional and has both competences of hard and soft skills. Soft skill is one aspect that a nurse should

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acquire. Soft skills are greatly required to support hard skills known as technical skills that a nurse obtains during his/her educational processes as nursing students. *Soft skills* include an ability to adapt, to communicate, to work together, to solve problems, as well as to be confident, discipline, and accurate (Hartiti, 2012). It can be concluded that *soft skills* are greatly required in the real working environment. Thus, an individual's success is not only based on his/her intellectual quotient but also his/her soft skills which result in his/her working achievements.

Agustian (2007) reports the results of a research conducted by Belt (2001), on respondents of Six Sigma magazine stating that the main problems regarding to *soft skills* include communication by 88%, interpersonal by 72%, and leadership by 56% while technical and analytical or known as *hard skills* are only by 18%. In facts, soft skill trainings are more frequently conducted than the hard skill ones in the real working environment due to the working necessities.

Christian (2008), as quoted by Human Capital magazine, estimates that people with high working complexities require high proportion of soft skill trainings than hard skill ones with a comparison of 70% to 30% or even 80% to 20%. Those are conversely applicable to people with low working complexities. For time allocation, Christian provides a general illustration that those deal with 10-15% working hours per individual per year. It can be concluded that *soft skills* are greatly required in the real working environment in which an individual may face various problems. Ideal learning or training designs are expected to have more portions on *soft skills* including leadership, communication, relationship maintenance, and negotiation.

Soft skills have bigger portions to support individual's success in the real working environment. Having sophisticated *hard skills* without having good personality or *soft skill*s may result in vain (Ismail, 2007). A study on human resource problems in the last decade is conducted by an *Emotional Quality Inventory (EQI)* institution. Professionals from all over the world are collected as samples. The results show that IQ which is maximally 20% of the brain capacity contributes only 6% for an individual's success, than EQ does. In addition, Carnegie Institute of Teknology finds other proofs that from 10,000 successful persons, 15% of their success are determined by their technical skills, while the other 85% are dominated by personality or soft skill factors. Edward Wiggam also finds that 400 or 10% of 4,000 people lost their jobs due to their technical inability. It means that the other 90% of people are jobless due to their problems on personality (Christian, 2008).

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The objective of this research is to describe the nursing lecturer's transformational competences in classroom management at

faculty of nursing and health of Muhammadiyah University of Semarang.

METHODS

This non experimental or descriptive research is conducted with a survey approach to figure out the profile of nursing lecturers' transformational competences in classroom management at Faculty of Nursing and Health of Muhammadiyah University of Semarang by using questionnaire as the measuring device. The research samples are the entire lecturers of Nursing Undergraduate Program of Faculty of Nursing and Health of Muhammadiyah University of Semarang fulfilling inclusion criteria with a total of 24 respondents.

RESULTS

This research has been carried out on 24 lecturers at the University of Muhammadiyah Semarang. The nursing lecturers collected as the research samples, 79.2 % are female. The lecturers' average age is 42. The youngest one of 31 years old and the oldest one is 52 years old, and 93,9% of them is master graduate.

Students' perceptions on the nursing lecturers' leadership competences describe on table 1 that 54.2% of lecturers have good transformational leadership while the other 45.8% have not. Most lecturers have charismatic competence but not many of them have idealistic persuasive competence.

Based on the results above, the researchers provide a training module for lecturers to improve their transformational leadership methods in classroom, laboratory, or clinical management as outcomes to develop this research. This module consists of handout materials, lesson plans, schedules, and assessments. This module is prepared based on literature studies and is supervised by experts which is then used to improve their transformational leadership for the benefits of nursing students' soft skill improvements. The module is enclosed.

Table 1
The Nursing Lecturers' Transformational Leadership competences

Nursing Lecturers' Transformational Leadership Component	Good		Poor	
	f	%	f	%
1. Charismatic competence	17	70	7	30
2. Idealistic persuasive competence	9	37.5	15	62.5
3. Inspirational motivation competence	13	54.2	11	45.8
4. Intellectual stimulation competence	13	54.2	11	45.8
5. Individual consideration competence	13	54.2	11	45.8
Overall	65	54.2	55	55

DISCUSSION

Transformational leadership is a vision achievement-based leadership. Michael (2001), and Eisenbeiss et al., (2008) state that transformational leadership improves a nurse's empathy, understanding, working motivation, applicable values, and interests on jobs that he/she has already chosen. Failla & Stichler (2011) and Stina et al (2008) state that transformational leadership improves a nurse's working satisfaction and working environment. The results of a research conducted by Akerjordet & Severinsson (2008) suggest that transformational leader's emotional quetient and interpersonal competence improve subordinates' knowledge, care, confidence, participation, and communication that a nurse's working satisfaction and patients' satisfaction are also improving. A lecturer's transformational leadership may influence students' competences in improving their soft skills.

A lecturer's charismatic competence enables him/her to provide visions, goals,

and strategies for students to become professional nurses.

A lecturer's idealistic persuasive competence may become a role model and an example to be followed. It may also encourage students to have positive attitudes on nursing profession, give examples of positive attitudes to develop his/her positive values as a nurse as well as an image of a professional nurse, and have a good interpersonal relationship.

A lecturer's inspirational motivation competence has a meaning to direct students to have values that being a nurse is a professional choice, to give acknowledgement of nursing profession, and to motivate students in completing their assignments based on their nursing profession, to proportionally give students rewards, to prepare a conducive learning environment.

A lecturer's intellectual stimulation competence enables him to lead the class, develop teaching materials, improve teaching methods, and assigning techniques which stimulate creativities.

A lecturer's individual consideration competence enables students to have confidence in pursuing a carrier and self actualization, to readily face competitions as professional nurse, and to be motivated in educational development.

CONCLUSION

The nursing lecturers have good transformational leadership competencies.

