

**FACTORS CONTRIBUTING TO SLEEP DEPRIVATION AND  
NURSING STRATEGIES TO FACILITATE SLEEP IN INTENSIVE  
CARE UNITS AT MUHIMBILI NATIONAL HOSPITAL  
DAR ES SALAAM,  
TANZANIA**

**Tigistu Gebreyohannis Gebretensaye**

**MSc Nursing (Critical Care and Trauma) Dissertation  
Muhimbili University of Health and Allied Sciences  
November, 2013**

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**By**

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**A dissertation Submitted in (partial) Fulfillment of the Requirements for  
the Degree of Master of Science in Nursing (Critical Care & Trauma) of  
Muhimbili University of Health and Allied Sciences**

**Muhimbili University of Health and Allied Sciences  
November, 2013**

**CERTIFICATION**

The undersigned certify that they have read and hereby recommended for acceptance by Muhimbili University of Health and Allied Sciences a dissertation entitled ***Factors Contributing to Sleep Deprivation and Nursing Strategies to Facilitate Sleep in the Intensive Care Units at Muhimbili National Hospital, Dar es Salaam, Tanzania***, in (partial) fulfillment of the requirements for the degree of Master of Science in Nursing (Critical care and Trauma) of Muhimbili University of Health and Allied Sciences.

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**DECLARATION**

**AND**

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I **Tigistu Gebreyohannis Gebretensaye**, declare that this **dissertation** is my own original work and that it has not been presented and will not be presented to any other University for a similar or any other degree award.

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Date .....

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**ACRONYMS**

dB	decibels
ICU	Intensive Care Unit
MNH	Muhimbili National Hospital
MOI	Muhimbili Orthopedic Institute
MUHAS	Muhimbili University Of Health And Allied Sciences
NREM	Non rapid eye movement
OHS	Open heart surgery
REM	Rapid eye movement
USA	United States of America
IV	Intra venous
GABA	Gamma-Aminobutyric Acid

## OPERATIONAL DEFINITIONS

- 1. Sleep architecture** is the structure and pattern of sleep which encompasses several variables, such as the amount of time spent in REM and NREM sleep and sleep duration is the total time spent asleep in a 24 hour period
- 2. Sleep deprivation** is defined as a sufficient lack of restorative sleep over a cumulative period, resulting in exhaustion, lethargy and daytime sleepiness as reported by the patient.
- 3. Sleep quality** is one's satisfaction of the sleep experience, integrating aspects of sleep initiation, sleep maintenance, quantity, and refreshment upon awakening
- 4. Sleep quantity** Is the duration of sleep an individual spent during the light and deeper stages of sleep.
- 5. Sleep pattern** Progression of pattern of sleep from slow wave to REM to the deeper NREM.
- 6. Sleep promoting strategies** strategies used by ICU nurses to enhance patient's sleep including stress reduction, pain management, reduction of unnecessary light and noise and consolidation of patient care interventions.

## ABSTRACT

Sleep is defined as a periodic, reversible state of cognitive and sensory disengagement from the external environment. It is a complex physiologic and behavioral process essential for rest, repair, well-being, and survival. Sleep deprivation has been identified as a challenge for patients in the intensive care unit and this may lead to a variety of physiological and psychological dysfunctions that affect the recovery process. Studies conducted over the past 30 years indicate that sleep deprivation alters respiratory function, disrupts hormone levels, lowers immune function, and leads to neuro-cognitive changes.

The aim of this study was to determine the modifiable factors that affect sleep in intensive care units, assess the nursing strategies practiced in the ICU and assess the actual nursing practice through observation.

**Methods:** Quantitative, descriptive cross sectional study was conducted at the main and open heart surgery ICUs of Muhimbili National Hospital. Thirty three patients admitted to the main MNH ICU were interviewed and 41 nurses working in both the main MNH and Open Heart Surgery ICUs were provided with structured self-administered questionnaire. The main MNH ICU was also assessed for resource availability and actual nursing practice using a checklist. Participants were consented before their participation in the study. Ethical clearance was obtained from MUHAS ethical committee. The study was conducted from April to May, 2013.

**Data analysis:** Data collected from the 33 patients (17 women and 16 men) and 41 nurses (30 women and 11 men) was analyzed using Statistical Package for the Social Sciences (SPSS) software version 20. Descriptive statistical methods including chi-square, Fisher's Exact Test, P-value, frequency, and proportions were used. Data collected using an observation check list to assess resource availability and actual practice of ICU nurses was also compiled. Close-ended questions were used to collect information. Each response was numerically coded as



“0” for no or not observed practice and “1” for yes or observed practice. The data was then entered and analyzed using SPSS software version 20. Frequencies and percentages were used to analyze data and descriptively summarized.

**Results:** Patients reported that pain, noise, thirst and nursing care activities were the major factors impacting sleep in ICU; i.e 64% due to pain, 42% noise, 42% thirst and 39% due to care activities such as restriction of movement from blood pressure cuff and intravenous lines. Pain influenced sleep more in women than men, Fisher’s Exact Test,  $p= 0.025$ . Feeling of thirst also showed high statistical significance difference among sex ( $p 0.009$ ). Nurses believed *stress* was the major factor, followed by *pain, noise and light*, as contributors for sleep deprivation in MNH ICUs. According to the nurse respondents, 76% believed sleep is influenced due to stress related to medical jargon, 73% due to pain, 71% due to noise and 61% due to light. The strategies reported used to promote sleep include 93% reduce noise from monitor alarms, and telephone conversation, 63%, described air conditioner and heater adjustment, 63% participants described feeding patient as prescribed, and 51% reported they address fluid needs based on patient assessment; 42% described they adjust light. Observation results also showed, most nurses were observed reducing monitor and ventilator alarms, administering sedatives, increasing or reduction of clothing and giving warm baths, all nurses feed per ICU schedule, average number address fluid needs as prescribed. However staff telephone conversation in ICU was high.

**Conclusion:** Sleep in the intensive care unit is influenced by care and treatment routines, environmental sources, physiological and psycho-social factors. Pain followed by noise, feeling of thirst and nursing care activities are among the major challenges that influenced sleep in the ICU. Women patients are more susceptible for sleep deprivation due to pain and feeling of thirst than men at MNH ICU. Limited resources used for sleep promoting strategies may have impacted quality care delivery in the ICU.

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## **1. Introduction**

### **1.1 Back ground**

Sleep is defined as a periodic, reversible state of cognitive and sensory disengagement from the external environment (Kamdar, Needham, & Collop, 2011). It is a complex physiologic and behavioral process essential for rest, repair, well-being, and survival. Protein synthesis, cell division and growth hormone release are increased during sleep suggesting that sleep may be an important element of the healing process (Mostaghimi, et.al., 2005).

Normal sleep is characterized by four to five 90- min sleep cycles. Each sleep cycle, has an orderly progression through non-rapid eye movement (NREM) and rapid eye movement (REM) sleep. NREM sleep is divided into four stages. Stages 1 and 2 of NREM sleep are associated with superficial or lighter sleep. Stages 3 and 4 (slow wave sleep) are described as deeper restorative sleep and often last for longer periods. REM sleep is thought to be associated with dreaming and memory formation (Jones & Dawson, 2012). Sleep architecture is the structure and pattern of sleep which encompasses several variables, such as the amount of time spent in REM and NREM sleep and sleep duration is the total time spent asleep in a 24 hour period

Sleep quality and characteristics vary markedly in critically ill patients (Kamdar et al., 2011). Sleep deprivation has been identified as a challenge for patients in the intensive care unit (ICU) for decades and this may lead to a variety of physiological and psychological dysfunctions that affect the recovery process and increase morbidity and mortality amongst ICU patients (Eliassen & Hopstock, 2011). The intensive care unit environment has been regarded as a leading stressor because of the complex nature of patient's health problems that require an extensive use of highly sophisticated technology (Honkus, 2003). Immobility and presence of tubes in the nose/mouth were reported as the main stressors experienced by ICU patients. Illness and hospitalization certainly increase psychological stress. Both verbal and

non-verbal communications have a major impact on the patient's emotional stability limiting sleep (Hofhuis et al., 2008). Although patients may sleep 8 hours or more in a 24-hour period, sleep is highly fragmented and sleep architecture is abnormal with minimal time spent in the deeper restorative stages of sleep (Friese, Diaz-Arrastia, McBride, Frankel, & Gentilello, 2007).

Studies conducted over the past 30 years (Stuck et al., 2011), mostly on healthy volunteers, indicate that sleep deprivation alters respiratory function, disrupts hormone levels, lowers immune function, and leads to neuro-cognitive changes. In ICU patients, these sleep-related disturbances may have significant consequences; patients may have difficulties weaning from both noninvasive ventilation and mechanical ventilation, develop hyperglycemia making them more at risk for hospital-acquired infections, and can develop depression and anxiety. However, providing adequate sleep and rest for critically ill patients is typically not the top priority when the focus is on lifesaving interventions (Stuck et al., 2011).

Polysonographic studies in healthy volunteers and mechanically ventilated patients in Sunnybrook and Women's College Health Sciences Centre, University of Toronto, in Ontario, Canada have shown that sleep deprivation can cause negative nitrogen balance, impaired cellular and humoral immunity, increased oxygen consumption and carbon dioxide production, and disrupted thermoregulation (Gabor, 2003; Friese, 2008).

Female gender, early levels of increased stress, and problems in sleeping are associated with worse psychological recovery for survivors of critical illness (McKinley et al., 2012). Delirium has been shown to occur in up to 80% of critically ill patients in the U.S.A and is an independent predictor of adverse ICU outcomes, including increased risk of death, longer hospital stay, and higher costs (Weinhouse et al., 2009)

Disturbed sleep patterns result in the undesirable consequences of daytime sleepiness, lethargy, irritability, confusion, and poor short-term memory (Salas & Gamaldo, 2008).



Patients in the ICU are particularly susceptible to sleep disruption secondary to environmental and medical issues. In a study conducted in a multi disciplinary intensive care unit in South Africa the prevalence of sleep deprivation showed 70.6% (Ehlers, Watson and Moleki., 2013).

Factors contributing to sleep deprivation are multiple; patients can be aroused by sensory or other stimuli. The most important contributors to sleep deprivation in the ICU are environmental sources and patient care activities in the ICU during day and night. These factors, together with suboptimal nursing care, hinder patient sleep (Eliassen & Hopstock, 2011; Le et al., 2012; Tembo & Parker, 2009).

Addressing both the physiologic changes secondary to acute illness or injury as well as environmental factors such as noise levels, lighting practices, and patient care routines may result in improved sleep patterns and architecture for patients cared for in the ICU (Friese, Diaz-Arrastia, McBride, Frankel, & Gentilello, 2007).

## **1.2 Statement of the problem**

Sleep deprivation is a very common problem among patients in intensive care units (ICU), leading to physiological and psychological dysfunctions, which can affect clients' recovery and increases morbidity and mortality of clients. Critically ill patients frequently experience poor sleep, characterized by frequent disruptions & loss of circadian rhythms (sleep-wake cycle in 24 hours) (Young, et.al., 2008). The stress and fatigue of sleep deprivation may exacerbate cognitive changes in young adults (McCubbin et al., 2012)

Factors that are associated with sleep disruption in the ICU include medications, patient care interactions, and environmental sources. Critically ill patients admitted to MNH and open heart surgery (OHS) ICUs may share similar experiences since they will be admitted in the same intensive care unit regardless of their condition, age and sex, and other related factors.

The use of multi-disciplinary technologies in the ICU may result in disrupted sleep patterns. The noises produced from alarms by cardiac monitors, fluorescent light throughout day and night, continuity of patient care and other related environmental factors may contribute to sleep deprivation of patients in the settings. In a dissertation conducted for partial fulfillment of Masters degree in a South African private Hospital multi-disciplinary ICU (Ehlers, Watson and Moleki., 2013), reported an increasing number of myocardial infarctions, angina, and medical cases, and it is vital for these patients to get enough rest and sleep in a quiet, stress free environment. He also noted that, cardiac patients may find themselves lying next to surgical, ventilated, traumatic cases or even near or next to an ill, crying child. This can lead to anxiety, stress and resultant negative consequences to such individuals, and their families. Identification of the contributing factors for sleep disruptions will provide a better understanding by health care providers, and recommendation on reduction of incidence of sleep deprivation can be addressed. There were no published similar studies found in Tanzania or Africa, during literature search other than one South African study conducted by (Ehlers, Watson and Moleki., 2013) to determine factors that can contribute to sleep deprivation of patients in a multi disciplinary ICU.

