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Effects of Footbath in Improving Sleep Quality Among Filipino Elderly

INTRODUCTION

A progressive increase in the elderly population has drawn more attention to this age group's health (Leonard, 1994). In the Philippines elderly population is the fastest growing sector of the population since 1960s (Cruz, 2013). It is important to understand the physiologic changes during the aging process as well as the problems brought about it so that it can be managed effectively. One of which is problems in sleep which can lead to high occurrence of dissatisfaction and poor sleep among elderly (Zilli, Ficca & Salzarulo, 2000). It is the third most common problem after headache and digestive disorders in reference to elderly group (Seyyedrasooli et al., 2013).

Changes in circadian rhythm of body temperature (Vitiello, Larsen & Moe, 2004), reduction in the percentage of REM sleep (Van Cauter, Leproult & Plat, 2000), having long sleep latencies (less than 30 minutes), reduced sleep efficiency (85%), less sleep duration play a vital role in the sleep problems experienced by elderly (Israel & Ayalon, 2009). Sleep problems are important to be addressed because sleep is an essential human function that promotes wellbeing because it is the body's way of regaining energy and adapting from fatigue (Seyyedrasooli et al., 2013).

According to Joffe, Hallman, Gélinas, Herr & Puntillo (2013), the trend of using non-pharmacological treatment as an intervention has been increasing. One of which is footbath which is a non-pharmacological method that can help the induce relaxation (Saeki, 2000), stimulates vasodilation of the blood vessels and improves circulation (Mooney, 2009) and manipulate body temperature and affect the quality of sleep (Raymann, 2005).

SLEEP PROBLEMS AMONG ELDERLY

Poor sleep can lead to different consequences that can impair functioning of daily living. Some of these consequences include cognitive decline, increased risk for fall, daytime fatigue and reduced physical and mental health (Zisberg, Gur-Yaish & Shochat, 2010). As for Israel and Ayalon (2009) sleep problems are associated with increased risk for falls, difficulty of waking, difficulty seeing, deficits in attention, short term memory and performance level. Studies show that people having problems with sleep are reported to have poorer overall quality of life as well as more symptoms of anxiety and depression (Vitiello, 2009; Seyyedrasooli et al., 2013; Liao et al., 2005). In the Philippines, 6.8% of the population is composed of elderly (60 years old and above) (Cruz, 2013). According to United Nations, WHO, by year 2025 w/ a projected 100M total population 10% or 10M Filipinos will be 60 & above. With regards to sleep among Filipino elderly, older females experience more sleep problems compared to older males (Cruz, 2013).

According to Cumhuriyet University Health Sciences Faculty, Department of Nursing, Internal Diseases Nursing (2012), people will experience physical and physiological changes due to the process of aging. In their study conducted among 187 elderlies (ages 65 and above, sleep quality and quality of life decreases as the age of a person increases. Another study conducted by Zilli, Ficca, and Salzarulo (2000) stated that sleep deteriorates with age which leads to high occurrence of dissatisfaction and poor sleep complaints among elderly. Sleep problems can affect all age groups but the most vulnerable are the older adults and elderly (Israel et al., 2009). In the study conducted among 9,000 community-dwelling adults over age 65 years, 42% of them reported to have difficulty in maintaining and initiating sleep (Israel et al., 2009). These difficulties are associated with the physiologic changes our body experience throughout the process of aging. In addition to this, survey data showed that elderly individuals reported various sleep problems such as spending more time in bed, experience more awakenings during the night, and have increased complaints of insomnia (Israel, Poceta, Stepnowsky, Martin & Gerhman, 1997). As cited by Zisberg, Gur-Yaish and Shochat (2010), 50% of the elderly in the community and 70% in the assisted living setting complains of having sleep disturbances. Factors that may contribute to these complaints are physical and mental

co-morbidity, polypharmacy, functional status, primary sleep disorders and changes in circadian sleep-wake cycle. An older adult's characteristics of sleep architecture derived from polysomnography (PSG) (which is the most valid and accurate way to assess sleep) showed an increased amount of nocturnal wakefulness, increased NREM stage 1 sleep which is the transitional stage between waking and other sleep stages, reduced amounts or complete absence of NREM stages 3 and 4 of sleep or the slow wave sleep (SWS) (Floyd, Medler, Ager & Janisse (2000) and Van Someren, 2000). It is common that the percentage of REM sleep was also reduced slightly in elderly (Van Cauter, Leproult & Plat, 2000) as well as having long sleep latencies (less than 30 minutes), reduced sleep efficiency (85%), sleep duration of less than or equal to six (6) hours and changes in circadian rhythm of body temperature (Vitiello, Larsen & Moe, 2004).