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CONFLICTS OF INTEREST

Neither of the authors have any conflicts of interests that would bias the findings presented here.

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Original Research

Factors Affecting Indonesian Nurse Behavior in Applying Universal Precaution

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Abstract

Professional nurses in carrying out their roles and functions on a daily basis, are always at risk of contacting various diseases. Transmission of the disease can occur via direct or indirect contact, transmission can be through droplet transmission, and airborne transmission (CDC). Universal precautions are one of the strategies that have been recommended by the Centers for Disease Control and Prevention (CDC) in efforts to control infection and disease transmission in health facilities, such as hospitals, doctors' practices, and other health care centers. The purpose of the study was to determine the factors that influence the behavior of Indonesian nurses in implementing universal precaution in the Center for Health Services in Qatar. The research process was carried out in October 2011 in Qatar with a total sampling method, a total sample of 52 respondents. The results showed that most Indonesian nurses in Qatar with a Diploma in Nursing, had work experience of more than 6 years. Placed in various locations such as; ambulance services, company clinics and hospitals. There was no significant relationship between knowledge and nurses behavior in applying Universal Precaution ($p < 0.05$). There was no significant relationship between attitude and behavior of Indonesian nurses in implementing Universal Precaution ($p < 0.05$). There was no significant relationship between motivation and the behavior of Indonesian nurses in implementing Universal Precaution ($p < 0.05$). There was a significant relationship ($p < 0.05$) between the means and the behavior of Indonesian nurses in implementing Universal Precaution. Based on these results it is necessary to maintain the consistency of nurses to always apply universal precaution appropriately according to the patient's condition at hand

INTRODUCTION

Universal precautions are one of the strategies that have been recommended by the Centers for Disease Control and Prevention (CDC) in efforts to control infections and transmit diseases in health facilities, such as hospitals, clinical clinics, and other health care centers. Standard Precaution can prevent transmission of disease / microorganisms (Duerink, et al. 2006). The principle of universal precautions is to assume all patients are affected or infected by microorganisms, with or without signs and symptoms so that a uniform level of prevention must be

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used in treating all patients (Smeltzer, et al, 2009).

Universal Precaution (UP) ie. a way of handling that must be applied by health workers to minimize exposure to blood and body fluids from all patients who are sources of infection regardless of diagnosis or infection status (ICN, 2009). This method was first introduced by the Centers for Disease Control and Prevention in the United States in 1987, one of its main objectives is to protect health care workers from disease transmission in health facilities by stressing the importance of treating all patients as potential contagious infections so that steps need to be taken adequate prevention (Isa, 2006, from Khairudin 2007).

Health workers have the potential to be exposed to blood during their duties and therefore they have the risk of being infected with diseases caused by pathogenic germs, such as HIV, hepatitis C virus, and hepatitis B virus. Blood exposure can occur through percutaneous injury (needling or other sharp objects)), mucocutaneous incidents (splashes of blood or body fluid mixed with blood on the eyes, nose or mouth) or blood contact with normal skin (Kermode, et al, 2005).

WHO (2002) estimates that among 35 million health workers worldwide, around three million have experienced percutaneous exposure to blood-borne viruses each year (two million HVB, 900,000 HCV and 300,000 HIV). This incident is estimated to result in infection of 16,000 hepatitis C, 66,0000 hepatitis B and 200 - 5000 HIV. More than 90% of these infections occur in low-income countries and whereas in developed countries can be prevented (Kermode, et al., 2005)

According to Nopriadi, et al. (2004), hospital staff who have a high risk of getting nosocomial infections include: doctors, nurses, midwives and laboratory workers, given that these officers always check and make direct contact with patients. As health workers who are in the front lines of each health service center, nurses are always exposed to various cases of illness, this is very risky to the health of the health workers themselves. Research conducted by Anwar (2005) shows that universal precautionary procedures are still often ignored, influencing factors are lack of knowledge and lack of funds needed to support the implementation of universal precautionary procedures (Khoirudin, 2007).

According to Harris, Nicolai and Richmond (2010), that almost all Emergency Medical Service sites make a report if they are exposed to blood and body fluids, and they are aware of the risk of hepatitis and HIV. In addition EMS officials were found to be inconsistent in applying the precaution standard when treating patients or when using syringes, such as not wearing gloves 17% and not removing contaminated objects (19%), including needles (87%) at any time. There were also reported cases of 40% needle recapping, 1.4% lanceolate, and 4.5% needle puncture.

Officers in the emergency room have a high risk of occupational infections by pathogenic germs through the blood, but unfortunately, according to Evanoff, et al (1999) reported that adherence to the application of universal precaution is still low in clinical high-risk settings. Compliance with the use of PPE is influenced by knowledge, attitudes, perceptions of risk, and organizational climate. In addition, the availability of PPE and convenient or easy use also have an effect. Differences in the level of adherence to PPE observed between different work groups indicate that interventions designed for certain groups may be needed for changes in effects in the use of PPE and other precautions against blood-borne disease transmission.

The procedure of universal precaution must absolutely be implemented in all health care centers, such as in emergency rooms, action rooms, triage rooms, observation rooms and laboratories, as well as in ambulances. Various nursing procedures, both invasive and non-invasive, allow nurses to be exposed to germs that come from patients through blood and bodily fluids that contain blood. All nurses must apply universal precautionary procedures that are appropriate and consistent, at all times carrying out nursing actions for all patients, because in addition to self-protection, also to prevent cross infection to patients or colleagues. Universal precautions require nurses' abilities as executors, supported by facilities and infrastructure, as well as Standard Operating Procedures that regulate universal precautions. Health workers must get protection from the risk of contracting the disease in order to work optimally (Mahardani, 2010). The purpose of this study is to determine the factors that influence the behavior of Indonesian nurses in implementing universal precaution in the Health Service Center in Qatar.