### **1.3 Significance of the study and importance to nursing science practice**

Identification of the factors contributing to sleep deprivation provides direction to reduce modifiable risk factors and recommends strategies to promote sleep of clients admitted in the intensive care unit. Improving sleep of critically ill clients facilitates recovery, reduces cost by reducing hospital stay and reduces possibilities of further complications of patients in intensive care unit. The knowledge explored in this study can also be used as an input in the intensive care unit for future use.

#### **1.4 Study purpose**

The purpose of this study was to understand the factors that contribute to sleep deprivation among patients in the intensive care unit; and assess sleep promoting strategies currently used by the (ICU) nurses in both the general and open heart surgery intensive care units at Muhimbili National Hospital in Dar es Salaam, Tanzania.

#### **1.5 Research questions**

What factors contribute to sleep deprivation among patients in the intensive care units?

What available resources are used by nurses to enhance sleep to patients in MNH ICU?

What is the actual practice of nurses concerning sleep promotion in MNH ICU?

#### **1.6 General objective**

To identify factors contributing to sleep deprivation among critically ill patients and assess nursing strategies to promote patient's sleep in the intensive care units (ICUs), at Muhimbili National Hospital.

#### **1.7 Specific objectives:**

1. To determine factors influencing/disrupting sleep among intensive care unit patients.
2. To assess the sleep promoting strategies that are used by ICU nurses at MNH ICUs.
3. To assess resources utilized by nurses to enhance sleep in MNH ICUs.
4. To determine the actual nursing practice utilized by nurses to promote sleep of ICU patients through observation.

### **Nightingale's approach to nursing:**

Nightingale used her broad base of knowledge, to the understanding of disease occurrence and prevalence. She made an observation to develop an approach to nursing management and hospital construction, focusing on control of the environment of individuals and families, both healthy and ill. She discussed the need for ventilation, and light in sick rooms, proper disposal of sewage, and appropriate nutrition (George, 1995) Her most frequently cited work, Notes on Nursing, was not written as text but to “give hints for thought to women who have personal charge of the health of others” (George, 1995, p. 35). Notes on Nursing, is a thought looking forward on organizing and manipulating of the environment for clients seeking nursing care.

Nightingale also wrote notes on hospitals and introductory notes on the first maternity centers as well as a numerous letters (George, 1995). She provided many insights on the influence of the environment on the ill human being and the need to balance between the human being and the environment.

#### **2.1 Conceptual framework:**

Nightingale's Environmental Control Theory is appropriate for this study, because the theory emphasizes control of the environment to prevent disease occurrence and enhance healing. According to WHO (2006), the environment is defined as “all the physical, chemical and biological factors external to the human host” as well as those factors impeding related behaviour.

Nightingale viewed the manipulation of the physical environment as an important aspect of nursing care. She identified health of houses, ventilation and warmth, light, noise, bed and bedding, cleanliness of rooms and walls, and nutrition as major areas of the environment the nurse could control. She noted that when one or more aspects of environment are out of

balance, the client must use increased energy to counter the environmental stress and these stresses drain the client's energy inversely affecting healing.

## **Pain**

Sleep disturbances are highly prevalent in chronic pain patients (Schuh-Hofer et al., 2013). Understanding their relationship has become an important research topic since poor sleep and pain are assumed to closely interrelate. Pain experienced in the context of medical conditions and various pain syndromes, and experimentally produced pain, are associated with sleep disruption (Doghramji, 2012). Overall, the findings of the present study showed that implementing a well-designed protocol that involves regular and precise monitoring of pain, agitation and delirium along with appropriate and timely medical therapy, can be of great help in improving the medical care provided by the ICU team (Mansouri et al., 2013).

## **2.2 Noise**

An increased level of noise, or noise that creates an expectation in the mind, is that which hurts a patient. Loudness of the noise has negative effect upon the organ of the ear itself, which appears to affect the sick (Nightingale, 1860). According to (Wenham & Pittard, 2009), noise is an undesirable sound which is subjectively annoying or disrupts performance and is physiologically and psychologically stressful. Noise can be continuous, fluctuating, or intermittent. Sound is usually measured in decibels (dB) which is a logarithmic scale expressing the ratio of a sound pressure to a reference level. Studies have been suggested that the disruption to sleep caused by noise may become more important as a patient begins to recover from critical illness. In the ICU setting, peak daytime and nighttime noise levels routinely exceed 80 dB, the threshold associated with sleep disruption in critically ill patients (Kamdar et al., 2011). Noise in ICU is associated with technologies utilized in the intensive care unit, staff conversations, procedures, telephone conversation, and/ or noise from other patients (Jones & Dawson, 2012). The design of an ICU may influence noise pollution.

Strategies for noise reduction include double-glazed windows, floors, walls, and ceilings constructed of materials with high sound absorbing capabilities, to reduce sound transmission, and surrounding the nurses' station with clear glass. Use of ear plugs, reduction of volume of alarms, reduction of staff conversations are recommended to reduce noise levels and improve sleep of the critically ill in intensive care unit (Jones & Dawson, 2012).

### **2.3 Light**

As Nightingale wrote (1860), people do not consider enough the difference between wards and dormitories in planning buildings. Sunlight reaching the bedroom may not be a concern to healthy people, since they can expose themselves to the sun on their demand, but the case is reversed with the sick, because the critically ill patient may be confined to bed. In some ICUs, patients are not exposed to any natural light. Patients may then become unable to distinguish night from day and this can contribute to disorientation. Although light intensity in ICU usually reflects a 24 hour circadian rhythm, bright lights from the nurses' station, lights that are not dimmed, and lights that are turned on at night can be very disrupting to patients' sleep (Wenham & Pittard, 2009). Light levels of 1500 lux are necessary to disrupt sleep and 100 to 500 lux are needed to suppress melatonin release (normal indoor light 180 lux) (Kamdar et al., 2011). Unnecessary light reduction, modalities like, applying eye masks, use of curtains, and deeming light source can be useful to facilitate client's sleep in (ICU).

### **2.4 Temperature**

Ambient temperature exerts a prominent influence on sleep. Low ambient temperatures generally impair sleep, whereas higher temperatures tend to promote sleep. Total sleep time is maximal in well controlled temperature, where temperature regulation is achieved by control of insensible heat loss, without regulatory changes in either metabolic heat production or heat loss (Wenham & Pittard, 2009). Assessment of environmental and patient's body temperature to address needs on increase or reduction temperature may be useful. Opening or closing

windows depending on the condition, increase or reduction of clothing; use of air conditioner and other nursing care activities may improve sleep of critically ill in ICU.

## **2.5 Ventilation**

According to Nightingale, (1860), purity of air is essential; temperature must be controlled to an acceptable range to prevent febrile reaction. The first essential a nurse can do to a patient to keep the air he breathes as pure as the external air, without chilling him. If wind does not blow, air may become as stagnant. Timely assessment of patient feet and legs need to be considered using the hand. She also recommended that, wherever a tendency to chilling is discovered, hot bottles, hot bricks, or warm flannels, with some warm drink, is useful to restore the temperature. Current evidences suggest that the clinical role of general ward ventilation may have been underestimated and that through improved ward ventilation, it may be possible to reduce environmental contamination and thus reduce nosocomial infection rates (Beggs et al., 2008).

## **2.6 Stress**

Noxious stimuli in ICU such as fear, isolation, loss of control and negative expectations are major mediators of the high levels of stress (Papathanassoglou, 2010). Stress stimuli are non-specific, that is, psychological stressors display similar neuro-hormonal as well as psychophysiological effects. The relaxation response is regarded as the opposite of the stress response. Studies concluded that the levels of patients' relaxation and the amount and quality of psychosocial support while in the ICU are linked to short-term and long-term patients' outcomes (Papathanassoglou, 2010).

## **2.7 Hunger and thirst**

To the large majority of critically sick patients it is quite difficult to take any solid food. Critically ill patients generally experience fever at night, resulting dry mouths in the morning. Clients will suffer to eat with their dry mouths. This challenge calls for the need of feeding in the form of liquid with spoon every hour to get the requisite nourishment, and prevent them from being too much exhausted (Nightingale, 1860). Evidences found that energy requirements are altered in critically-ill patients and are influenced by the clinical situation, treatment phase of the process and fixed calorie intake (between 25 and 35 kcal/kg/day) is required. The recommended protein intake is 1-1.5 g/kg/day but can vary according to the patient's clinical status. Carbohydrate administration should be limited to a maximum of 4 g/kg/day and a minimum of 2 g/kg/day. Plasma glycemia should be controlled to avoid hyperglycemia. Fat intake should be between 1 and 1.5 g/kg/day. Some vitamins (A, B, C, E) are highly important in critically-ill patients, especially those undergoing continuous renal replacement techniques and patients with severe burns. (Bonet Saris, Márquez Vácaro, & Serón Arbeloa, 2011)

## **2.8 Bed and bedding**

Pressure ulcers are one of the most underrated conditions in critically ill patients and its development is complex and multi-factorial (Cox, 2011). In critical care patients, pressure ulcers are an additional comorbid threat in patients who are already physiologically compromised. According to Nightingale (1860), an adult in health exhales by the lungs and skin about three pints (three glasses of 473ml) of moisture, loaded with organic matter in twenty-four hours that is ready to enter into breakdown. All this moisture goes to chiefly into the bedding and it stays there. In sickness the quantity is often greatly increased, and is always more noxious. Nightingale also recommends attempt for change of bed sheets and aeration in an attempt to reduce the risk of ulcer development.



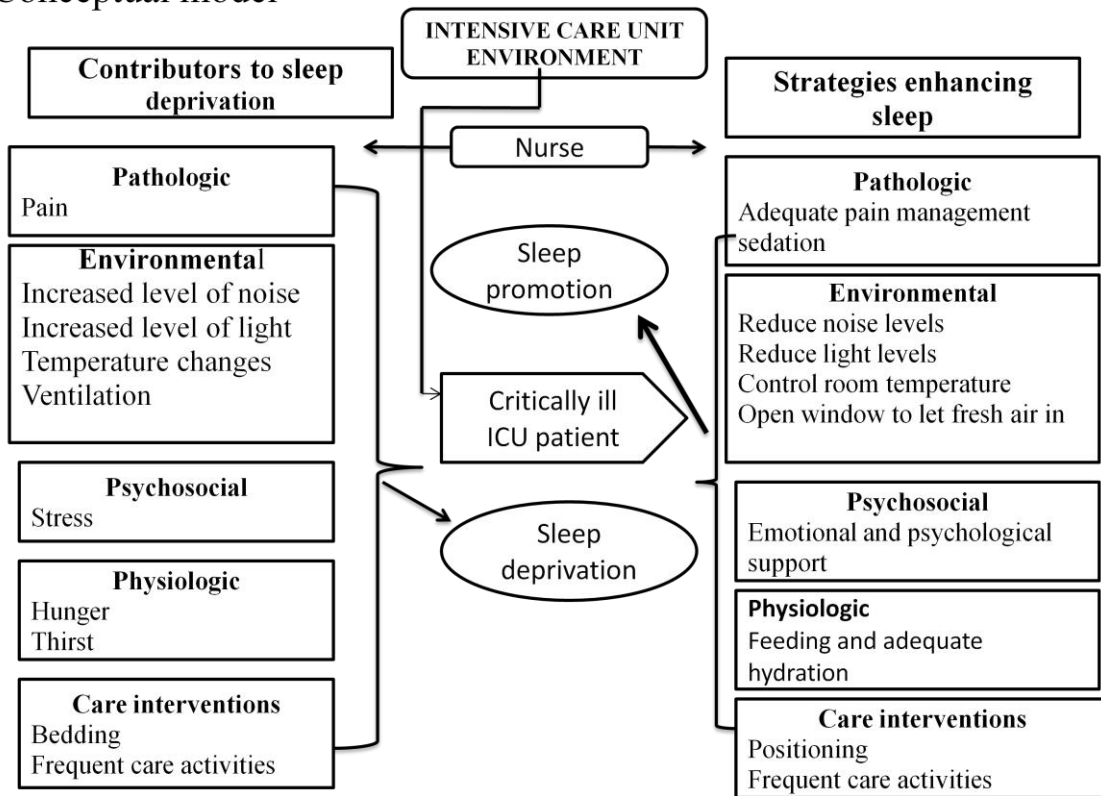
## **2.9 Care activities**

Studies from both medical and surgical ICUs show that 40—50 care interventions typically occur per patient per night (Eliassen & Hopstock, 2011). According to Eliassen & Hopstock (2011), patient care interventions that would require the nurse to wake a patient were reported as physiotherapy, X-ray, doctor's rounds, administration of antibiotics and blood gas control. Clustering of care has been recommended to allow for uninterrupted sleep periods (Honkus, 2003).