Circadian rhythm is the variation in body functions and behaviors that occur in a regular pattern around a 24-hour interval. Body temperature and sleep wake cycle each follow a circadian rhythm. It controls many physiological functions such as endogenous hormone secretions, core body temperature and sleep wake cycle (Aronson, Bell-Pedersen, Block, Bos, Dunlap, Eskin, Garceau & Geusz, 1993); Aschoff, 1984). The core (rectal) body temperature rises throughout the day-in the morning after waking up and reaches its highest point (peak) in the afternoon or early evening. Then it declines prior to sleep onset and reaches its lowest point (trough) in the early morning hours (Dijk & Czeisler, 1995; Lavie, 2001; Van Someren, Raymann, Scherder, Daanen, & Swaab, 2002). Changes in circadian rhythm are considered hallmark of aging and is attributed to reduced sleep quality among elderly. With these changes also arise problems such as advanced sleep phase, reduced sleep consolidation and duration and early morning awakenings (Zisberg et al., 2010). The most common circadian rhythm disturbance is advanced sleep phase syndrome. Elderly might begin to get sleepy earlier and then wake up earlier than desired. These persons will complain of excessive sleepiness in the early evening and early morning awakenings. Levels of melatonin also decreases with age and may contribute to disturbed sleep in the elderly (Israel et al., 2009).

For Cajochen, Munch, Knoblauch, Blatter & Justice (2006) characteristics of human sleep alterations associated with the process of aging are first, the reduction of

electroencephalographic (EEG) slow-wave activity and spindle frequency activity and second, an increase in involuntary awakenings during sleep. Circadian rhythm changes with age which causes a decline in the amplitude of circadian markers such as core body temperature, melatonin and cortisol. The protective effect of NREM stage 3 and 4 is reduced among elderly which contributes to awakenings. Compared to their younger counterparts, older adults have decreased amplitude due to having lower daytime peak, a higher night time trough, or a combination of both. With age, sleep-wake circadian rhythm becomes less synchronized and no longer has the same response to external cues. It becomes much weaker resulting to less consistent periods of sleeping and waking within a 24hr period. Meta-analysis compared the difference between the sleep of elderly and that of younger adults and it showed that elderly have less deep sleep (stages 3 and 4 of NREM) and less REM sleep. As slow wave sleep and REM sleep decreased, more of the night will be spent in lighter stages of sleep (Dijk, Duffy & Czeisler, 2000); Van Someren, 2000). Another study states that as people age, pattern of sleep cycle changes (Israel et al., 2009). Laboratory studies have shown that total sleep time during the night may decrease and by the age of 70 stages 3 and 4 of non-rapid eye movement might be abolished. The number of awakenings during the night increases in older adults, and as a result, sleep efficiency which is the amount of time spent in bed asleep, decreases (Israel et al., 2009).

FOOTBATH

Footbath according to Willis and Willis (2009) stated that the local immersion method of footbath in 43 to 46 degrees Celsius elevates temperature, relaxes tense muscles and increases white blood cell activity. The human foot is supplied by many blood vessels. Warm water stimulates vasodilation of these blood vessels and improves circulation and it supplies the feet with more nutrients (Mooney, 2009). Having cold sensations in the feet is a common complaint that results in sleep disturbance or poor quality of sleep (Miyazawa, 1996). Body temperatures have been suggested to be a signalling pathway for the modulation of sleep and wakefulness (Egan, 2005). Warming the skin causes the stimulation of the anterior hypothalamus, a key structure in sleep regulation (Egan, 2005). Immersion of the feet in warm water with the temperature of 42C-45C for 15 to 30 minutes refreshes the whole body and may be useful in facilitating sleep. Studies have shown that

passive body heating, such as footbath, can manipulate body temperature and affect the quality of sleep (Raymann, 2005). Warm footbath, therefore, has been frequently used as a therapeutic technique in the field of nursing (Genta, 1981).