METHODS

The study was conducted with a descriptive correlation method which is a study conducted to analyze the relationship between two research variables, namely between the independent variable and the dependent variable (Nursalam, 2008). The design used is the Cross Sectional approach. The sample in this study were all Indonesian nurses in Qatar, amounting to 65 people (INNA Qatar, 2011). This research was conducted at the Indonesian Nurses Community in Qatar, the Qatar Indonesian National Nurse Association (PPNI), which was carried out in October 2011. Data collection tools with questionnaires and observation sheets. Data were analyzed univariately, bivariately (Pearson Product Moment correlation, Spearman Rank. Kolmogorov-Smirnov test).

RESULTS

The results obtained by Indonesian nurses who work in Qatar are mostly men, aged less than 40 years and have a DIII education. In general they have ample work experience> 10 years. Indonesian nurses working in Qatar health care centers are scattered in several work locations, such as; in ambulances, in company clinics, and hospitals, and there are also those who work in ambulances and clinics. Most Indonesian nurses, have a positive attitude, and have high motivation, and expressed supportive means for the implementation of Universal Precaution. Indonesian nurses mostly have positive behavior towards the implementation of universal precaution.

Normality test results for knowledge, means and behavior variables, the significance value is less than 0.05, then the data is not normally distributed, while the normality test for attitude and motivation variables, the significance value is greater than 0.05, then the data is normally distributed.

Obtained results there is no significant relationship between behavior with knowledge nurses, between attitudes with nurses' behavior, between motivation and behavior (Table 1).

Table 1
Correlation of Knowledge, Attitudes and Motivation with Nurse Behavior in implementing Universal Precaution

Indicator	Correlation coefficient	p
Nurse Knowledge	-0.260	0.063
The attitude of the nurse	0.037	0.797
Nurse motivation	0.159	0.260

There is a meaningful relationship between facilities and infrastructure with behavior (Table 2).

Table 2
Correlation of Facilities and Infrastructure with Nurse Behavior
in Applying Universal Precaution

Indicator	Correlation coefficient	p
Facilities and infrastructure available	0.458	0.001

DISCUSSION

Indonesian nurses working in Qatar, mostly aged between 30 - 39 years old. Characteristics of Indonesian nurses working in Qatar are mostly in the early adult phase so they have emotional maturity and can make the right decisions in carrying out their roles and functions as professional nurses . According to Berg (1996) age is the age of the nurse who outlines an indicator in the maturity of each decision-making that refers to each of his experiences (Rozulaina, 2007).

Indonesian nurses who work in Qatar, in general, have had enough previous experience, where most respondents have a tenure of> 10 years Before working in Qatar, they have worked in company clinics in Indonesia, and in hospitals, both in Indonesia and abroad. Siagian (1995) states, one's service life in the organization needs to be known, because tenure is one indicator of productivity and work motivation. Furthermore Siagian assumes that the longer a person works in an organization the higher the productivity, because he is more experienced and has high skills in completing tasks, but it is not impossible the opposite happens, that people who have long worked in the organization will show symptoms of decreased motivation and productivity work. If someone gets a good work experience in the past, it will also have a good effect in the new workplace, but conversely if the experience of something less certainly will affect the new work environment.

The study described that male respondents were more dominant because the nurses' admission system from Indonesia in Qatar at this time was still dominated by male nurses, while female nurses were generally local. Gender is the respondent's identity that is used to distinguish male or female nurses. Siagian, (1995) states that there are certain types of work that are suitable for women or men. And the nursing profession is seen as a female profession, but it is also possible for men to enter the profession, but in small numbers.

The study explained that Indonesian nurses in Qatar, most of them were Nursing Academy graduates. Which means that most Indonesian nurses are still at the level of semi-professional (vocational) nurses. Low education level, but have a long working experience, will affect the behavior of nurses. The higher level of nurse education can influence nurses' behavior in applying universal precaution appropriately and correctly. The results of research on Indonesian nurses have a high level of knowledge about universal precaution. High knowledge about universal precaution can encourage someone to behave according to the expected standard. Knowledge of how diseases are transmitted and their prevention can encourage nurses to apply universal precaution appropriately and correctly.

The study showed that most Indonesian nurses had a positive attitude towards the adoption of universal precaution. A positive attitude of nurses can encourage nurses to behave positively towards the application of universal precaution to prevent transmission of disease, from patient to nurse and vice versa from nurse to other patients. The results showed that most Indonesian nurses were highly motivated. Motivation can arise from within an individual or come from the environment for someone and what gives direction to their activities

The results of research on Indonesian nurses showed that the majority of respondents stated the means of support. The availability of facilities at work is one of the factors that influence the formation of compliance and includes enabling factors (Green, 2000). If the facilities and facilities are insufficient in the working environment, it is certainly difficult to achieve the goals of an organization. The availability of facilities and infrastructure has a very important role among other factors that influence the behavior of nurses in the application of universal precaution, because without the means and infrastructure, standard precaution cannot be applied precisely and consistently.

The results obtained by the relationship between knowledge and behavior of nurses that are not significant (p <0.05) These results are in line with the study of Regina, et al (2001) in Hong Kong, which showed no significant relationship between nurse knowledge and compliance with Universal Precaution and It is recommended that Universal Precaution training programs need to be considered to be combined with empirical knowledge. But this is different from the results of research conducted by Karmode, et al (2005), which states that some actions that need to be emphasized to improve the compliance of health workers in the application of universal precaution, not only their knowledge and understanding, but also the importance of creating a safe environment by the organization that hired him. According to the results of research conducted by Ndikom and Onibokum (2007) there is a significant relationship between knowledge and behavior in HIV prevention among health workers in Nigeria. According to the authors knowledge of how disease transmission and prevention can encourage nurses to apply universal precaution appropriately and correctly. However, high knowledge about universal precaution must also be supported by facilities / facilities available at the workplace agency.