## **2.9 Environmental model:**

Environmental control enhances effective sleep of clients in the ICU. Manipulating the physical environment in the way that is conducive to clients is an important part of nursing care. ICU nurses need to identify and manipulate the modifiable sleep limiting factors, in the ICU environment, and they can design strategies to improve the situation in the intensive care unit. This model helps to identify the gap in the nursing practice and to design evidence based strategies used by other settings, for a better client outcome. This study will address which factors affect client's sleep in the general and open heart, surgery ICUs in Muhimbili National Hospital, and what modalities are practiced by nurses working in both ICUs, to promote sleep.

## Conceptual model



Adapted with modification from Nightingale 1860; Kamdar et al., 2011

Model was modified to include sleep promoting strategies that can be used in (ICU), to enhance sleep of the critically ill.

### **3. Literature review**

Literature search was conducted through databases Google, Google Scholar, Hinari and PubMed, using key words that are related to the topic in study (e.g sleep deprivation, and insomnia, factors affecting sleep, critically ill, sleep promoting strategies, sleep & ICU). Information which has relevance to the topic are used and cited for reference.

According to Matthews (2011), sleep disturbances in critically ill patients may result from pre-existing primary sleep disorders, underlying injury or illness, therapeutic/diagnostic interventions, and environmental factors. Sleep derangements have been reported to be more severe in hospitalized patients than in ambulatory patients (Ambrogio et al.,2008). Sleep derangements can lead to deleterious consequences, in critically ill patients. ICU patients experience qualitative and quantitative sleep disruption leading to sleep deprivation and adverse sequelae (Little et al., 2012). These patients commonly report poor sleep, related to potentially modifiable factors.

#### **3.1 Pain**

Disturbed sleep and pain have been thought to be related in a reciprocal, bidirectional fashion (Doghranji, 2012). Patients in critical care units may have pain for a variety of medical and surgical reasons, and these patients are often subjected to medical procedures that are painful as well (Honkus, 2003). Pain control is an essential provision in critically ill patients (Altshuler & Spoelhof, 2013). Inappropriate pain control may also diminish immune function and negatively affect wound healing (Altshuler & Spoelhof, 2013). Providing adequate analgesia ensures a more comfortable ICU stay, decreases the need for GABAergic sedation, and it may decrease the risk of delirium. Other studies (Friese, 2008; Honkus, 2003) also suggested patient comfort measures such as adjustments to achieve optimal ventilator synchrony, adequate pain management to improve ICU sleep.

### **3.2 Noise**

Noise is commonly reported by ICU patients as a significant disruptor of sleep and most often is due to staff conversations, alarms, overhead pages, telephones, and televisions (Kamdar et al., 2011). Level of noise can be reduced by liberalizing ventilator and monitor alarm, providing with earplugs and minimizing conversations in the ICU (Friese, 2008).

### **3.3 Light**

According to Kamdar and colleagues (2011), light plays a vital role in synchronization of the circadian rhythm. Light can be reduced by adjusting the light and offering the patient an eye mask (Friese, 2008). In a randomized control study conducted to determine self-reported sleep experiences and perceived factors affecting sleep quality among intensive care patients before and after the introduction of earplugs and eye masks; more patients reported that they had slept longer using the eye masks and earplugs (Jones & Dawson, 2012).

### **3.4 Temperature**

Humans defend their body temperature from a cold stimulus mainly by behavioural means, seeking shelter, lighting a fire, and putting on more clothes. Physiological mechanisms including peripheral vasodilatation and perhaps increasing food intake, but the only means of significantly raising heat output is by muscle contraction, exercise, shivering and an increase in muscle tone (Campbell, 1997). The limits within which homeothermy can be maintained and the organism function effectively are from 35 to 36<sup>0</sup>c. As (Campbell, 1997), both trauma and infection alter the temperature at which the body sets its internal environment and in general temperature is increased. Surface cooling with cloths soaked in ice water produced an active and effective decline in body temperature (Campbell, 1997). Hypothermia (core temperature  $\leq 35^{\circ}\text{C}$ ) is also described as an independent risk factor for mortality after trauma (Inaba et al., 2009).

### **3.5 Ventilation**

The air has been postulated as a potential route of transmission of bacterial organisms within the hospital setting (Munoz-Price et al., 2013). This is especially the case for drug resistant *Staphylococcus aureus*, which has been found to disseminate through the aerial route across inpatient. According to (Munoz-Price et al., 2013), the role that air plays in the transmission of this organism is unclear. Assessment of the role of the layout of a unit (open vs individual rooms), crowding, humidity, influence of the ventilation system and aeration are aspects of interest for future study.

### **3.6 Stress**

In ICUs, there are several conditions that can trigger stress responses in patients (Rosa, Rodrigues, Gallani, Spana, & Pereira, 2010): Any type of stressor or situation demanding physical or psychological adaptation, i.e., representing a threat or a challenge, is considered a stressor. Sleep deprivation, loneliness, fear and anxiety are considered psychological stressors. Also, subjection to healthcare professionals, the distress of relatives, impersonal treatment, insecurity and other situations causing anxiety and distress are mentioned. A typical ICU environment consists of the sounds of various monitors and alarms of varying intensities, the beeping of many different machines with flashing lights of various colours, and other ongoing noises and activities (Ehlers, Watson and Moleki., 2013). This is considered 'normal and customary' to the staff who work in this environment. The language spoken is understood by 'those' who work in the ICU. However these noises and the continuity of activities may lead to feelings of anxiety, stress and inability to rest or sleep in patients.

### **3.7 Bed and bedding**

Bathing, skin care, dressing and linen changes, and repositioning are all part of routine methods used to help make patients more comfortable. Risk factors that might play a role in

pressure ulcer development: duration of surgery and number of operations, fecal incontinence and/or diarrhea, low preoperative protein and albumin concentrations, disturbed sensory perception, moisture of the skin, impaired circulation, use of inotropic drugs, diabetes mellitus, too unstable to turn, decreased mobility (Keller, Wille, Van Ramshorst, & Van der Werken, 2002).

### **3.8 Care interventions**

ICU patients are in need of bedside observation and specialized nursing care, because of their critical condition (Eliassen & Hopstock, 2011). Nursing care activities may be performed as part of a routine, and the nurse has to remain aware of the problem of sleep deprivation and to prioritize which activities are important for the individual patient. Sleep disruptions may result from intense ICU routine entails a multitude of round-the-clock nursing tasks, including administering medications and making clinical assessments as well as monitoring ventilators and other equipment. In addition to adversely affecting patients during their ICU admission, the effects of sleep disruptions may linger even after discharge (Le et al., 2012). Consolidation of patient care interventions suggested improves patient's sleep in ICU (Jones & Dawson, 2012; Kamdar et al., 2011).

In general addressing both the physiologic changes secondary to acute illness or injury as well as environmental factors such as noise levels, lighting practices, and patient care routines may result in improved sleep patterns and architecture for patients cared for in the ICU (Johansson et al., 2012). Non-pharmacological methods based on cognitive behavioral therapy provided by nurses are also needed to enhance sleep in the care of the critically ill. ICU nurses can implement music therapy, environmental interventions, therapeutic touch (a technique in which the hands are used to direct human energy for healing purposes without actual physical contact), and relaxing massage to promote sleep in critically ill patients. These interventions are safe and may improve patient sleep.

## **4. Methods:**

### **4.1 Study design.**

This is a quantitative descriptive cross sectional study conducted at Muhimbili National Hospital main and open heart surgery ICUs. This study was conducted to determine the factors that influence and/or disrupt sleep of ICU patients. The design was ideal because cross sectional studies provides advantage for single time (snap shot) data gathering with regard to the time allocated for the study to be accomplished.

### **4.2 Site/ setting**

Muhimbili National Hospital is a national referral and University hospital located in Ilala district, Dar es Salaam, Tanzania. The hospital has 1500 bed capacity and attends 1000-1200 out patients a week. It has 2700 employees of those 300 doctors and 900 registered and enrolled nurses with the rest supporting operations (Muhimbili National Hospital 2012). There are 25 departments and 106 units in the hospital. The main ICU is a specialized section of the hospital that provides a comprehensive and continuous care for the critically ill patients. It is located in the ground floor at close proximity to Emergency Medical Department, Operation Theater, diagnostic facilities, and Central Sterilization Supplies Departments.

Initially this ICU was operating with 8 beds but currently it has reduced the number of beds to six due to narrowed space in the facility, but the space between beds remained still narrow. The beds are arranged on either two longer sides of the room with the nursing station at front of the room. This ICU provides service to all ages and sexes with medical and/or surgical conditions under the same roof. The number of nursing staff working in this facility is 29.

The open heart surgery ICU is the other unit in the hospital located at the third floor of the new building for open heart surgery patients. This ICU is a nine bed capacity, eight in one open room and another one in a separate room. The ICU is well equipped with ideal space

between patient beds, and is stuffed with 18 nurses providing service for cardiac surgical cases.

In the current study patients study participants were selected from the main MNH ICU only; however, nurse study participants were drawn from both the main MNH and open heart surgery ICUs. Other ICU settings such as MOI was excluded for the reason that most patients admitted were head injury patients during the survey, and pediatric care unit was excluded since they were not targets of the study. Forty one nurses from both ICUs and 33 patients from the main ICU including patients transferred to the general ward (ward one) participated in the study

#### **4.3 Study populations:**

The study populations were patients admitted to the main MNH ICU and those transferred from the main MNH ICU to the general ward (ward one) who were above the age of 15 of both sexes were involved in the study. Nurses working in both the main MNH and open heart surgery ICUs were also enrolled.

#### **4.4 Sampling technique:**

A convenient sampling technique was used to involve both patients and nurses as study participants. This technique was used because of time constraints to achieve the calculated sample size. All consenting patients admitted to the main MNH ICU, who met the inclusion criteria, were selected to participate in the study. In addition, all nurses working in both the main MNH and open heart surgery ICUs for more than six months and currently working within the units were also conveniently enrolled. Nurses assigned to beds number 1 and 6 were conveniently selected for observation. The selection was based on the fact that those beds were arranged proximal to the nursing station allowing easy observation. Eight ICU nurses attending critically ill patients among all main ICU nurses who responded for the self-



administered questions from the main MNH ICU were observed. Participants for the observation component were not studied for more than once. The observation process was completed observing eight nurses at the end of the stipulated one week for data gathering through observation checklist. Information from observation showed similar pattern indicating data saturation, therefore there was no need for extension of the data collection period.

#### 4.5 Sample size:

Sample size was determined using sample size calculation formula

$$n = \left( \frac{Z}{d} \right)^2 P(1 - P)$$

Where

n = required sample size

Z= level of confidence (1.96 for 95% confidence level)

P = expected proportion

d = margin of error

$$n = \left( \frac{1.96}{0.05} \right)^2 P(1 - P)$$

Prevalence of 70.6% was used to determine the sample size from a study assessing factors contributing to sleep deprivation in multi disciplinary intensive care unit in South Africa (Ehlers, Watson and Moleki., 2013).

$$n = \left( \frac{1.96}{0.05} \right)^2 0.71(1 - 0.29)$$

$$n = \underline{\underline{316}}$$

The sample size for patients, based on the sample size calculation was 316. Survey of records for patient admission in the main MNH ICU – not including the open heart surgery ICU, was conducted to assess feasibility of the study. According to the survey, the total number of admissions during the years 2010 and 2011 it was 413 and 362 respectively, with an average monthly admission of 34.4 and 30.2. By the time of the survey, the open heart surgery ICU in Muhimbili Orthopedic Institution (MOI) was in a transfer process to the new building of open heart surgery. This condition limited conducting patient survey in the facility during the

transition period. Therefore all consenting patients admitted in the main MNH ICU and patients transferred to ward one within one week were recruited.

The obtained sample size was small, thus 33 patients (17 females and 16 men) were participated in the study. For the nurses, a total number of 29 nurses' from the main MNH ICU and 18 nurses at the open heart surgery (OHS) ICU were enrolled. Nurses from open heart surgery ICU were involved in the self administered questionnaire only to assess what they believed improve patients sleep in ICU and they believe they do. However, main ICU nurses were involved in both the self-administered questionnaire and actual practice. Of those (41) 87.2% nurses responded to the self administered questionnaires. Sample size was not determined for nurses as the population sample was small and all included. Morris (2008) suggested, as the population size becomes smaller than 300 everyone in the population needs to be studied.