There are factors that should be taken into consideration in performing footbath. From the Codes of Practice for high risk in UK prepared by the members of the Thermostatic Mixing Valve Manufacturers Association (TMVA) in 2000, the recommended National Health Service (NHS) Estates Health Guidance Note in UK, refers to hot water and surface temperatures for safe use. These are recommended for all healthcare premises and those premises registered under the Registered Homes Act 1984 (Ref 3): 44oC for an unassisted bath fill; 46oC for an assisted bath fill; 41oC for shower applications; 41oC for washbasin applications; 38oC for bidet applications. NHS Estates also states 41oC as being the maximum for the high-risked. In non-care applications some individuals might require higher temperatures but even in these cases a temperature of not more than 43oC should be used. In the United States, manufacturers of hot water tanks have been presetting hot water at 49oC for more than 20 years (Mezei & Stanwick, 2004). A study in the state of Washington, where water heaters were mandated to be set at 49oC, showed a decrease in severe injuries by 50% (Mezei & Stanwick, 2004). Water temperatures (temperatures of 44oC and above) can create a scalding burn risk to people who are vulnerable (Health and Safety Executive, n.d.). When bathing vulnerable individuals such as elderly, water temperatures must not exceed 44C (Angel, 2012).Grant (2013) stated that scald injury prevention must be considered on elderly as they are at increased risk for having scald injury due to the aging process, not checking the water temperature before taking baths and slipping into the shower. Also, in the same journal by Grant (2013), US Consumer Product Safety Commission (CPSC) and the American Burn Association (ABA) reported that most older adults will suffer burn if exposed to 155°F (68.3°C) water temperatures for few seconds. ABA (2012) recommended the setting for the home hot water heater at 120°F (49°C) which is considered safe and the recommended normal temperature setting for bathing is 100°F (37°C). Water must be tested first using a thermometer. If temperature exceeds 49oC, water must be adjusted until the desired temperature. A study on self-induced burn injury from thermal footbath among Asians by Loh and Tan (2014)

stated that the use of thermal footbath as a cause of burn injury is mostly due to patient-misuse or ignorance of correct usage. In contrast Thng, Lim and Low (1999) said that in Asian countries, a common culture among patients with peripheral neuropathy is to immerse their feet in self-prepared hot water without checking the water temperature, with a belief that it will "improve circulation" and hence "cure the numbness". This practice has led to accidental burn injuries as described in the case reports and in their conclusion, if diabetic patients choose to immerse their feet in hot water, temperature of the water should always be measured with a thermometer and immersion time should be limited. (Loh et. al., 2014).

The fall in core body temperature before sleep onset and during sleep is associated with dilatation of peripheral blood vessels, permitting heat dissipation from the body core to the periphery (Krauchi .2002); Krauchi, Cajochen, Werth & Wirz-Justice, 2000) is associated with a shorter sleep latency (Krauchi, Cajochen, & Wirz-Justice, 2004). This difference as reflected by the distal-proximal skin temperature gradient (DPG) has been shown to be a good predictor of sleepiness and body's readiness for sleep (Krauchi, Cajochen, Werth, & Wirz-Justice, 1999). Thus, in relation between body temperature and sleep, passive body heating treatments such as a warm footbath to help promote the peripheral gradient for heat loss in the evening. This has the potential to facilitate sleep onset and improve overall sleep quality in older adults. A warm foot bath may increase peripheral blood flow and temperature gradient (DPG) to facilitate heat loss without increasing core body temperature and hereby improve sleep onset and quality (Krauchi et al., 2004). Another study regarding DPG from Liao, Landis, Lentz & Chiu (2004) determined the effectiveness of using footbath between two different water temperatures (40 degrees and 41 degrees) among 6 Taiwanese elders (3 Males, 3 Females). Results showed the two water temperatures having no significant difference but both effective in increasing the distal-proximal skin temperature gradient which showed relevance of having better sleep. Another study, a single crossover design was used in examining the effects of a warm footbath on body temperatures, distal-proximal skin temperature gradient and sleep outcomes. In the said study, body temperature and polysomnography were recorded for 3 consecutive nights. The participants were randomly assigned to

receive 41 degrees Celsius for 40 minutes before sleep onset on night 2 or night 3. It was found that the warm footbath shortly before sleep onset raised foot temperature and heat loss gradient. REM sleep was increased on the bathing night and an amount of wakefulness was reduced in the second NREM sleep period. Participants also perceived that they had less wakefulness after sleep onset (Liao, Chui & Landis, 2001).