The results obtained by the correlation between attitude and behavior of nurses were not significant at (p <0.05). Research conducted by Oliviera, et al (2009) states that despite the fact that staff have adequate knowledge about universal precaution, they fail to behave appropriately in their actions to reduce the risk of spreading infectious agents and causes of work accidents. Although there are still some respondents who are negative about universal precaution, it does not prevent them from continuing to apply universal precaution that is true and right in the workplace. Whereas Askarian, et al (2005) conclude that strong support for the achievement of the implementation of the standard precaution guidelines depends on several factors such as optimal awareness and positive attitudes each health worker has, and this goal cannot be achieved without continuing training by quality staff, as often mentioned in various literature. According to researchers a positive attitude needs to get support from other factors so nurses can behave optimally in applying universal precaution.

The results obtained by the correlation between attitude and behavior of nurses were not significant at (p <0.05). These results are not in line with the results of research conducted by Khairudin (2010) which concluded that there is a significant relationship between nurses' motivation in implementing universal prevention. Mark Cole, (2005) states that a motivational teaching approach is needed in changing the behavior of health workers to increase the level of compliance in applying hand washing before and after taking medical action. The author assumes that nurses' motivation in behavior in the application of universal precaution is not always consistent, because motivation can be influenced by factors of encouragement from within the individual, as well as outside the individual.

The results obtained by the correlation between attitude and nurse behavior were

significant at ($p < 0.05$). This is in line with the results of research conducted by Efstathiou et al (2011), stating that one of the inhibiting factors of health workers in implementing universal precaution is the unavailability of appropriate facilities and infrastructure when they need it. While the results of research conducted by Ndikom and Onibokum (2007) state that the facilities and infrastructure needed in practice must always be available, and so also the workplace environment must be sufficiently conducive to the application of universal precaution. These facilities and facilities essentially support or enable the realization of a behavior, so it is called a supporting factor or enabling factor (Green, 2000). Facilities and infrastructure in the nurse's workplace environment have the greatest influence on the application of universal precaution, because without adequate facilities and infrastructure, it is not possible for a nurse to apply universal precaution that is appropriate and consistent.

Limitations that exist in this study include the use of the study correlation approach method so that the relationship determined from the independent variable and the dependent variable is not a causal relationship, because the study was conducted at the same time and without any follow-up. And the absence of controlling factors in this study. With the limited number of respondents available, so that if this study is conducted with a larger number of samples, it will certainly produce better results. And there are still other factors that can be used as independent variables in this study, such as level of education, length of work experience, perceptions, sources of funds and others. Data collection using a questionnaire has a very subjective impact so that the truth of the data depends on the honesty of the respondents. Researchers have not found the standard standard questionnaire so that the instrument is based on the understanding and experience of the researchers themselves, which of course is still limited as a beginner researcher. The questionnaire was used for the first time although the results of the validity and reliability tests were quite good but only one research site was limited. Appropriate and consistent application of universal precaution is very important for a nurse to provide nursing care to the clients.

CONCLUSION

The results of the study of the factors influencing the behavior of Indonesian nurses in implementing universal precaution at the Qatar Health Service Center, namely: the majority of Indonesian nurses working in Qatar are male, aged less than 40 years old, have a DIII education, already have considerable work experience , spread across several work locations, such as; in ambulances, in company clinics, in hospitals, while most work in ambulances and clinics. There is a relationship between the availability of facilities and infrastructure with the behavior of Indonesian nurses in carrying out universal preventive action procedures in the work environment. There is no relationship between the level of knowledge, attitudes and motivation of nurses on the behavior of Indonesian nurses in carrying out universal preventive action procedures in health care centers.

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CONFLICTS OF INTEREST

Neither of the authors have any conflicts of interests that would bias the findings presented here.

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Original Research

Tuberculosis Knowledge among University Students in Indonesia

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Abstract

The rising tuberculosis (TB) incidence has become one of the main health issues in the world. The objective of this study is to understand TB knowledge and what factors may predict students' TB knowledge among University students in Indonesia. This study included a total of 200 students. Convenient sampling was used to recruit students for the study. Univariate analysis utilized, such as t-test and one-way ANOVA and Pearson correlations coefficient. Stepwise multiple regression analysis was used to understand which factors can predict the TB knowledge. Overall, the mean score for TB knowledge among the students was 9.49 out of 14. Most of the respondents were male, and included several ethnicities, such as Sunda and non-Sunda. The variables associated with TB knowledge were gender, education, major field of study, and heard of TB. Moreover, the study found that, as predictors, the variables that influenced knowledge about TB ranked according to relevance were: major field of study and educational background. Health promotion among students is very important to improve their knowledge related to TB disease. The findings could be used for designing the university strategic programs in measuring the knowledge of TB among their students. Students with accurate knowledge of TB can help reduce its prevalence in Indonesia.

INTRODUCTION

The rising tuberculosis (TB) incidence has become one of the main health issues in the world. Although some interventions for the prevention and treatment of TB have been developed, the incidence and mortality rates of TB continue increasing (Easwaran et al., 2015; Depkes, 2011). According to the World Health Organization (WHO) (2017), there were 360,565 patients with TB in Indonesia. The Indonesian Ministry of Health also reported that TB was the fourth leading cause of death in Indonesia, and 6, 371 patients developed TB in 2014. In addition, most of these new cases were adults aged between 25-34 (17.18 %), 35-44 (17.18%), and 45-54 (17.33%) (Kemenkes, 2015). Furthermore, TB could cause significant mortality and morbidity in a community (Murray et al., 2014).