#### **4.6 Inclusion criteria:**

- All consenting adolescent and adult patients admitted to the main ICU with sufficient cognitive function, who spent two days or more in the ICU.
- Patients scheduled for discharge directly from the ICU after completion of medical treatment and-
- Patients already transferred from the main ICU to the general ward (ward one) within one week after transfer from ICU were included. The number of participants from ward was not defined since the information gathered was combined together with that of the main ICU.

The inclusion criteria for the transferred and the discharged patients was based on other studies; thus, a multicentre cohort study in a University hospital in Garnisonsvagen studied consecutively admitted and who remained in the ICU for more than 24 hours, and who were alive 6 months after discharge from hospital (Orwelius et al. 2008). The data was collected from the surviving patients at 6 months and 12 months after their discharge from

hospital. Another study (Gabor 2003), also evaluated sleep disruption in ICU patients at University of Toronto, Ontario, three days after patient discharge from ICU.

- Mechanically ventilated and intubated patients were not interviewed until they were extubated and off mechanical ventilation, but interviewed 48 hours after their extubation and off the mechanical ventilation to exclude mixed effects of mechanical ventilation and intubation on sleep.
- As for the nurses, those who were working in both settings; the main MNH and open heart surgery ICUs, with a minimum work experience of six months were also included in the study.

#### **4.7 Exclusion criteria**

- Patients who had insufficient cognitive function.
- Age less than 15 years
- Head injury patients
- Patients who were transferred to general ward and spent more than one week after being transferred from the ICU
- Nurses working in both ICUs, with less than six months ICU experience were also excluded.

#### **4.8 Instruments:**

Three instruments including interview questionnaire for patients, self administered questionnaire for nurses and observation checklist to assess availability of resources necessary for sleep promoting practices and nurse's sleep promoting practice were developed by the researcher as presented in the literature review (Eliassen, 2011; Watson, 2008). all instruments were checked by both supervisors for their relevance to answer the research question and validated.

**Structured questionnaire for patients-**

An interview structured questionnaire was used to collect information from patient study participants. The tool involved two parts, 8 questions about socio-demographic data and 42 questions related to the study. The structured interview questionnaire was designed to gather information concerning the factors that disrupt and/or limit patients' sleep in ICU as reported by the patients' themselves. The instrument was translated from English to Swahili and independently back-translated into English. It was checked and agreed by two other personnel and supervisors.

**Structured questionnaire for nurses-**

A structured self-administered questionnaire was also designed by the researcher to gather information about the factors which ICU nurses believe influence/disrupt patient's sleep and the strategies that nurses believe they provide to promote sleep in ICU patients. This tool involves 3 sections, including socio-demographic, level of understanding and practice assessing questions. The self-administered questionnaire was provided to the ICU nurses and nurses responded to the questions by indicating the factors they believe are responsible to influence patient's sleep and the strategies they believe they practice to promote ICU sleep. Responses were indicated as "X" in mark from the options provided.

**Observation checklist**

A structured checklist instrument involving two sections which assessed availability of supplies necessary for sleep promoting practice and the sleep promoting practices by nurses was used. Observation of ICU supplies was conducted by the researcher assisted by the main ICU block manager. However, sleep promoting practice of the nurses was observed by the researcher only. A total of eight observations (three during the morning, three afternoons and two during night shifts) within one week were conducted.

All instruments were checked for their relevance with regard to the current study and agreed by both supervisors with some adjustments. The purpose of combining self-administered questionnaire and observation checklist data collection instruments was to triangulate the nurses' responses with their practice concerning sleep promoting strategies used and describe as it occurs in real situations.

#### **4.9 Pre-test**

All instruments were pre-tested for their relevance to answer the research question prior to the actual data collection period. One question from nurses self administered questionnaire concerning nurse's level of education was adjusted for age classification, otherwise there were no other errors found during pre-testing. There were no changes in the patients' interview questionnaire.

#### **4.10 Recruitment of research assistants**

Two research assistants from MNH with the qualifications of Bachelor degree in nursing were recruited to collect data from patients and nurses. The research assistants were fully trained on study objectives and needs of consistency during administration of the interview. A training module was designed and half day training was conducted at the class room in the School of Dentistry (appendices-E). Each research assistant was assigned to a separate duty. One research assistant was assigned to interview patients and the other conducted the self-administered instrument for nurses. The reason for the need of research assistance was investigator's language barrier. Close follow up and supervision of the data collection process was made by the investigator though language barrier was a challenge due to the reason that the investigator did not speak Swahili language.

The Origin of investigator is from Ethiopia, knows Tigrigna and Amharic as national and English as a foreign languages. The investigator was not able to directly monitor verbal communication during data collection during interviewing patients. But this limitation was overcome by the use of structured questionnaire, and training of data collectors to consistently use the wordings in the Swahili version of the instrument to reduce information biases.

#### **4.11 Data collection:**

The data collection period was extended from beginning of April to end of May 2013. Data collection for patients took place 48 hours after their admission to the ICU. Information concerning factors limiting sleep and strategies facilitating ICU sleep was also gathered from nurses working in both the main MNH and open heart surgery ICUs. Participants gave written consent prior to their participation. Information from patient interview was gathered by one of the research assistants, and nurses self-administered questionnaire by the second research assistant, while the observation was conducted by the researcher.

Interview questionnaire was guided by research assistant during the data collection for patients. Patients responded to the interview questions which were audibly read by the research assistant and responses were indicated as “X” mark on the space provided corresponding to the list of items responsible to interfere with ICU sleep. Severely ill but conscious patients were interviewed after satisfactory recovery from acute illness. Patients on mechanical ventilation were also interviewed 48 hours after they were extubated and off the mechanical ventilation. This protocol was assumed to reduce mixed effects resulting from factors influencing sleep with deliberate restrictions of fluid as well as severity of illness. Information was also gathered from patients who were transferred to the general wards (ward one) within one week period of their transfer in order to reduce recall biases.

The self-administered questionnaire was distributed to the nurses for them to fill. The nurses indicated their response on the space provided. Observation of the nurses for sleep promoting

practice and availability of supplies required for sleep promoting practice was also assessed using check-list. The observation took place two weeks after self administered questions were filled by the ICU nurses. The reason for delaying the observation was to reduce Hawthorne effect of study participants (Fernald, Coombs, DeAlleaume, West, & Parnes, 2012), Practical studies in real-world settings may be particularly vulnerable to unintended effects on intervention outcomes. The nurses were therefore informed that the study also involved data collection through observation. The average time taken during each observation was 3: 57 hours. Only one nurse was observed per session, and data collection through observation was completed within one week period as stipulated. Observation of ICU nurses mainly focused on nurses caring critically ill and mechanically ventilated patients.

#### **4.12. Data management and analysis**

Data collected using interview and self-administered questionnaires was cleaned at the end of each data collection day to ensure completeness of the data. The data was compiled and entered into a computer, then analyzed using Statistical Package for the Social Sciences (SPSS) software version 20. Descriptive statistical methods including chi-square, Fisher's Exact Test, P-value, frequency, and proportions were used. P-value below 0.05 was considered as the level of significance for differences.

Data collected using observation checklist was also compiled and numerically coded for each response as "0" and "1". Thus, "not observed practice and missing resources" were represented by "0" while "Yes observed practice and available resources" were represented by "1". This approach simplified quantitative data analysis using SPSS software version 20 and displayed in frequencies. Patients response concerning to factors affecting sleep was correlated with the nurses response and descriptively summarized. In addition findings from observation were also correlated with the nurses' responses and descriptively summarized.

#### **4.13 Reliability and validity of instruments:**

Both research instruments were pre-tested on three patients and, four nurses, prior to the actual data collection period. Both pre-tested subjects signed informed consent and agreed to be interviewed or fill the self administered questionnaire. The information gathered from those pre-tested subjects was excluded from the data analysis of the actual study. All data collection tools were checked by the supervisors for their relevance to the study. Interview questionnaire for the patients was translated from English into Kiswahili. It was checked and agreed by two other personnel and both supervisors.

Internal validity refers to the extent to which the information obtained through the structured interviews is a true reflection of reality of factors influencing sleep deprivation in ICU, and not the result of irrelevant or extraneous variables (Burns & Grove 2005:215). The tool was developed by the researcher and agreed by both supervisors after having given some adjustments, that the items in the structured interview and self administered questionnaires pertained to factors that can influence patients' sleep deprivation in ICU. However, threats to external validity in this study include non-randomized convenient and small sample size which enrolled only 33 patients and 41 nurses, limiting the possibility of generalizing the findings of this study to other similar settings.

#### **1.14 Ethical consideration**

Ethical clearance was sought and issued from MUHAS Expedited Review Sub Committee of Senate Research and Publication. Permission to conduct the study was granted from both block managers of the two settings and informed consent from participants was obtained. For minors between ages 15 and 18, verbal consent were obtained from study participant and written consent from parents/guardians. Minors were allowed to decide whether to participate in the study or not. and they were comfortable making decision. Critically ill patients were



interviewed after satisfactory recovery from illness. Study participants were informed about the purpose of the study and no person was coerced to participate and every interviewee could withdraw his or her participation at any stage without any change in the care they would otherwise get.

## 5. Results

Two groups of populations involving critically ill ICU patients and nurses working in ICU were studied in the current study. The following algorithm shows the process to the enrollment of the study participation.

**Figure 1 Algorithm of participants enrolled in the study at MNH, 2013.**

Figure 1.1 ICU patients' enrollment in the study from the main MNH ICU.

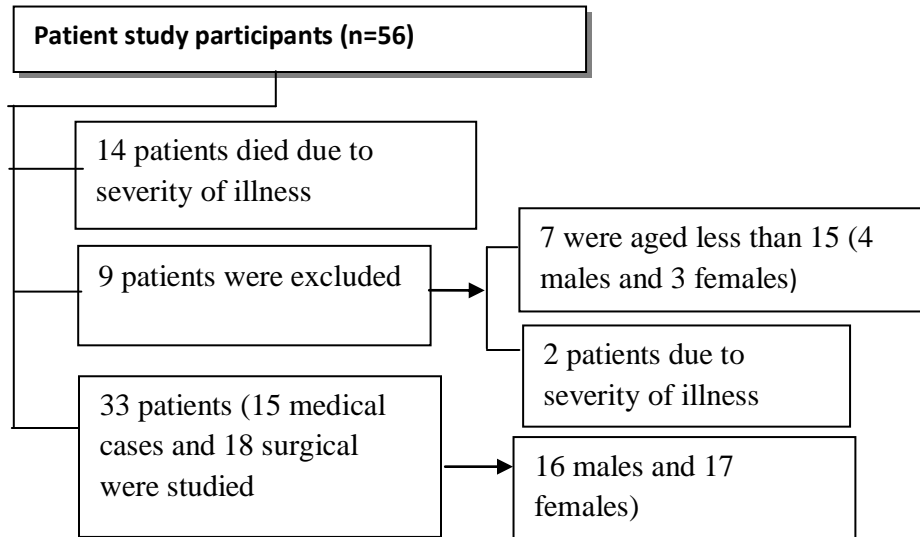
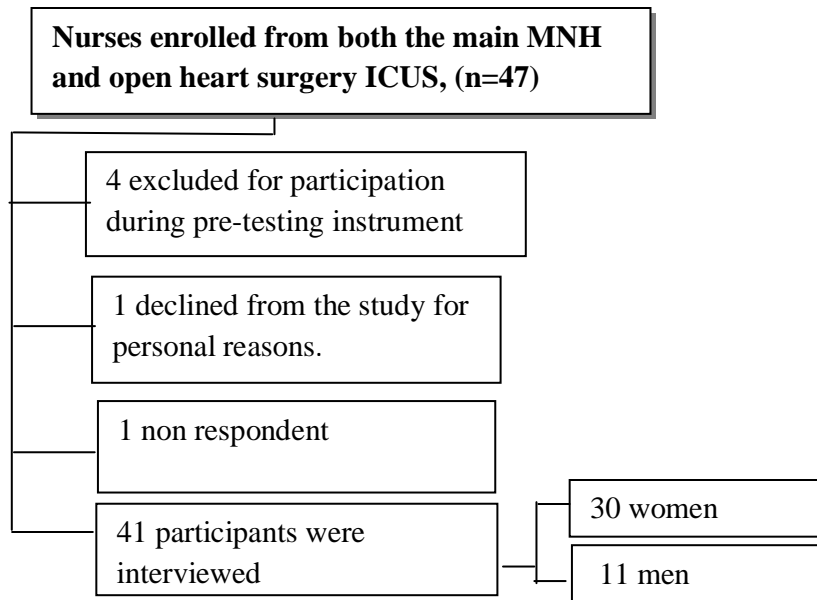


Figure 1. 2 ICU nurse study participants enrollment in the study.