In a variety of studies regarding footbath, the following showed a favorable result of footbath that enhances the quality of sleep among elderly; In the study of Seyyedrasooli et al., (2013), 46 older adult participants were divided into two groups which is composed of the experimental group and the control group. The experimental group is the ones who were asked to soak their feet in 40-41degree Celsius warm water for 20 minutes before sleeping in a 6-week time period. The comparison difference in the two groups included components of sleep latency and sleep duration with a difference in the total statuses of sleep quality which is improved in the footbath group. At the end of intervention, the foot-bath group showed recovery in terms of sleep disturbance. As stated by Syyedrasooli et al., (2013), sleep disturbance decreases from 69.6% to 39.1% in the footbath group and it decrease from 56.5% to 47.8% in the control group. This finding was more visible to the footbath group compared to the control group. Moreover, this showed that footbath causes an increase in the elderly quality of sleep. In another study conducted, warm foot-bath improved nocturia and sleep condition among 18 female elderly aged 65 years old (Kobayashi, Yamagata, Yoshiyama, Araki & Takeda, 2004). A research study conducted by Yang, Chen, Lee, Fang & Chao (2010) stated that footbath in warm water significantly increased the quality of sleep. This study had 21 participants and utilized the Verran and Snyder-Halpern Sleep Scale to evaluate sleep quality. Furthermore, a study by Sung and Tochichara (2000) showed that footbath caused better sleep onset. A study on Effects of the footbath on tympanic temperature, sweat rate, blood pressure, and heart rate among the elderly person at Nagoya University School of Health occurred. The subjects of the study were nine elderly persons for foot bathing (average 73.5 years old) and 10 elderly persons for full bathing (average 77.4 years old). The tympanic temperature was measured using a thermistor, sweat rate using the ventral capsule method, and blood pressure and heart rate using an autonomic sphygmomanometer during control period 10

minutes before bathing, for 20 minutes during bathing, and for 10 minutes after bathing. The study concluded that the footbath is safe, does not cause any change in blood pressure and is expected to provide mild warming for the elderly (Miwa, Sugimura, Shiraishi, Tanaka, Kawamura & Deguchi, 2007). However, according to the study of Liao, Wang, Kuo, Lo, Chui & Ting (2013) it was stated that footbath does not alter sleep in older adults both with good or poor sleep. Another study by Liao, Chui & Landis (2004) did not show changed and perceived sleep outcomes. Also, a study by Liao (2002) stated that there was no significant change in sleep efficiency and sleep maintenance.

Effects of aging include deterioration of sleep quality. Since sleep is essential to promote well-being, this study aims to determine the effectiveness of footbath among Filipino elderly since no present studies have been conducted in the Philippine setting. In addition to this, despite numerous studies proving the effectiveness of footbath in improving the sleep quality of elderly, other studies concluded that footbath has no significant effect in sleep quality among elderly.

RESEARCH HYPOTHESIS

H1: There is no significant difference in the distal temperature and proximal temperature before and after footbath and upon waking up.

H2: There is no significant difference in the distal-proximal gradient (DPG) before and after footbath and upon waking up.

H3: There is no significant difference in the systolic blood pressure and heart rate variability before, during, after footbath and upon waking up.

H4: There is no significant difference in the sleep quality before and after footbath.

H5: There is no significant difference between the seven domains in measuring the quality and patterns of sleep of the participants.

THEORETICAL FRAMEWORK

The Ludwig open system model was used as the conceptual framework. It is composed of the input, throughput and output. The input describes the characteristics and condition of the elderly that the researchers aim to improve and investigate. This pertains to poor sleep quality, blood pressure and heart rate variability, and distal-proximal temperature gradient. The throughput is the "Footbath (maintained at 40 degrees Celsius for 20

minutes)", which is the intervention proposed in this study, that may increase peripheral blood flow and temperature gradient (DPG) to promote sleep quality among elderly. The output or the expected outcomes in performing footbath are to improve sleep quality, determine the effects on blood pressure and heart rate variability and on the distal-proximal temperature.

METHODS

RESEARCH DESIGN

A one group- pretest post-test design was utilized since control group is not possible due to too few subject availabilities. In this design, comparisons were made before and after the administration of footbath. This is the preferred method to measure the degree of change occurring as a result of treatments or interventions. (Taylor, Kemode & Roberts, 2012).

SUBJECTS AND SETTING

Purposive sampling technique was used to select the 20 female Filipino elderly participants aged 65-86 years old from a home-for-the-aged institution in NCR Philippines. A week before the start of the intervention the participants were assessed using the Health History form of the UST-College of Nursing to determine their past and present medical condition. Depression Stress and Anxiety Scale and Mini-mental State Exam were utilized to assess their mental capacity and condition. A pretest using the Pittsburgh Sleep Quality Index (PSQI) was given to determine their quality of sleep. These assessment tools confirmed the eligibility of the participants for the study based from the inclusion criteria of elderly aged 65 and above who may or may not be taking over-the-counter and prescribed medications, and who has controlled medical conditions common among elderly such as hypertension, heart arrhythmia, mild gastritis, mild liver disease, rheumatoid/osteo arthritis, more than 5 score in the PSQI and the exclusion criteria of a history of uncontrolled persistent hypertension (BP of 140 and above) without maintenance drug, chronic conditions like presence of malignancies or tumor, diabetes mellitus, bleeding disorders, cardiac ischemia and insufficiencies, other contraindications of heat therapy like edema, scar tissue and acute inflammatory conditions. Elderly that has acute illness, undergoing hemodialysis, with peripheral and vascular nerve disorders and

known sleep apnea, presence of mental disorder, having depression, anxiety and stress. During the entire course of the study 4 participants withdrawn from the study thus 16 participants completed the study.