The high prevalence of tuberculosis impacts society, economy and the environment. One study from Nigeria found that TB patients' friends frequently

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have a discriminatory attitude towards them (Asuquo et al., 2014) due to the stigma linked to the disease (Dhuria, Sharma, & Ingle, 2008). The disease has social implications: most patients in one study conducted in Mexico reported losing their sense of identity, including loss of productivity and relationships with family, resulting in a severe perception of isolation (Morris et al., 2013). Moreover, a study found that the costs associated with the illness impoverish many households, because many patients accumulate debt and experience loss of income and productive farm assets. Among the 160 cases of TB in this study conducted in China, most of the TB patients were household heads, the primary source of income for their households. After being diagnosed, they lost opportunities to work due to social stigma and the effects of the disease. As a result, 30% of the cases in that study earned incomes below the official poverty line (Jackson, Sleigh, Wang, & Liu, 2006). In Mexico, patients' inability to work and their uncertainty about how TB would affect their ability to survive financially appeared to reduce their sense of worth (Morris et al., 2013).

The reason TB patients gave most frequently to explain their non-adherence to treatment in Indonesia was lack of money to pay for fees and transportation (Widjanarko, Gompelan, Dijkers, & der Werf, 2009). A study aiming to estimate a patient's cost for tuberculosis diagnosis and treatment from the patient's perspective found that these costs are a significant economic burden on patients in Zambia. Moreover, the three largest predictors of patient costs are treatment supervision strategy, patients' delays in seeking care and gender (Amsler et al., 2008). Furthermore, TB has a significant impact on quality of life of patients in several domains, including patient's environment and their psychological well-being (Dhuria et al., 2009). Many studies have shown that the environment has a great impact on TB transmission. For example, a study from Brazil demonstrated that the transmission of TB is directly linked to the community's living conditions (Farias et al., 2013). Therefore, the condition of patients' homes needs to be investigated, prioritizing those cases with inappropriate ventilation and overcrowding, as closed environments facilitate transmission and domestic contacts put potential patients at greatest risk of catching the disease (Kemenkes, 2014). Conversely, other studies have reported that TB negatively affects quality of life in the environmental domain, such as sense of safety, transportation, financial security, quality and accessibility of health and social care, and opportunities for leisure activities. Other studies also found that TB's impact was the greatest on quality of life in the environmental and psychological domains (Dhuria et al., 2009; Sule et al., 2014).

Students' lack of knowledge about TB is one factor that causes the high incidence of TB in Indonesia. Specifically, lack of knowledge about the cause, prevention, transmission, and symptoms of TB result in poor behavior seeking treatment. For example, the National TB Team program of Indonesia reported that many TB patients stop taking medication before they fully recover, as they do not know that the disease can become latent and that improvement in symptoms does not necessarily indicate a cure (Depkes, 2011). Seeking proper treatment mainly depends on peoples' knowledge about TB and their perception of risks associated with it (Uchenna et al., 2014). For instance, patients in many countries believe that TB is hereditary and incurable. Due to such false perceptions regarding TB, patients may have less motivations to manage their symptoms (Dewi, Barclay, Passey, & Wilson, 2016; Hoa, Chuc, & Thorson, 2009). One study of 748 participants with suspected TB in Indonesia found that 11.3% had not yet sought care and approximately 33% would rather seek care from traditional health practitioners than

health professionals (Ahmad, Richardus, & de Vlas, 2012). Moreover, adherence to isoniazid preventive therapy (IPT) for TB in Indonesia is low (Rutherford et al., 2012). Conversely, patients who have accurate knowledge of TB may seek more care. The more frequent they seek care, the more knowledge they have about TB. This is because patients can be given correct information while getting treatment from health care providers (Yousif, Donaldson, & Husseynova, 2011). Hossain et al. (2015) reported that accurate knowledge is an important factor in predicting patients' care seeking behaviors. Therefore, it is essential for governments to develop intervention programs that promote knowledge, prevention, and treatment of TB.

The Indonesian government recommends conducting more research on TB prevention in Indonesia (Depkes, 2011). A number of studies have been done in Indonesia about prevention of and rehabilitation from TB. Some have screened people for TB (Lock et al., 2011; Triasih et al., 2016). Few studies have focused on patients' knowledge about TB. These revealed that knowledge among people suspected of having TB living in Yogyakarta had a moderate level of knowledge about the disease, whereas others had low knowledge (Ahmad, Richardus, & de Vlas, 2012; Lock et al., 2011). Patients with inadequate knowledge of TB were at higher risk of getting inadequate treatment compared to patients who had acquired more information about TB (Fatiregun, Ojo, & Bamgboye, 2009). Therefore, this study is investigating knowledge about TB among students in Indonesia. This will be one of the first studies to evaluate knowledge about TB in a non-patient population.

METHODS

This study used a cross-sectional descriptive study design. This study was conducted at the University of Muhammadiyah Tasikmalaya in Indonesia. Total population of this study were all students who study at the University of Muhammadiyah Tasikmalaya in Indonesia, numbering 1.500 students in total. The sample of this study was students with health-related and non-health-related major at the University of Muhammadiyah Tasikmalaya in Indonesia. The sample size was 200 students. A convenience sample method used in this study. In this study, the researcher used a TB knowledge questionnaire developed by Dr. Lock and his colleagues in 2011. Then this instrument asked participants to provide demographic information, including age, gender, educational background, residential area, ethnicity, marital status, major field of study, TB experience, TB x-ray, TB screening, wearing a mask, and family history of TB. Prior to implementing the study, the researcher trained a research assistant to collect data. After obtaining permission from the Institutional Review Board (IRB), the research assistant collected the questionnaire. After collecting the questionnaires, the researcher went through the questionnaire to ensure completeness and examined the number of eligible students. Each participated student was then assigned a study ID for data entry, and then the researcher calculated a total score based on the participants' responses, then enter the data to SPSS. Univariate analyses utilized, such as t-test and one-way ANOVA were used to test the knowledge score between different levels of categorical variables. Pearson correlations coefficients were used for investigating correlation between continuous variables. Furthermore, multiple linear regressions were used to understand which factors can predict TB knowledge.