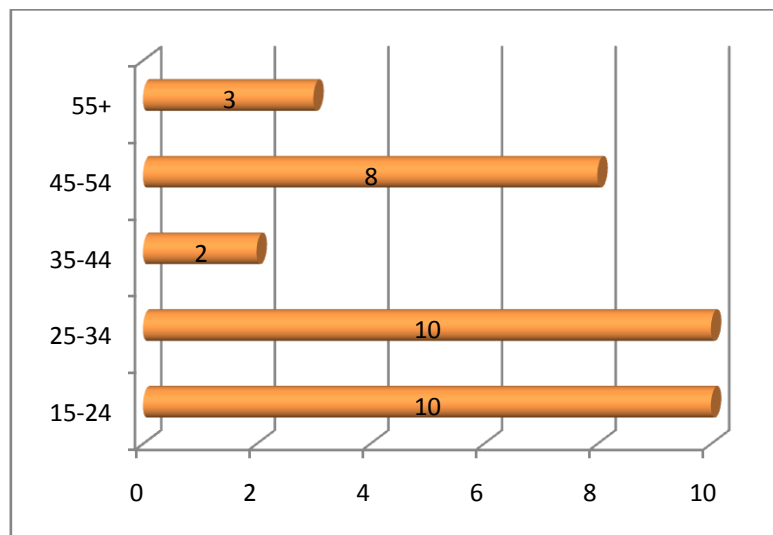


**Table 1 Socio-demographic characteristics of patients at MNH ICUs, April - May 2013.**

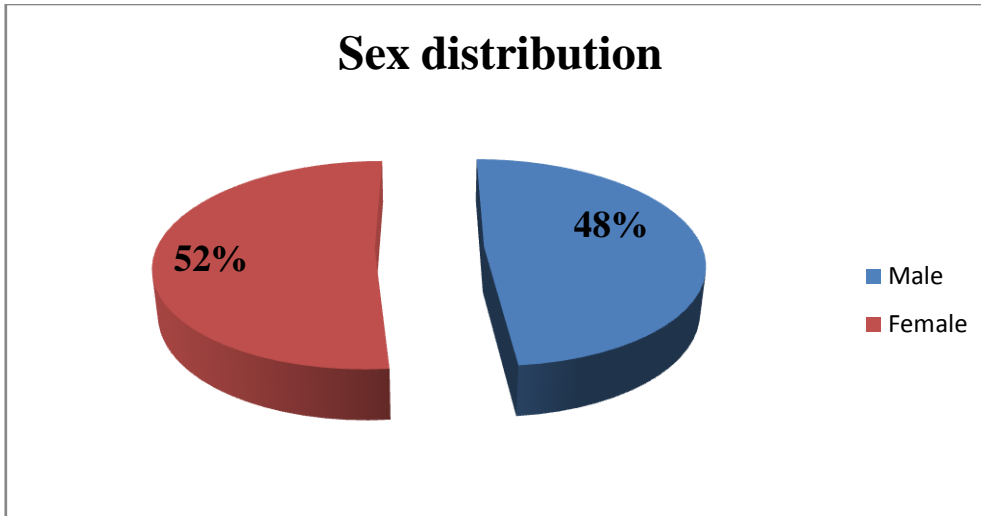
S/N	Characteristics	Category	(n= 33)	Percent (%)
1	Age	15-24	10	30.3
		25-34	10	30.3
		35-44	8	24.2
		45-54	2	6.1
		55+	3	9.1
		Total	33	100.0
2	Sex	Male	16	48.5
		Female	17	51.5
		Total	33	100.0
3	Marital status	Single	17	51.5
		Married	15	45.3
		Divorced	1	3.0
		Total	33	100
4	Occupation	Employed	3	9.1
		Unemployed	13	39.4
		Self-employed	15	45.5
		House wife	2	6.1
		Total	33	100.0
5	Place of residence	Urban	16	48.5
		Rural	17	51.5
		Total	33	100.0

A total of 56 medical and surgical patients were admitted to the main MNH ICU during the data collection period; of those 14 died due to severity of illness, 9 patients (7 aged below 15

and 2 patients with severe illness) were excluded. Thirty three patients (17 women and 16 men) were interviewed. The mean age of patients' was 34.45 and standard deviation of 15.27. As shown in table (1), age distribution of respondents were (ten) 30% aged between 15 and 24, another (ten) 30.3% were age between 25 and 34, (eight) 24.2% were between 45 and 54, (two) 6.1% were aged between 35 and 54 and the remaining (three) were aged above 55. Regarding sex distribution (sixteen) 49% were males and (seventeen) 51% were females. More details are summarized in table (1).



**Figure 2** Bar graph showing age distribution of critically ill patients in Muhimbili National Hospital ICU (April to May 2013)



**Figure 3** Pie chart indicating sex distribution of critically ill patients in Muhimbili National Hospital ICU, (April to May 2013)

**Table 2** Patients reports of pathologic and Care interventions influencing their sleep at MNH ICU

Factor	(n=33)	Percent
Pain		
Pain	21	63.6
Blood pressure cuff restricting movement	13	39.4
IV lines and tubing restricting movement	13	39.4
Discomfort from endo-tracheal & naso-gastric tubes	12	36.4
Discomfort from urinary catheters	9	27.3
Cardiac monitors restricting movement	9	27.3

As described in Table 2, the most common factor which influenced sleep at MNH ICU was pain. Of the 33 study patient participants (21) 64% of study participants described pain influenced their sleep at MNH ICU. Restriction of movement from intravenous lines and tubes and blood pressure cuff also contributed (13) 39% each for sleep interruptions in MNH ICUs. Further details are summarized in table (2).

**Table 3 Environmental factors influencing patient's sleep at MNH ICU,**

Factor	(n =33)	Percent (%)
Noise		
Noise from cardiac monitor alarms	14	42.4
ICU Staff conversation	8	24.2
Noise from outside ICU	5	15.2
Noise from other nearby patient	4	12.1
Telephone conversation	4	12.1
Light		
Excessive light in ICU	7	21.2
Temperature		
Feeling cold at night	8	24.2
Feeling hot at night	6	18.2
Ventilation		
Ventilator dysynchrony	9	27.3

As shown in table (3), the environmental factors influencing sleep in the ICUs include, noise produced by cardiac monitor alarms accounted (14) 42%. Noise from staff conversations (8) 24%, excessive light at night has (7) 21%, feeling cold at night accounted (8) 24% and ventilator dysynchrony (9) 27%. More details are summarized in table (3)

**Table 4 Psycho-Social stressors influencing patient's sleep at MNH ICU,  
(April to May 2013)**

Factor	(n=33)	Percent
Stress due to medical jargon spoken	9	27.3
Stress due to death occurring in the ICU	9	27.3
Stress due to worries about family	8	24.2
Stress due to worries about work	6	18.6
Stress due to isolation of bed position	3	9.3
Worries from nurses' talking about other patients	5	15.2
Fear of ventilator machine in close proximity to bed	7	21.2
Other stressors		
Distress due to gender difference during bed baths	7	21.2
Distress due to lack of privacy	4	12.1
Not knowing nurses name	4	12.1
Need for time awareness	6	18.2
Doctors talking to nurses about patients	2	6.1
Dislike wearing hospital clothing	2	6.1
Do not see Doctors often enough	3	9.3

As shown in table 4, psycho-social factors that have contributed to sleep disruption in intensive care units in MNH ICU include, stress due to medical jargon and death occurring in the ICU accounting (9) 27% each, followed by worries about family (8) 24%, are among the main findings reported by ICU patients. Other psycho-social factors which impacted sleep in this study are summarized in table (4)



**Table 5 Physiological factors influencing patient's sleep at MNH ICU, (April to May 2013)**

Factor	(n=33)	Percent (%)
Thirst	14	42.4
Hunger	12	36.4

Table 5: Patients were interviewed to indicate all that apply among physiologic factors that influenced sleep during their stay in the ICU. As presented in table 5, (11) 42% respondents reported they experienced feeling of thirsty among physiological factors, and (12) 36% said they experienced feeling of hunger during their stay in the ICU

**Table 6 Comparison between factors influencing ICU patients sleep by sex**

	SEX	Yes	(n=8)	P value Fisher Exact Test
Pain	Male	7	14	0.025*
	Female	9	3	
Noise from alarm	Male	6	10	0.420
	Female	8	9	
Thirst	Male	3	11	0.009*
	Female	13	6	
Hunger	Male	3	9	0.046*
	Female	13	8	

\* Symbol to show significant differences between test variables

The above table shows comparison between gender and factors contributed sleep deprivation as reported by patient respondents. Pain was associated with sex at MNH main ICU, statistical findings of Fisher Exact Test showed ( $p = 0.025$ ), showing statistically significant difference between pain and gender to influence patient's sleep in ICU. Women were more affected from sleep deprivation due to pain than men. Feeling of thirsty was also associated with sex,

statistical findings of Fisher Exact Test showed ( $P = 0.009$ ), which is highly statistically significant. Therefore there is a statistical significant difference between men and women patients to suffer from sleep deprivation due to feeling of thirsty. Women experience more sleep disturbance due to feelings of thirsty compared to male patients in ICU. According to the above table feeling of hunger was associated with gender. Statistical findings of Fisher exact test showed,  $p = 0.046$  which is statistically significant Therefore there is a statistical significant difference between male and female patients to suffer from sleep deprivation due to feeling of hungry. Females experience more sleep disturbance compared to male patients, but the association was weak.

**Table 7 Care activities influencing patient's sleep at MNH ICU (April - May 2013)**

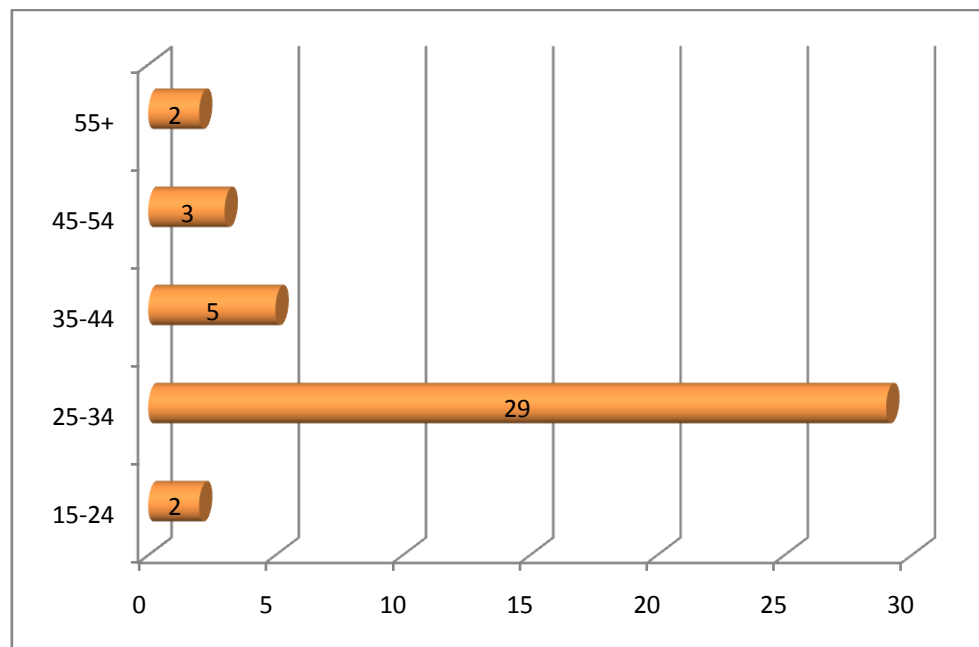
Factor	(n =33)	Percent (%)
Bedding		
Discomfort from wet bed sheets	5	15.2
Long time sleep on the same position	12	36.4
Uncomfortable ICU bed	4	12.1
Discomfort from wrinkled bed sheets	4	12.1
Care activities		
Ongoing activities in the ICU	11	33.3
Continuous intravenous fluids	8	24.2

Of the 33 ICU patient study participants, (12) 36% described prolonged stay on the same position influenced their sleep during their admission at MNH ICU, and, (eleven) 33% respondents described they perceived ongoing activities influenced ICU sleep at MNH ICUs. Other summaries are shown in table (7)