RESEARCH INSTRUMENTS AND TOOL

1. Health History Form

A health history form utilized in the college (UST-College of Nursing) was used as an assessment tool to determine the participant's past and present medical history and eligibility to the study. The results were validated by the resident nurse of the institution.

2. Mini-Mental Status Examination (MMSE)

The Mini-Mental Status Examination (MMSE) or also called Folstein test created by Folstein, Folstein and McHugh in the year 1975, is a 30-point questionnaire used to screen cognitive impairment was used as an assessment tool. This examination is commonly used in medicine to screen for dementia that is common among elderly. It is also used to screen the severity of cognitive impairment and to follow the cognitive changes in an individual over time making it an effective way to document individual responses to a said treatment. The MMSE test is composed of simple questions and problems in a number of areas: the time and place of the test, repeating lists of words, arithmetic such as the serial sevens, language use and comprehension, and basic motor skills. In the interpretation of the test, in which 30 dichotomous items that has a total score of 30, any score greater than or equal to 27 indicates a normal condition. Scores below 24 is an indication of a cognitive impairment. This is used as an assessment tool for the eligibility of the participants. In the Philippine setting, the researchers gained a Cronbach's alpha of 0.99.

3. Depression Anxiety Stress Scales (DASS)

Depression Anxiety Stress Scales (DASS), developed by the researchers of the University of New South Wales in Australia, is a 42-item used to measure three negative emotional states of depression, anxiety and tension/stress was used as an assessment tool. Each of the three DASS scales contains of 14 items, divided into subscales composed of 2-5 items with similar content. The depression scale has subscales assessing dysphoria, hopelessness, devaluation of life, self-derecation, lack of interest/involvement, ahedonia

and inertia. Another is in the anxiety scale that assesses autonomic arousal, skeletal muscle effects, situational anxiety and subjective experience of anxious affect. And lastly, for the stress scale, this highlights levels of non-chronic arousal through difficulty relaxing, nervous arousal and being easily upset/agitated, irritable/over-reactive and impatient. Each of this is rated on a four-point Likert scale of frequency and severity of the participants' experiences over the last week. The scores ranged from 0, meaning that the client believed the item "did not apply to them at all", to 3 meaning that the client considered the item to "apply to them very much, or most of the time". The main purpose of DASS is to identify areas of emotional disturbance especially in the degree of severity in the core symptoms of depression, anxiety and stress. Scores of Depression, Anxiety and Stress are calculated by summing the scores for the relevant items. The depression scale items are 3, 5, 10, 13, 16, 17, 21, 24, 26, 31, 34, 37, 38, 42. The anxiety scale items are 2, 4, 7, 9, 15, 19, 20, 23, 25, 28, 30, 36, 40, 41. The stress scale items are 1, 6, 8, 11, 12, 14, 18, 22, 27, 29, 32, 33, 35, 39. The score for each of the respondents over each of the sub-scales, are then evaluated as per the severity-rating index. This is used as an assessment tool for the eligibility of the participants. In the Philippine setting, the researchers gained a Cronbach's alpha of 0.800.

4. Pittsburgh Sleep Quality Index (PSQI)

The Pittsburgh Sleep Quality Index (PSQI) is an instrument effective in measuring the quality of sleep in elderly created by Buysse, Reynolds, Monk, Berman & Kupfer in 1989. It is a self-rated 4-point Likert scale questionnaire composed of 18 questions that aims to measure sleep disturbance and usual sleep habits during the prior month only. This tool differentiates "poor" from "good" sleep through the seven domains of sleep difficulties: Subjective sleep quality – described by the study participant by rating it; Sleep latency - The length of time it takes from lying down for the night until sleep onset; Sleep duration - during the nocturnal sleep episode or across the 24-h period; Habitual sleep efficiency – Determines the number hours of actual sleep the participant gets at night; Sleep disturbances - Encompass disorders of initiating and maintaining sleep, disorders of excessive somnolence, disorders of sleep–wake schedule, and dysfunctions associated with sleep, sleep stages, or partial arousals; of sleep medication – Determine how often

participant has been taking medicine whether prescribe or over the counter to help fall sleep; Daytime dysfunction – Assess whether there is presence of trouble staying awake while driving, eating meals, engaging in social activity and keeping enthusiastic in getting things done. Total mean score of these 7 components makes the total score of the instruments and ranges between 0-21 scores higher than 5 show poor sleep quality. The PSQI validity with Cronbach's alpha was 0.83. In the Philippine setting, the researchers gained a Cronbach's alpha of 0.757.