RESULTS

This chapter describes the characteristics of the study population, which aims to present the principle findings of the study related to differences in knowledge among

university students in Muhammadiyah University of Tasikmalaya, Indonesia. Different statistical methods were used to ascertain the features of the studied population and to display tendencies in the data gathered.

Descriptive Statistics of the Study Population

A total of two hundred students were recruited and interviewed for this study. All participated students were studying in Muhammadiyah University of Tasikmalaya, Indonesia at the time of recruitment.

The mean age of the students was 21.46 (SD± 1.982) at the time of data collection ranging from 18 to 27 years old. The majority of the respondents were male, with 124 (62%) males and 76 (38%) females. Among several ethnicities, students of Sunda ethnicity outnumbered the others. Of the students included in the study population, 163 (81.5%) were Sundan ethnicity, 30 (15%) were Javans, 3 (1.5%) were Betawis and 4 (2%) were Malays.

Regarding educational background, the majority of the students (*n* = 161, 80.5%), had completed senior high school (SMA). A total of 36 (19.5%) students had specific high school (SMK) education. Most of the students were single or widowed (*n* = 162, 81%), and about 38 (19%) were married.

More than half of the students (*n* = 106, 53%) lived in rural areas, and 94 (47%) lived in urban areas. According to their major field of study, the majority of the students (*n* = 130, 65%) were pursuing health related studies, with 47 (23.5%) in education and 23 (11.5%) in engineering.

Most of the students (*n* =191, 95.5 %), had heard about TB, and only 9 (4.5%) had not heard about the disease. More than half of the students (*n* = 165, 82.5%) had not had an X-ray for TB, and only 35 (17.5%) students had one. The same number of students had been screened for TB.

According to the students, about 120 (60%) students had worn masks, and 80 (40%) had not. The majority of the students (*n* = 166, 83%), did not have a family member with TB, and only 34 (17%) did have family with TB.

Table 1
Demographic Characteristics of the Students

Indicators	n	%	Mean ± *SD*	Range
Age			21.46±1.982	18-27
Gender				
Male	124	62.0		
Female	76	38.0		
Ethnicity				
Sunda	163	81.5		
Java	30	15.0		
Betawi	3	1.5		
Malay	4	2.0		
Educational background				
Senior high school (SMA)	161	80.5		
Specific high school (SMK)	39	19.5		
Marital status				
Single or widowed	162	81.0		
Married	38	19.0		
Residential area				
Urban	94	47.0		
Rural	106	53.0		
Major field study				
Health-related studies	130	65.0		
Education	47	23.5		
Engineering	23	11.5		
Heard of TB				
No	9	4.5		
Yes	191	95.5		
Had X-ray for TB				
No	165	82.5		
Yes	35	17.5		
Had TB screening				
No	165	82.5		
Yes	35	17.5		
Wear masks				
No	80	40.0		
Yes	120	60.0		
Family member with TB				
No	166	83.0		
Yes	34	17.0		

Note. TB, tuberculosis.

Statistically Significant Differences between Demographic Characteristics and Students' Knowledge

This study used Pearson correlation, t-test, and one-way ANOVA to determine the relationships among demographic factors and students' knowledge (table 2). An independent- sample t-test showed that gender [male (M=9.81, SD=2.38), female (M=8.95, SD=2.61)] was significantly associated with knowledge [t (198) = 2.40, p= .017]. These results suggest that gender has an effect on knowledge. Similarly, there was a significantly related between educational background [SMA (M=9.28, SD=2.53), SMK (M=10.33, SD= 2.20)] and knowledge [t (198) = -2.39, p= .018]. Likewise, major field of study and knowledge showed a significant relationship [F (2, 197) = 21.82, p= .000]. In addition, students who have heard of TB [yes (M= 9.57, SD= 2. 40), no (M=7.67, SD= 3.70)] was significantly associated with having knowledge about TB [t (198) = -2.25, p=.025].

On the other hand, most variables included in this study showed no statistically significant association with TB knowledge. For example, Pearson correlation test found there was no correlation between age and TB knowledge (r = .138, n=200, p= .052). Similarly, ethnicity had no statistically significant association with TB knowledge [t (198) = 1.09, p= .277]. Moreover, no statistically significant relationship was found between marital status [single or widowed (M=9.49, SD= 2.40), married (M=9.45, SD= 2.89)] and TB knowledge [t (198) = .103, p= .918]. Similarly, the results showed there was no significant association between residential area [urban (M=9.38, SD= 2.76), rural (M=9.58, SD= 2.26) and knowledge [t (198) = -.542, p= .588]. Surprisingly, a family member having TB [yes (M= 10.1, SD= 2.49), no (M=9.35, SD= 2.49)] did not correlate with TB knowledge [t (198) = -1.703, p=.090]. Furthermore, having had an X-ray for TB [yes (M=10.1, SD= 2.46), no (M=9.35, SD= 2. 50)] was not statistically significant related with knowledge about TB [t (198) = -1. 65, p= .101]. The same result found in having TB screening. Moreover, there was no statistically significant association found between having wear masks [yes (M=9.62, SD= 2.40), no (M= 9.29, SD= 2.64) and TB knowledge [t (198) = -.912, p= .363].

Predicting Knowledge of Students at Muhammadiyah University of Tasikmalaya (UMTAS).

A stepwise multiple regression analysis was conducted to determine the best linear combination of sub-dimensions of socio-demographic factors related to TB knowledge among university students in Indonesia. The result found major field of study and educational background were recognized as predictive factors. Specifically, as shown in Table 3 that major field of study (standardized coefficients β = - .409, p = .000) and educational background (standardized coefficients β = .181, p = .005) significantly predicted knowledge about TB among Muhammadiyah University students in Indonesia.

The unstandardized coefficient for major field of study was (β = -1.475), which indicated that students who were not pursuing health-related studies were more likely to have lower knowledge scores. For educational background, the unstandardized coefficient score was positive (β = 1.141), which indicates that students who had a Specific High School (SMK) education had greater knowledge than Senior High School (SMA).