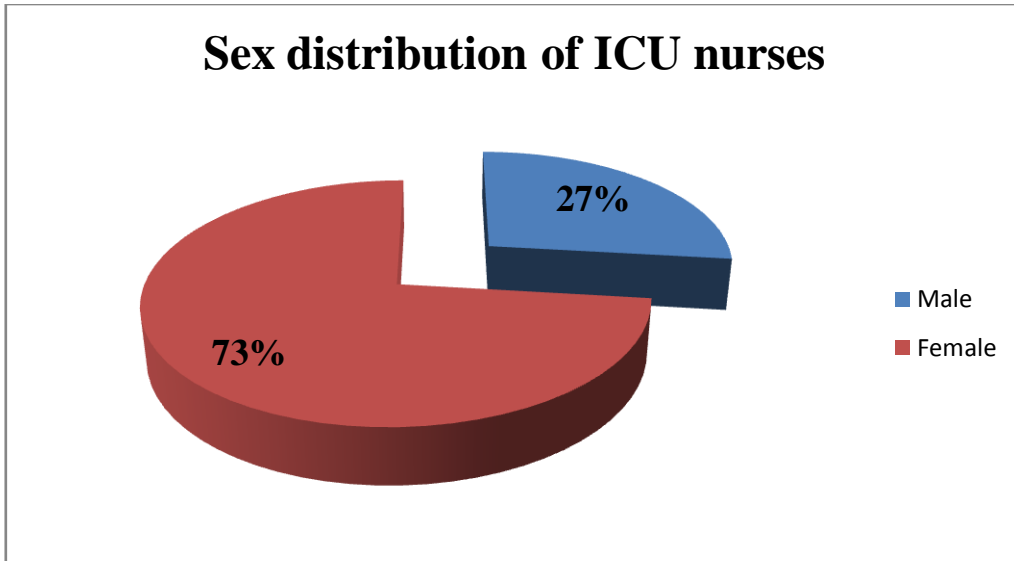
**Table 8 Distribution of demographic characteristics of ICU nurses at MNH ICUs**

S/N	Characteristics	Category	(n=41)	Percent (%)
1	Age			
		15-24	2	4.9
		25-34	34	82.9
		35-44	5	12.2
		45-54	3	7.3
		55+	2	4.9
		Total	41	100.0
2.	Sex			
		Male	11	26.8
		Female	30	73.2
		Total	41	100
3	Work experience			
		0-5	1	75.6
		5-10	3	7.3
		11-20	2	4.9
		21-34	2	4.9
		35+	3	7.3
		Total	41	100
4	Educational level			
		Certificate	6	14.6
		Diploma	25	61.0
		Bachelors	7	17.1
		Masters degree	2	4.9
		Other	1	2.4
		Total	41	100

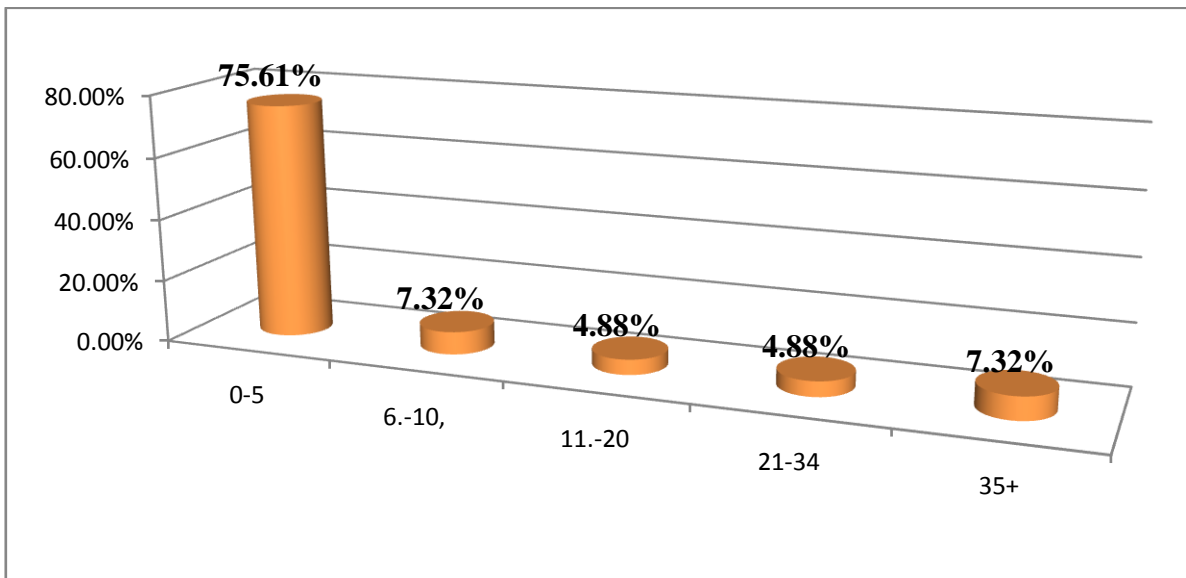
As shown in the above table, 47 (29 from the main MNH and 18 from the main ICUs), were enrolled in the structured self administered questionnaire, however only nurses from the main ICU were included in the observational study. Of all respondents, 4 nurses who participated in the pre-testing of instrument were excluded, one non response and one declined due to personal reasons. Forty one nurses (30 women and 11 men) responded for all questions properly. The mean age of respondents was 33.1 with a standard deviation of 8.74. Most (29) 71% nurses were aged between 25 and 34 years, and majority (30) 73% nurses were females. The educational level of study participants were (25) 61% have Diploma, (7) 17% Bachelors' Degree, (6) 15% have certificate, (2) 5% have Masters Degree. Further details are summarized in table (8)



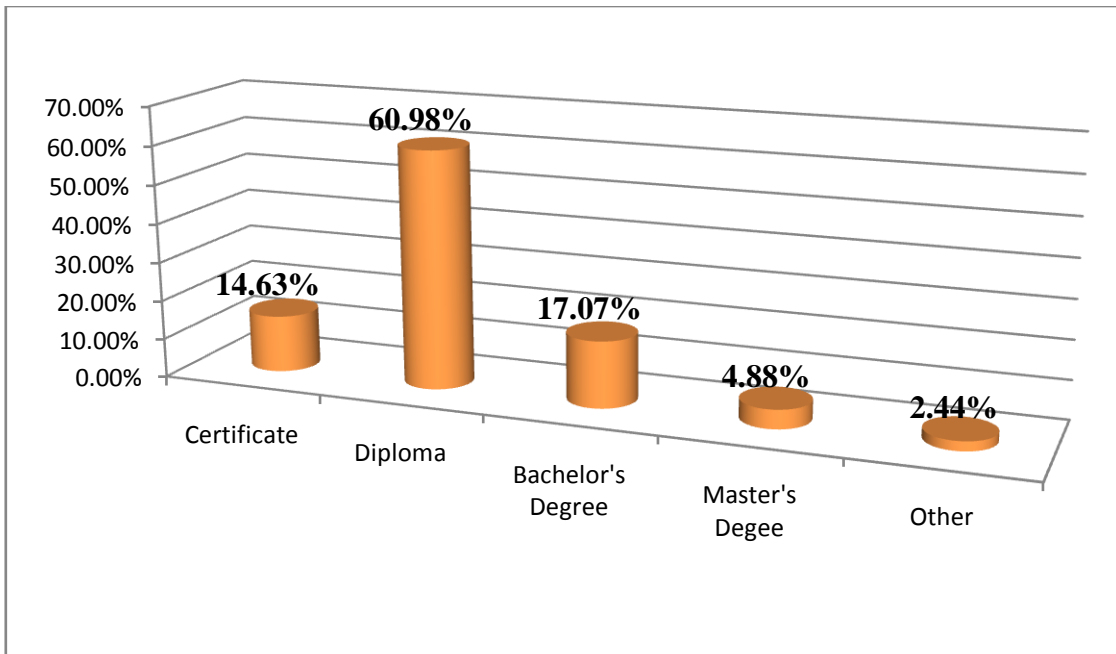
**Figure 4: Age characteristics of ICU nurses working in Muhimbili National Hospital main and open heart surgery ICUs, (April to May 2013)**



**Figure 5: Sex characteristics of ICU nurses working in Muhimbili National Hospital main and open heart surgery ICUs, (April to May 2013)**



**Figure 6 Work experience of ICU nurses working in Muhimbili National Hospital, main and open heart surgery ICUs, (April to May 2013)**



**Figure 7 Educational background of ICU nurses working in Muhimbili National Hospital, main and open heart surgery ICU, (April to May 2013)**

**Table 9 ICU nurse's perception to pathologic and care interventions influencing patient's sleep at MNH ICUs.**

Factor	(n=41)	Percent (%)
Pain		
Pain	30	73.2
Discomfort from endo-tracheal and naso-gastric tubes	28	68.3
Blood pressure cuff restricting movement	22	53.7
IV lines and tubing restricting movement	19	46.3
Discomfort from urinary catheters	16	39
Cardiac monitors restricting movement	15	36.6

As presented in table 9, higher proportions of respondents (30) 73% responded for pain as the major source of sleep disruption in critically ill ICU patient at MNH. Another (28) 68% nurses also reported, endo-tracheal and naso-gastric tubes discomfort, influenced sleep. Restriction of

movement due to blood pressure cuffs, and IV lines and tubing perceived contributed (22) 54% and (19) 46% respectively. Table (15) summarizes the remaining results.

**Table 10 ICU nurse's perception of environmental factors influencing patient's sleep at MNH ICU (April to May 2013).**

Factor	(n =41)	Percent (%)
Noise	29	70.7
Excessive light in ICU	25	61
Increased or decreased room temperature	18	43.9
Ventilator dysynchrony	15	36.6
Unpleasant smell	7	17.1

As shown in table 10, noise was perceived by nurses as the leading cause of sleep disruption among the environmental factors at MNH ICU, contributing for (29) 71%, excess unnecessary light also constituted (25) 61% and temperature changes for (18) 44%.

**Table 11 ICU nurse’s perception to psycho-Social factors influencing patients sleep at MNH ICU, (April to May 2013)**

Factor	(n=41)	Percent (%)
Stress due to medical jargons spoken	31	75.6
Stress due to death occurring in the ICU	20	48.8
Stress due to worries about family	21	51.2
Stress due to worries about work	11	26.8
Stress due to isolation of bed position	8	19.5
Other stressors		
Lack of privacy	20	48.8
Not knowing nurses name	9	22
Need for time awareness	17	41.5
Do not see Doctors often enough	8	19.5
Dislike wearing hospital clothing	7	17.1
Need use ICU telephone to call family	6	14.6

As shown in Table 11, (31) 76% respondents perceived stress due to use of medical jargon as the main challenge influencing sleep in MNH ICUs. Other psycho-social factors which include, worries from family contributed (21) 51%, , lack of privacy and death occurring in ICU (20) 49% each and need for time awareness(17) 42%, affected sleep in MNH ICUs, as perceived by nurse study participants. More details are in table (11).



**Table 12 ICU nurse's response to physiological factors influencing patient's sleep at MNHICU, (April to May 2013)**

Factor	(n=41)	Percent (%)
Hunger	22	53.7
Thirst	18	43.9

As it is shown in table 13, of 41 study participants (22) 54% described that feeling of hungry and (18) 44% feeling said thirst led patients to loss of sleep at MNH ICU.

**Table 13 ICU nurse's perception to environmental factors influencing patient's sleep at MNH ICU (April to May 2013)**

Factor	(n=41)	Percent (%)
Bedding		
Uncomfortable ICU bed	9	22
Care activities		
Ongoing activities in the ICU	15	36.6

As indicated in table 13, of the 41 ICU nurses respondents, (9) 22% reported that they perceived uncomfortable ICU bed and (15) 36.6% ongoing activities influenced patient's sleep in ICU.

**Table 14 Comparison between nurses' educational level and their perception for ongoing activities influencing ICU sleep April to May 2013,**

		Nurse's educational level					
		Certificate	Diploma	Bachelors	Masters	Others	Total
Ongoing activities	Yes	2	4	6	2	1	15
	No	4	21	1	0	0	26
Total		6	25	7	2	1	41

\*Chi-Square Test ( $X^2$ )<sub>3</sub> = 17.076, (P, 0.002)

Table (14) Comparison between nurse's educational level and their perception to ongoing activities influencing ICU sleep showed high statistical significant differences between nurses level of education and their response to the impact of ongoing activities on sleep in ICU, ( $X^2$ )= 17.076 df 3, 17.076, P = 0.002. Nurses with academic levels of Masters and Bachelors better understood that ongoing activities disrupt ICU patients' sleep than nurses with lower level of education.