5. Skin temperature recordings: Infrared Thermometer

An Infrared Thermometer measures heat generated by surfaces and cavities that will be used to obtain the abdominal (proximal) temperature and foot (distal) temperature. The said device was placed directly at the skin of the abdomen close to the femoral artery for the proximal area and for the distal part, it was placed at the medial aspect of the ankle. The Distal-Proximal skin temperature gradient was also identified where in the foot temperature and the abdominal temperature must be equal. DPG was obtained by subtracting foot (distal) temperature from the abdominal (proximal) temperature.

6. BP and heart rate monitoring chart

A monitoring chart will be provided and made for the respondents BP and heart rate in order to monitor changes that will happen to the respondents in the duration of the intervention.

DATA COLLECTION PROCEDURE

After the assessment, secured consent was given to the qualified participants. The 20-qualified female elderly participants were divided into two groups (Wednesday Group and Saturday Group) consisting of 10 members each. The participants were divided in order to adequately facilitate the respondents and accommodate the procedure in line with the regular bedtime schedule of the participants. The sessions were scheduled an hour before their usual sleep every Wednesday and every Saturday for two consecutive weeks.

During their first night or first session of treatment for the Wednesday and Saturday groups, foot bathing was administered to all of the 10 members of each group. On the second night of the Wednesday and Saturday group, two participants from both groups

withdrawn from the study for the following reasons, three (3) of them slept earlier that is why they were not able to receive footbath and the other 1 left the institution for a vacation. A total of eight (8) participants remained in each group. In the end, 16 participants have completed the study.

During the intervention, the researchers prepared and set the temperature of the water at 40°C and it was maintained using a heat retaining foot tub machine. To maintain the desired temperature, the water was monitored every ten minutes using a laboratory thermometer. All materials and equipment needed for the intervention were prepared by the researchers while the elderly was asked to sit down and relax. They were assisted while they were immersing their feet in the warm water (40 °C) for 20 minutes.

Blood pressure and heart rate were taken before foot bathing, at the 10th minute of the intervention, and after foot bathing. Body temperature (proximal and distal) was measured before and after foot bath. Researchers used infrared skin thermometer to obtain abdominal and foot skin temperature to assess proximal and distal temperatures respectively. In abdominal temperature, the infrared skin thermometer was placed on the abdomen close to the femoral artery; and for the foot skin temperature, it was placed at the medial aspect of the ankle. Foot skin temperature (distal) was subtracted to the abdominal temperature (proximal) to attain distal-proximal gradient (DPG). One researcher took the heart rate and blood pressure of all the participants using the same paraphernalias and another researcher took the distal and proximal temperatures. This was done to ensure accuracy of the data. After the intervention, the participants went to asleep. The researchers stayed with the participants throughout the night and until the morning of the next day to obtain their vital signs (BP, HR, proximo-distal temp) every after intervention, upon waking up. Participants were instructed to proceed to the researchers immediately upon waking up for the assessment. Post test of PSQI was given after the last day of intervention. Gathering of data was obtained immediately for statistical treatment.

DATA ANALYSIS

This study utilized the use of: Mean which is the arithmetic average of the distribution and the measure of central tendency which measured the summation of values of sleep quality and vital signs score divided by the number of observations; Paired sample t-test was used to test the difference and measure the pre-test & post-test of the group; One-way ANOVA is was used to determine the relationship of foot bath to the sleep quality and vital signs of elderly. It was used to different types or variances to test the hypothesis of different means.

ETHICAL CONSIDERATIONS

Health and safety requirements were met and research participants were fully aware and informed about the research. The following have been carefully addressed to the participants:

Confidentiality- The researchers assured to the participants that all the data and information that were gathered from the course of the intervention was kept confidential. Researchers used initials in identifying the participants all throughout the study. The researchers safeguarded all the information entrusted to them by the participants by storing it in a secured place.

Principle of informed consent- Information regarding the study was fully disclosed verbally and through a written informed consent. They were informed of the possible benefits and risks of the study as well. An informed consent was obtained from the participants.