Table 2
Mean Knowledge Scores of Students with Demographic Characteristics

Variables	n	Mean ± SD	t/F/r	p	LSD
Age		21.46±1.982	.138[c]	.052	
Gender			2.40[b]	.017**	
Male	124	9.81±2.380			
Female	76	8.95±2.612			
Ethnicity			1.09[b]	.277	
Sunda	163	9.58±2.454			
Non-sunda	37	9.08±2.691			
Educational background			-2.39[b]	.018**	
Senior high school (SMA)	161	9.28±2.530			
Specific high school (SMK)	39	10.33±2.204			
Marital status			.103[b]	.918	
Single or widowed	162	9.49±2.409			
Married	38	9.45±2.892			
Residential area			-.542[b]	.588	
Urban	94	9.38±2.756			
Rural	106	9.58±2.259			
Major field of study			21.82[a]	<.001***	
Health-related studies	130	10.26±1.895			1>2
Education	47	8.15±2.750			1>3
Engineering	23	7.83±3.070			2>3
Heard of TB			-2.25[b]	.025**	
No	9	7.67±3.708			
Yes	191	9.57±2.409			
Had X-ray for TB and Had TB screening					
No	165	9.35±2.496	-1.65[b]	.101	
Yes	35	10.11±2.459			
Wear masks			-.912[b]	.363	
No	80	9.29±2.649			
Yes	120	9.62±2.398			
Family Member with TB					
No	166	9.35±2.488	-1.70[b]	.090	
Yes	34	10.15±2.488			

Note. **p < .05. ***p < .01; TB, tuberculosis; a F-values from one-way ANOVA; b Independent t-test; c Pearson correlation; LSD = Post Hoc.

Table 3
Predictors of TB knowledge

Variables	Unstandardized coefficients		Standardized coefficients	t	p
	B	*SEB*	*Beta*		
Constant	10.282	.600		17.142	<.001***
Major field of study	-1.475	.230	-.409	-6.399	<.001***
Educational background	1.141	.403	.181	2.836	.005**

Note:
a. Dependent Variable: Knowledge
b. Predictors in the Model: Major field of study, Educational background
***p < .01; **p < .05; B, beta; SEB, std. error.
R= .509, R^2= .25, Adjusted R^2=.215

DISCUSSION

This study explored knowledge of tuberculosis among university students in Indonesia. The respondents were students at the Muhammadiyah Tasikmalaya University, Indonesia. The mean age of the students was 21.46 years at the time of data collection. Their ages ranged from 18 to 27 years. A majority of the students, 124 (62%), were male. The mean TB knowledge score among the students was 9.49 (SD±2.500) out of 14 possible points. Knowledge scores ranged from 2 to 14 items correctly answered.

Demographic factors associated with TB knowledge

This study findings showed that there are several factors, such as gender, educational background, major field of study and having heard about TB, related to knowledge about TB. In addition, major field of study and educational background were predictors of TB knowledge levels among students in Muhammadiyah University of Tasikmalaya.

Gender associated with knowledge

With few exceptions, studies worldwide find gender is a significant factor in knowledge about disease, although the patterns differ. Results from Vancouver, Canada showing no significant relationship between gender and knowledge about hepatitis B, are exceptional (Leung et al., 2006).

The study found that gender had a statistically significant relation with knowledge of TB among university students in Indonesia. According to the results, men had greater knowledge about TB than women. The difference in knowledge between male and female students might be attributed to differences in access to information, media and participation in different social groups.

These results are supported by those of other studies in some developing countries. A study by Wang and colleagues (Wang, Fei, Shen, & Xu, 2008) about knowledge of TB in the rural Chinese population found differences TB knowledge among males and females. Females had lower knowledge about TB health services and were comparatively unwilling to receive information about TB than males. Moreover, Females did not seem to get information about TB and share it with other people. However, females were more likely to seek health care and go to village clinics, yet males preferred to seek health care at high-level hospitals.

This pattern of greater knowledge about disease among men does not break down neatly according to a society's level of economic development. One can see this pattern in developing countries, for example, a study in Vietnam showed that, of a total sample of 559, most of women 82% did not know that TB is caused by bacteria (Hoa, Thorson, Long, & Diwan, 2003). Likewise, males had significantly higher knowledge scores about TB disease than females in Sudan (Mohamed, Yousif, Ottoa, and Bayoumi, 2007).

In contrast, some studies in developing countries have found women to have more health knowledge than men. For example, in a study about HIV/AIDS knowledge in Ghana, results consistently showed significant gender differences among undergraduate university students, with women having greater knowledge than men (Asante & Boadi, 2013). In Colombia, a study found that women more frequently had correct responses to questions about dengue fever and its transmission. This could suggest that women in Columbia may be more interested in or sensitive to acquiring skills that allow them to recognize the disease and prevent its transmission (Diaz-Quijano et al., 2018). In Malaysia, a study about factors associated with knowledge related to hepatitis B and C found that a significantly higher proportion

of female respondents had better knowledge of hepatitis C, compared with males (Ahmad, Sann, & Rahman, 2016).

In Bangladesh, men had greater awareness than women about TB disease, TB latency and Directly Observed Treatment, while on the other hand, Bangladeshi women had more knowledge about the bacterial cause of the disease and its curability than men. This gender difference may reflect the culture and lifestyles in Bangladesh. Much of the time, mothers and daughters stay at home and are more prone to enjoy TV, which, however is a relatively poor source of information. They are comparatively less exposed to markets or public places. On the other hand, men are more exposed to markets, hospitals and other public places. So, they have more chances to gain information from varied sources, such as billboards, posters and friends, in addition to TV (Rana et al., 2015).