**Table 15 Comparison of patient experience versus nurses perception for factors influencing patient's sleep at MNH main ICU**

Factors	Patient's experience (n=33)		Nurse's perception((n=41)		( $\chi^2$ )	p- value
Pain	Yes	21 (64)	Yes	30 (73.2)	0.74	0.45
	No	12	No	11		
B/P cuff restricting movement	Yes	13 (39.4)	Yes	22 (53.7)	1.48	> 0.23
	No	20	No	19		
IV line and tubes restricting movement	Yes	13 (39.3)	Yes	19 (46.3)	0.38	0.639
	No	20	No	22		
Discomfort from ETT and NGT	Yes	12 (36.4)	Yes	28 (68.3)	3.41	0.01
	No	21	No	13		
Noise	Yes	14 (42.4)	Yes	30 (73.2)	7.11	0.01*
	No	19	No	11		
Stress due to medical jargons use in ICU	Yes	9 (27.3)	Yes	31 (75.6)	17	0.000*
	No	24	No	10		
Stress due to death occurring in ICU	Yes	9 (27.3)	Yes	20 (48.8)	3.51	> 0.09
	No	24	No	21		
Stress due to worries about family	Yes	8 (24.2)	Yes	21(52.2)	5.52	0.03*
	No	25	No	20		
Hunger	Yes	12 (36.4)	Yes	22 (53.7)	2.2	0.138
	No	21	No	19		
Thirst	Yes	14 (42.4)	Yes	18 (44)	0.02	0.89
	No	19	No	23		
Ongoing activities	Yes	11 (33.3)	Yes	15 (36.6)	0.085	0.81
	No	22	No	26		

\* Significant differences

Patient's experience of factors influencing sleep in ICU was compared with nurses' perception impacting patient's sleep in ICU. Significant difference in responses of the two groups was observed for noise ( $\chi^2(1) = 7.11$ ,  $p=0.01$ , stress due to medical jargon use in ICU ( $\chi^2(1) = 17$ ,  $p < 0.001$  and stress due to worries about family ( $\chi^2(1) = 5.52$ ,  $p = 0.03$ , as they are perceived or experienced by nurses and patients (table 17). Both groups agreed that the listed factors affected sleep in ICU patients, but they differed in validating the factors. More nurses perceived noise, stress due to medical jargons use in ICU and stress due to worries about family as factors influencing sleep than do patients,

**Table 16 Strategies used by ICU nurses to reduce care and treatment factors affecting patient's sleep at MNH ICUs, (April to May 2013)**

Strategies used by ICU nurses	(n=41)	Percent (%)
<b>Pain management strategies in ICU</b>		
Analgesics is given on pt's demand	20	48.8
Analgesics is given routinely in ICU	18	43.9
Analgesics is given before procedures	3	7.3
Strategies used to reduce sleep interruption.		
Reduction of all types of stimuli	22	53.7
Cluster procedures to specific time	19	46.3
Smoothing bed sheets and comforting patient	15	36.6
Strategies to improve restriction of movement		
Move IV lines and tubes to a comfortable position	31	75.6
Sedation	19	46.3

Table 16 shows ICU nurses responses for pain management in ICU, (20) 49% responded they administer analgesics on patient's demand and (18) 44% said they administer analgesics routinely Sleep promoting strategies used by ICU nurses to reduce sleep interruptions related to care and treatment factors, (22) 54% said they reduce all kinds of stimuli, (19) 46% they cluster procedures to specific time, and (15) 37% use comfort measures such as stretching and

smoothing bed sheets, to reduce restriction of movement, (31) 75% reported they move IV lines and tubes to a comfortable position.

**Table 17 Strategies used by ICU nurses to reduce environmental factors affecting sleep in ICU patients, (April to May 2013)**

Strategies used for reduction of environmental factors affecting sleep	(n=41)	Percent (%)
<b>Noise</b>		
Reduce alarm and telephone conversation tone	38	92.7
Administer sedatives	5	12.2
Use ear plugs on patient's ear	1	2.4
<b>Light</b>		
Give sedatives	20	48.8
Adjust light from source (dim lighting)	17	41.5
Use windows curtain to reduce source of light	7	17.1
Use eye cover masks	1	2.4
<b>Temperature control</b>		
Use AC adjustment and heater as weather changes	26	63.4
Increase /reduce clothing patient temperature changes	21	51.2
Shut door and windows	1	2.4

As shows in the above table, ICU nurses described they used strategies to control environmental factors influencing sleep in intensive care units. Among the strategies, (38) 93% reported they reduce monitor alarm tone and telephone conversation (5) 12% used administration of sedatives to control sleep interruptions due to noise levels.

Sedation was also reported by (20) 49% respondents as a strategy used by nurses to reduce sleep interruption related to unnecessary light and another (17) 42% reported they adjust light source (dim light). Strategies used to control temperature changes as described by the nurses,

(26) 63% used air conditioner or heater according to temperature change, (21) 51% reported they use increasing or reducing cloths.

**Table 18 Strategies used by ICU nurses to reduce psycho-social factors affecting patient's sleep in ICU, (April to May 2013)**

Strategies used by ICU nurses	(n=41)	Percent (%)
<b>Strategies used to reduce stress</b>		
Give emotional and psychological support	37	90.2
Discuss patient's progress to reduce stress	15	36.6
Nurses intervene to solve psycho-social problems	11	26.8
Allow patient to call family and discuss personal issues	5	12.2
<b>Death handling in the ICU</b>		
Death care is given in the same room & covered with screen until moved to mortuary	38	92.7
Moved dead body immediately to another room for care	3	7.3
<b>Need to know nurse's name</b>		
Nurse introduces self during admission	32	78
Patients can read badge to call the nurse	9	22
<b>Patient need for time awareness</b>		
Nurses respond to patients' questions	20	48.8
Patients can read time from the wall clock	21	52.2

As shown in table 18, nurses were asked what strategy they use to help patients cope with stress and most (37) 91% reported they provide emotional and psychological support and (15) 37% nurses discuss with patients about patient progress. To address patients need to know nurse's name, (32) 78% said they introduce themselves during admission and the remaining reported that patients can read from badge.

Concerning death handling in ICU, (38) 93% participants said death care is given in the same room and waits until moved to mortuary. Table (18) summarizes the rest results.

**Table 19 Strategies used by ICU nurses to reduce physiological factors affecting patient's sleep in ICU, (April to May 2013)**

Strategies used by ICU nurses	(n=41)	Percent (%)
Feed patient as prescribed	26	63.4
Feeding requirement is based on patient's demand	15	36.6
Fluid requirement addressed based on prescription	19	46.3
Fluid requirement addressed based on patient's demand	1	2.4
Fluid requirement addressed based on fluid assessment	21	51.2

Table 19 Nurses were asked about how they address nutritional requirements of ICU patients and (26) 63% responded they feed patients based on prescription and the remaining said they feed based on patient's demand. Of those 41 respondents, (26) 63% also reported they address fluid needs of patients as prescribed, and (15) 37% said they address based on patient's demand.

**Table 20 Observation results for list of available resources necessary for sleep promoting practice in ICU, (April to May 2013)**

S/N	List of available resources	Yes	No
1	Ear plug		✓
2	Player (music)		✓
3	Water flow sound		✓
4	Adjustable light source		✓
5	Eye masks		✓
6	Window curtain	✓	
7	Air conditioner	✓	
8	Blanket	✓	
9	Bed sheets	✓	
10	Warming device		✓
11	Feeding utensils	✓	
12	Glass for water	✓	
13	Spoon	✓	
14	Recommended pain medication	✓	
15	Recommended sedatives	✓	
16	Recommended anti-pyretic	✓	
17	Bathing equipment	✓	
18	Pneumatic compression massage device		✓
19	Lotion	✓	
20	Wall clock	✓	
21	Family visits	✓	
22	Doctors visits	✓	
23	Screen/shutters /curtains	✓	
24	Wide space between patients		✓
25	Window One per patient	✓	



Table 20 shows the available and missing supplies which can be used for sleep promoting strategies in ICU. Among the listed items needed, ear plugs, sound device or player, eye covering mask, adjustable light, warming device, pneumatic compression device were unavailable or missing in the main ICU during the count. MNH ICU have adequate number of windows, at least one per patient, but none of them were seen open during the whole observation process. Observation for space between patient beds showed narrow space (Results summarized in table (21)).

**Table 21 Observational results from main ICU nurses for actual practice to promote patient's sleep in MNH ICU.**

Strategies used by ICU nurses	(n=8)	Percent (%)
Environmental		
Use air conditioner to control room	8	100
Temperature		
Reduce cardiac monitor and ventilator alarms	7	87.5
Apply curtain to reduce excessive light through window	7	87.5
Increase or reduce clothing according to weather condition	7	87.5
Takes care of equipment drop during procedures	6	75
Give warm sponge bath	5	62.5
Controls own voice during telephone conversation	3	37.5
Controls own voice during staff conversation	1	12.5
Physiological		
Feeds patient timely	8	100
Addresses fluid needs	4	50
Psycho-social		
Allows family visits	8	100
Uses screen to maintain privacy	5	62.5
Uses similar sex option during bathing	2	25
Move dead body sooner (n=3)	1/3	33.3
Care and treatment		
Doctors visit patient often enough	8	100
Administer analgesics	7	87.5
Give anti pyretic drugs to reduce fever	6	75
Administers sedatives	6	75
Uses manual massaging to enhance sleep	3	37.5

Table 21 shows results from observation of (n=8) ICU nurses during the three shifts, morning, afternoon and night. According to the, observed results all were using air conditioner, feed patient timely according to ICU schedule, allowed family visits as per schedule and all observations showed visit by doctors. Among (8) nurses observed (7) reduced cardiac monitor alarms, similar (7) used curtain to cover the window to reduce excess light, and another (7) increased or reduced clothing according to temperature changes. To address pain related sleep interruptions, (7) among (8) observed administering analgesic drugs, in which all patients were mechanically ventilated patients. Further details are in Table 21.

**Table 22 Comparison between nurses observed practice and their self-perceived response to strategies promoting patients sleep at MNH ICU.**

Strategies used by ICU nurses	Response	Nurses Observed	Nurses Self-perceived	P value
	Yes	7	18	
Administer analgesics routinely	No	1	23	0.027*
Reduce cardiac monitor and ventilator alarms	Yes	7	38	
	No	1	3	0.522
Apply curtain to reduce excessive light through window	Yes	7	7	
	No	1	34	0.00027*
Increase or reduce clothing according to weather condition	Yes	7	21	
	No	1	20	0.062
Move dead body to another room sooner (n=3)	Yes	1	3	
	No	2	38	0.254
Feeds patient timely as prescribed	Yes	8	26	
	No	0	15	0.040*
Addresses fluid needs as prescribed	Yes	4	19	
	No	4	22	0.575

As shown in the above table comparison between nurses' practice and perceived nurses response showed variation in routine administration analgesic administration ( $\chi^2 = 5.091$ ,  $df = 1$ ,  $p=0.027$ ). Observed nurses significantly differ in the routine administration of analgesia compared nurses responses. Statistical tests comparing use of curtain as a reduction strategy for excessive light through window also showed a high statistical significance difference between observed practice and nurses perceived response, ( $\chi^2 = 16.269$ ,  $df = 1$ ,  $p = 0.00027$ ). Moreover, timely feeding of patients as prescribed also showed significant difference between observed practice by nurses and their perceived response, ( $\chi^2 = 4.218$ ,  $df= 1$ ,  $p = 0.040$ ).

## 6. Discussion.

The aim of the study was to determine the environmental, physiological, psycho-social, and care and treatment factors that influence sleep in ICU, sleep-promoting interventions that ICU nurses believe they provide, and to assess availability and utilization of resource used for sleep promoting strategies. Numerous sleep influencing factors were described, by respondents as listed in the results section. However, most prevalent factors and strategies mentioned by majority of the respondents will be mentioned in the discussion. The four most common factors included, pain, noise, thirst and nursing care activities were identified as contributing to sleep deprivation of critically ill patients in ICU. The findings are discussed logically in their respective categories according to the modified and adapted Nightingale's environmental model (Nightingale, 1860; Kamdar et al., 2011). The conceptual framework used in this study was useful for providing insight to understand the sources of the research problem, possible solutions to the problem, hypotheses to be tested and to identify relevant variables for analysis.

### 6.1 Pain

Pain is very common symptom in critically ill patients, contributes to awakenings during sleep (Kamdar et al., 2011). At MNH, 64% of patient respondents reported pain influenced sleep in ICU. In a patient survey assessing sleep quality in ICU, Little et al. (2012), found 40% pain contribution to sleep deprivation. Another South African study, by (Ehlers, Watson, & Moleki, 2013) also reported 91.2% contribution of pain to sleep deprivation. There was a wide range of variation among the three studies; this variation may be due to differences in pain threshold, patient tolerance, or differences in pain management protocols between the facilities. Pain significantly differs among both sexes. Female patients suffered more sleep deprivation due to pain compared to male patients in MNH ICU, Fisher's Exact Test ( $P = 0.025$ ), which is less than the significance level 0.05. However, pain showed no significant difference between age groups,  $X^2(3) = 3.507$ , ( $P > 0.05$ ). Explanations for females to suffer more pain than men may be, (1) estrogen fluctuations modulate some types of pain, (2)

differences in brain function can influence sensitivity because it was shown thalamic and cortical involvement in the detection and interpretation of nociceptive stimuli, (3) gender differences in pain sensitivity as a function of their genetics have been also demonstrated (Castro-Sánchez et al., 2012).