Respect for human dignity- The subjects have the right to decide for voluntary participation and has the right to withdraw from the treatment at any time. Each respondent in this study was also subjected to fair treatment.

Non-Maleficence- The researchers did the following necessary precautions to prevent harm and ensure safety of the participants. All the materials needed for the footbath were prepared by the researchers. The temperature of the water was closely and regularly monitored using laboratory thermometer and maintained its temperature within 40°C through the heat retaining foot tub machine. Since the participants were elderly, they

were assisted by the researchers all throughout the study, researchers stayed with the participants throughout the intervention to address their concerns and to monitor their response to the said intervention. There were also registered nurses from the institution that foreseen and accompanied the elderly and the researchers. Assessment tests were administered and the resident nurse of the institution assessed and validated the eligibility of the participants before the intervention to assure that they were capable and qualified for the study.

Footbath was safely administered to all of the participants and no untoward incidents like burns, falls, drowsiness and others happened. However, as a precaution, researchers planned to do the following in case accidents happened during the intervention: 1. The researchers will bring them immediately to the hospitals and medical facilities nearest to institution. 2.There will be a standby and an on-call ambulance inside the institution that can transport immediately the elderly to the hospital. 3. The registered nurse who is present throughout the intervention can also provide first aid. All the research injury related expenses will be shouldered by the researchers.

Beneficence- This study aimed to promote quality of sleep to the participants to enhance their wellbeing. They were oriented about the objectives, significance and benefits of the study, some health teachings were also provided so that they will be knowledgeable about the sleep problems which are common to them. The tests that were administered were fully explained and informed consent was obtained first before proceeding with the implementation. Researchers helped and assisted them in answering the tests given. Through this study, they will be aware that foot bath is a possible intervention for sleep problems and use it as a means of care in the future. The researchers will be held responsible for all research related incidents and expenses.

RESULTS

1. Is there a significant difference in the proximal and distal temperatures before, after footbath and upon waking up?

Table 1. Proximal and Distal Temperature in three different settings

Temp.	Settings	Mean	SD	N	F	P-Value	Interpretation
Proximal temp	before	36.7563	0.31921	16	3.178	0.046	Significant H_0 Reject
	after	36.6969	0.31774	16			
	wakeup	36.5719	0.25430	16			
Distal temp	before	36.5625	0.22252	16	12.877	0.000	Significant H_0 Reject
	after	36.7313	0.23062	16			
	wakeup	36.4656	0.17890	16			

The table shows that there is a significant difference in the proximal temperatures taken in three different setting with the f-value is 3.178 and a p-value of 0.046. Likewise, the distal temperature has an f-value of 12.877 with a p-value of 0.000 which also means that there is also a significant difference in the distal temperatures taken in three different settings.

2. Is there a significant difference in the distal-proximal gradient (DPG) before and after footbath and upon waking up?

Table 2. Distal-proximal gradient Mean results

DPG	BEFORE footbath	AFTER footbath	Upon WAKING-UP
1^{ST}	-0.15	0.04375	0.00625
2^{ND}	-0.14375	0.075	-0.05625
AVE	-0.146875	0.059375	-0.025

The table shows the means of the DPG before and after footbath and upon waking up the next morning. It was seen that the temperature after footbath increased from the mean temperature of -0.146875 to 0.059375. Upon waking up, their temperature has decreased to -0.025. The drop-in temperature from the baseline and upon waking up is a normal re-action of the body.

3. Is there a significant difference in the systolic blood pressure and heart rate variability before, during, immediately after footbath and upon waking up?

Table 3. Systolic blood pressure and heart rate variability in four different settings

	Settings	Mean	SD	N	F	P-Value	Interpretation
Systolic blood pressure	before	124.0625	10.73414	16	5.014	0.003	Significant H_0 Reject
	10th	119.0625	11.73893	16			
	after	117.8125	11.56591	16			
	wakeup	127.5000	11.35924	16			
Heart rate	before	72.4688	11.49470	16	0.315	0.815	Not Significant H_0 Accept
	10th	72.1875	10.72362	16			
	after	71.9063	10.11980	16			
	wakeup	70.0938	10.86088	16			

Results showed that there is a significant difference (f-value of 5.014; p-value of 0.003) in the systolic blood pressure taken at four different settings. Meanwhile, there is no significant difference (f-value of 0.315; p-value of 0.815) in the heart rates that were taken in four different settings. With a decrease in BP during footbath that are within the normal range, and sustained normal heart rates, results showed that footbath is a safe intervention among elderly.