Worldwide, differences in knowledge about transmissible disease between men and women are common. However, follow few obvious patterns. In both developed and developing countries, one sex or the other was better informed. The reasons for these differences in knowledge levels among men and women remain mostly unproven and speculative. Yet are understood to be social in origin.

Education associated with knowledge

This study found that educational background was significantly associated with knowledge about TB among university students in Indonesia. Results from the students show that students who had a Specific High Schools (SMK) education had greater knowledge than those who went to Senior High School (SMA). This result might be influenced by the courses that they got from the school. For example, Specific High School (SMK) had more courses related to the health knowledge and they do also practice how to prevent some disease.

This finding supported by others studies. For example, a study about TB knowledge and factors affecting case detection under the national TB control program (NTP) in Bangladesh found that low education was related with poor knowledge about TB. It shows that information of TB is not reaching less educated people in an effective method (Hossain et al., 2015). Moreover, a study by Yin et al. (2013) showed that elderly participants who had finished high school education or above had better odds of possessing adequate health knowledge than those whose highest education level was below junior high school. This finding is similar with other studies, for example, a study by Freitas et al. (2015) and Hoa, Chuc, & Thorson (2009), reported that higher education levels were related with greater awareness and willingness to seek information about TB.

Moreover, the Sudanese study on knowledge of tuberculosis and its treatment among TB patients found a general low of awareness of the disease and its treatment, but higher educational levels will increase the level of satisfactory knowledge (Mohamed, Yousif, Ottoa, and Bayoumi, 2007). Similarly, a study of knowledge and misconceptions about TB in the general population in Serbia found that education level was a predictor of right understanding about modes of transmission (Vukovic, Obradovic, & Bjegovic, 2008). a study in Nigeria found that the educational status of participants and their spouses was linked with TB-related knowledge, attitudes and practices (Uchenna et al., 2014). Moreover, people who had post-secondary education were more likely to be knowledgeable about the importance of completing tuberculosis treatment in Kenya (Ndwiga, Kikuvi, & Omolo, 2016). In Tanzania, schooling likewise proved to have a significant positive effect on TB knowledge (Haasnoot, Boeting, Kuney, & Roosmalen, 2010). Also, another study in the USA, patients who had completed six or more years of schooling

were significantly to have sufficient knowledge about TB (Mondal, Nazrul, Chowdhury, & Howard, 2014).

The relationship between education and adequate knowledge about TB is straightforward: none of these studies reported that people with more formal schooling knew less than others about TB, its causes, transmission and treatment.

Associations between major field of study and TB knowledge

Major field of study had a significant association with knowledge about TB among university students in Indonesia. Results from the students show that students who were not pursuing health-related studies were less likely to have high knowledge scores. This may be attributed to the fact that education and engineering majors do not have lectures in heath topics that could convey knowledge about TB. But students pursuing health-related majors necessarily have lectures that include knowledge related to TB.

This association between major field and health knowledge has been proven in several studies. For example, a study in the USA about knowledge appropriate to metabolic syndrome reported that, among university students, health science majors had greater knowledge than non-health science majors. In fact, it could be explained that courses in health sciences would have covered the topic of metabolic syndrome more than in other fields (Yahia, Brown, Rapley, & Chung, 2014). Similarly, a study that compared medical and non-medical students using samples from three universities in Northeastern China found that the level of knowledge about appropriate use of antibiotics was greater among medical students than non-medical students. It showed that medical students could get information about antibiotics more easily than other students or the general public (Huang et al., 2013). However, there are distinctions in knowledge levels within the health science. For example, a study about TB knowledge in Italy found that medical students were better informed than nursing students; the medical students in their study provided correct answers in most cases (from 62.2% to 99%), and the medical students' level of knowledge was significantly higher than that of the nursing students (Montagna et al., 2014). Such studies show that major field of study influences participants' knowledge about health and medical treatments.

Association between having heard of TB and knowledge

"Heard of TB" refers to information obtained by knowing someone who has TB or through word-of-mouth, media, and attending seminars and educational programs. In this study, having heard of TB was significantly associated with knowledge about TB among university students in Indonesia. The results of the study show that most of the students had heard about TB. It could be explained by the fact that students at the Muhammadiyah university of Tasikmalaya had some seminars that related to the disease. This finding is consistent with a study in Bangladesh that found that most students stated that they had heard of TB from various sources, such as electronic media, print media, relatives and friends (Rana et al., 2015). However, interestingly, results from Serbia showed all non-medical university students in one study had heard about TB, with the majority describing it as a disease or specifically a pulmonary disease. Nonetheless, their knowledge about TB was uneven and inadequate, especially relating to the cause of the disease, mode of transmission and the sites affected (Smolovic et al., 2012)

Studies drawing participants from the general public have assessed the accuracy of knowledge obtained from different information sources. Specifically, the study from Malaysia mentioned above found that

most respondents had previously encountered information about TB. However, knowledge of TB transmission was insufficient and the participants had some inaccurate knowledge about the disease. Comparing exposure to different types of traditional mass media, those who listened frequently to radio were more likely to have correct knowledge about tuberculosis transmission (Sreeramareddy et al., 2013). Another study in Nigeria, awareness of tuberculosis was highest among people who had learned about it from television, radio, and community members (Uchenna et al., 2014).

CONCLUSION

This study identifies the factors that influence students' knowledge about TB in Indonesia. Health promotion among students at Muhammadiyah University of Tasikmalaya is very important to improve their knowledge related to TB disease, especially about the cause, transmission, and symptom of the disease. The findings could be used by the university design strategic programs that measure knowledge about TB among their students. The further study could be developed to look for other factors, such as culture, information/mass media, job, and economy, that may influence knowledge of different population groups or in different areas. These results can provide evidence for the field of academic nursing to devise programs about TB prevention for university students in Indonesia.

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CONFLICTS OF INTEREST

Neither of the authors have any conflicts of interests that would bias the findings presented here.

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