4. Is there a significant difference between the domains in measuring the quality of sleep of the participants?

Table 4. Seven domains in measuring the quality of sleep

variables	Pre-Post test	Mean	Std. Deviation	F	P-value	Interpretation
subjective sleep quality	pretest	1.3750	.71880			
	post test	.3125	.47871			
sleep latency	pretest	2.2500	1.12546			
	post test	1.1250	1.02470			
sleep duration	pretest	1.4375	1.03078	14.120	0.000	Significant H_0 reject
	post test	.7500	.85635			
habitual sleep efficiency	pretest	1.1250	1.14746			
	post test	.3125	.60208			
sleep disturbances	pretest	1.6250	.50000			
	post test	1.1875	.40311			
sleep medication	pretest	.3750	1.02470			
	post test	.0000	.00000			
daytime dysfunction	pretest	.5625	.81394			
	post test	.2500	.57735			

The table shows that the means of each of the seven domains decrease after foot bathing. There is also a significant difference between the domains with p-value of 0.000 (<0.05

alpha) and f-test 14.120. This means that foot bathing before sleep time has improved their sleep quality, sleep latency, sleep duration, and sleep efficiency, and lessened their sleep disturbances, daytime dysfunction, and use of sleep medication.

5. Is there a significant difference in the over-all sleep quality before and after footbath?

Table 5. Over-all Sleep quality (PSQI) before and after the footbath

PSQI	Pre-Post	Mean	SD	N	t	P-Value	Interpretation
Sleep Quality	Pre-test	8.7500	3.00000	16	5.850	0.000	Significant H_0 Reject
	Post-test	3.9375	2.43499	16			

Results showed that there is a significant difference in the sleep quality among the participants as indicated by a t-value of 5.850 and a p-value of 0.000. This means that the foot bath is an effective intervention in promoting sleep quality among the elderly.

DISCUSSION

It was found out that the proximal temperature with a p value of 0.046; f-value of 3.178 showed a significant difference when taken in the three different settings. Likewise, the distal temperature with a p value of 0.000; f-value of 12.877 also showed a significant difference in three different settings. The difference between the average mean of the distal proximal gradient before (-0.146875) footbath and after (0.059375) footbath showed a significant increase in DPG however, the average mean upon waking up (-0.025) showed a decrease in DPG. The result of the systolic blood pressure showed a significant difference with a p value of 0.003; f-value of 5.014 that was taken at four different settings. Meanwhile, there is no significant difference in the heart rates with a p value of 0.815; f-value of 0.315 that were also taken in four different settings. The over-all sleep quality showed that there is a significant difference as indicated by the p-value of 0.000; t-value of 5.850. Lastly, the seven domains also showed a significant difference with a p-value of 0.000 (<0.05 alpha) and f-test 14.120.

Results signify that after footbath the temperature from the proximal (abdomen) decreases and the distal (foot skin) temperature gradually increases and the DPG increases. These made the participants become sleepy. Thus, footbath has helped in facilitating

sleep onset. After footbath, blood pressure also decreased which was within the normal range and the heart rate as well was sustained within normal range, thus results showed that footbath is a safe intervention among elderly. The immersion of the feet with warm water caused vasodilation thus improved circulation among the participants therefore promoting relaxation and sleep. Footbath before sleep has showed improvement in sleep quality, sleep latency, sleep duration, and sleep efficiency, and lessened their sleep disturbances, daytime dysfunction, and use of sleep medication among elderly. It also showed that their PSQI score after footbath has decreased. These means that the foot bath is an effective intervention in promoting sleep quality among the elderly.

CONCLUSION

This study showed the effectiveness of warm footbath as an intervention in the sleep quality among Filipino elderly. With the criteria of having poor sleep among the elderly participants and their taken baseline blood pressure, heart rate and distal-proximal temperature, researchers administered footbath set at 40oC for 20 minutes. Footbath initiated increase in peripheral blood flow and DPG promoting sleep quality which is evidenced by the improvement in all of the seven domains namely: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep medication, and daytime dysfunction. Warm footbath also facilitated heat dissipation to increase the distal temperature and decrease proximal temperature, thus increases the distal proximal gradient, which helps in initiating onset of sleep. Using this intervention in addressing sleep problem is safe as noted by normal and sustained heart rate. Change in systolic blood pressure was within normal and safe range.

This study validated and reaffirmed that warm footbath has a positive effect in improving the sleep quality of elderly. This can be used as a safe nursing intervention in addressing sleep problem among Filipino elderly.

LIMITATIONS

There are several limitations in this study which includes the limited number of the study participants, the preclusion in examination of gender differences in the findings and lastly the limited time allotted in data gathering.

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