## **6.2 Noise**

Noise is the second leading cause of sleep deprivation at MNH ICU. In this study 42%, of ICU patients described noise arising from monitor alarms led them to poorer sleep. Loud staff conversation was also described by 24% of the study participants. Noise influences ICU sleep both men and women. There was no significant difference between men and women on statistical tests for noise versus gender. Fisher's Exact Test ( $P, > 0.05$ ). Little et al. (2012), reported 42%, contribution of noise and loud conversation 33%. In another interventional study using polysomnographic recordings, Kamdar et al. (2011), reported 17% to 24% awakenings attributing to environmental noise. Findings of the current study showed similarity with the study by Little et al. (2012), but findings of the third interventional study by Kamdar et al. (2011), varied. These differences amongst the studies could be due to differences in the methodology used, physical location of the ICU in proximity to noise sources, number of patients in the same room, differences in utilization of advanced technologies and quality of nursing care practice.

## **6.3 Light**

At MNH 21% patients admitted to the ICU during the study period, described excessive light limited their sleep. Patients cared for in the ICU are frequently exposed to light 24 hrs/day (Friese, 2008). Such continued exposure to light can disrupt the patient's naturally occurring circadian rhythm. According to Friese (2008), melatonin secretion is increased during periods of darkness; however, an immediate drop in melatonin secretion occurs when the retina is exposed to light. A drop in melatonin hormone level in the body affects the sleep wake cycle.

In another study Little et al. (2012), reported contribution of light to be 40%. Findings of the two studies showed difference may be due to individual differences or the intensity of excess light used in the facilities.

#### **6.4 Stress**

The ICU environment is perceived as a stressful place ( Pérez et al., 1996); loss of sleep increases an individual's risk of infection and conversely, that sleep is vital for recovery from illness (Friese, 2008). At MNH 27% of patients stated stress resulting from use of medical jargons spoken and deaths occurring within the ICU led patients to poor sleep. Another 24% participants also described that, worries about family and work, and 18% reported time disorientation impacted sleep in MNH ICU. Little et al (2012) reported 29% poor sleep due to stress related to time disorientation. Prolonged sleep deprivation produced a catabolic state, opportunistic infection, and death in ICU from septicemia within 27 days (Kamdar et al., 2011). Emotional support and coping strategies to patients with critical illness and their families may help to improve sleep in MNH ICUs.

#### **6.5 Thirst and Hunger**

Feeling of thirst is a common symptom exhibited in the critically ill patients with severe illness. At MNH 42% patients described that feeling of thirst led to loss of sleep in ICU. Sensation of thirst is a frequent symptom in terminally ill patients and is associated with dehydration, hyperosmolality, poor general conditions, stomatitis, oral breathing, and opioids (Morita et al., 2001). Oxygen can be very drying to the nasal passage if not humidified (Honkus, 2003). Li & Puntillo (2006), reported approximately 40% of the ICU patients experienced severe thirst, which showed similarity with the current study. In the South Africa, Watson (2008) also reported 79% patients suffering from thirst. Variations between studies may be due to difference in severity of illness and/or patient's diagnosis. Feeling of thirst showed high statistical significance between sexes, Fisher's Exact Test ( $p < 0.01$ ), Feeling of

thirst influences sleep in both men and women at MNH ICU, however, the severity of the problem varies among male and female patients. Women patients suffer more sleep deprivation due to feeling of thirst than men. There was no well established explanation found during literature review for women to suffer more than men due to thirst. However this may be the effect of small sample size. Therefore, provision of adequate fluid replacement and optimal hydration of both men and women with critical illness could help improve sleep of the patients. Feeling of hungry was also described as a challenge influencing patient's sleep in ICU. 36% respondents reported they experienced feelings of hunger led patients to poor sleep in MNH.

## **6.6 Bed and bedding**

At MNH 36% ICU patient study participants described they suffered from position discomforts This was consistent with the study by Little et al. (2012), 35% poor sleep quality and quantity related to position discomfort and the contribution of discomfort from wrinkled and wet beds were describe by 27% of the study participants. At MNH 36% ICU patients described they suffered from position discomforts and 27% due to continuous intravenous fluids. Little et al. (2012), also found 35% poor sleep quality and quantity related to position discomfort and 33% for intravenous catheter. Findings from both studies showed similarity of their results.

## **6.7 Care activities**

Ongoing activities including, wound care, bathing, blood sample drawing, suctioning, positioning and other activities are among the routine procedures carried out in ICU. At MNH, 33% study participants described ongoing activities impacted sleep during their admission to the main MNH ICU. Le et al. (2012), evaluated sleep disruption in different specialty ICUs involving, medical, surgical, cardiothoracic, and pediatric ICUs and. sleep disturbances related to care intervention among these were, 40.0% in medical ICU, 27.8% surgical ICU and 29.3%



in cardiothoracic ICU. The findings are more or less similar with the current study. Continuity of intravenous fluid was also reported by 24% respondents as a cause of sleep deprivation.

## **6.8 Nursing strategies promoting sleep in the ICUs**

A total of 41 nurses from both the Main MNH and open heart surgery ICUs participants with mean and standard deviation  $33.1 \pm 8.7$  were enrolled in the study. The main findings were nurses believed stress as the major factor, followed by pain; noise and light, as contributors for sleep deprivation in MNH ICUs.

### **6.8.1 Pain**

Pain has been linked to the inability to sleep (Honkus, 2003). Patients in critical care units may have pain for a variety of medical and surgical reasons, and these patients are often subjected to medical procedures that are painful as well. According to the respondents' 73% described they perceived pain among the factors leading to sleep deprivation at MNH ICUs. Comparison between nurses' observed practice and nurses' response to the strategies they believe they do showed variation in routine analgesic administration ( $\chi^2 = 5.091$ ,  $df = 1$ ,  $p=0.027$ ). Observed nurses performed better compared to nurse's responses for routine administration of analgesia. Other care interventions such as, restriction of movement due to blood pressure cuffs were mentioned by 68%, intravenous lines and tubes 54% and restriction of movement due to cardiac monitor lines, ongoing activities and ventilator dysynchrony 37% each. Some care and treatment factors that possibly affect sleep were cited by fewer nurses. The reduction in response to these factors may be related with lack of awareness for impacting sleep, may be due to differences among nurse's educational level. Nurses with different educational level significantly differ in their response for contribution of ongoing activities to influence sleep in ICU. Nurses with higher educational level showed better understanding compared to nurses with low educational level, ( $X^2 (4) = 17.076$ ,  $p$  value, 0.002), but nurse's educational level verses nurse's practice to cluster procedures, showed no statistical significance, ( $X^2 (4) =$

3.650,  $P > 0.05$ ). It is important that nurses need to be aware of problems associated with sleep deprivation and to prioritize among activities. Minimizing sleep interruptions, rescheduled nighttime routine patient care activities, such as chest radiography, bedding changes, bathing, medication delivery, clustering of care has been recommended (Friese, 2008).

### **6.8.2 Noise**

Several studies have examined the role of noise and light, for sleep disruption. According to Honkus (2003), sound levels of 35 db have been found to disrupt from sleep. Noise was reported to be prioritized disrupting nighttime sleep and less so for daytime sleep (Eliassen & Hopstock, 2011). Preventing conversations from being held near the patient's bedside was reported to be highly prioritized during both night- and daytime. At MNH, 71% nurse respondents' perceived noise as one of the most contributing factor for sleep deprivation in critically ill ICU patients. Though there were an efforts of noise reduction by nurses, alarm noise seemed still loud and more magnified during the late evening and night time, but this need to be supported by other interventional studies which involve measurement of sound levels in ICU. A statistical test comparing between nurses response about their perception and patients response for their experience on noise to influence patient's sleep in ICU showed high significant difference, ( $p = 0.01$ ). Nurses perceived noise influence sleep in ICU more than patients witnessed they experienced. However, even if nurses perceived noise as a major factor impacting ICU patients' sleep, staff and telephone conversation was high during ICU observation of practice. The strategies used to promote sleep as reported by the ICU nurses include, reduction of noise levels from monitor alarms, and telephone and staff conversations. During the observation most ICU nurses' were exhibit reducing monitor and ventilator alarms.

### 6.8.3 Light:

Of the 41 study participants 61% respondents described light to have an impact on sleep in ICU. The respondents believed excessive light negatively affect sleep in ICU. Lighting has been identified as a factor preventing sleep (Honkus, 2003). Bright lights from the nurses' station, lights that are not dimmed, and lights that are turned on at night are all very disrupting to patients' sleep. ICU nurses described they reduce unnecessary light by adjusting light (dim light), but during ICU observation there were no adjustable light in the ICU that nurses can adjust to reduce or increase light levels as needed. Few nurses also said they close window curtains as light reduction strategy.

### 3.8.4 Temperature

Contributions of increased or reduced room temperature limiting sleep in critically ill patients were reported by 44% of the respondents. Strategies used to control temperature according to ICU nurses; most described they used air conditioner and heater adjustment with changes in temperature. ICU observation also revealed all nurses used air conditioner; seven among eight observed used strategies of increasing or reduction of clothing and (5) giving warm baths. Studies suggested strategies to improve environmental causes include, creation of a sleep-promoting environment by reducing sleep-disturbing stimuli (Eliassen, 2011), noise reduction strategies involving, liberalizing monitor alarm settings, minimize staff conversations, use of earplugs, white noise, or music therapy, staff education and training will need to be an important part of instituting any integrated strategy designed to improve sleep in ICU (Friese, 2008). Significant modifications in lighting practices, reduced lighting coupled with shielding of eyes, dimmed nighttime light, and staff education on highlighting the importance of adequate rest during recovery is recommended. Statistical tests comparing the use of curtain as a reduction strategy for excessive light between observed nurses practice and their also showed a high statistical significance difference, ( $\chi^2 = 16.269$ ,  $df = 1$ ,  $p=0.00027$ ).

Observed nurses performed better than their response for use of curtain as light reduction strategy. Moreover, timely patient feeding as prescribed also showed significant difference between observed practice by nurses and their perceived response, ( $\chi^2 = 4.218$ ,  $df = 1$ ,  $p = 0.040$ ), observed practice performed well compared to their perceived response, however the level of significance was weak.

#### 6.8.4 Stress

According to ICU nurses; stress due to use of medical jargons were perceived as the major factor influencing sleep. Stress related to use of medical jargons (terminologies that is not understood by patients) was perceived by nurses leading patients to lack of sleep at MNH ICU. However, patients' rated these as the eighth cause of sleep deprivation. Comparison between nurses and patients responding for stress due to medical jargons use as a sleep limiting factor also showed high significant difference ( $p < 0.001$ ). Other stressors like, worries about family were described by 51%, lack of privacy and death occurring within ICU 49%. Nurses and patients significantly differed in their response for stress related to worries about family impacting patient's sleep in ICU, ( $p < 0.05$ ). Both the nurses and patients agreed stress due to medical jargons used in ICU and stress due to worries about family influenced sleep in ICU; however nurses assumed stress related to worries about family influenced sleep more than the patients does. Stress reduction strategies were also described by the ICU nurses, 90% reported they give emotional and psychological support, 37% discuss on patient progress and 27% said they intervene to solve psycho-social problems. During observation, among three deaths occurred in the ICU, one body were taken soon after death care given, but the remaining two stayed for longer than 3 hours within the same room in ICU . Five nurses among the eight were also observed using screen to maintain patient's privacy. According to some studies, provision of emotional support and coping strategies to conscious patients with critical illness or major trauma injuries and their families (Peris et al., 2011), and optimizing

analgesia and sedation should be routine in ICU practice, and are likely to be psychologically beneficial (Hatch, McKechnie, & Griffiths, 2011).

### **6.8.5 Thirst and Hunger**

At MNH 54% of ICU nurses reported they perceived feeling hungry and 44% feeling of thirsty leading to lack of sleep in ICU. According to the MNH ICU nurses, the strategies they believed they practice feeding and adequate hydration as prescribed. The nurses were also observed feeding their patients at fixed intervals as per ICU schedule. Adequate nutrition is critical to the survival of critically ill patients. Micronutrient supplementation is essential for immune function while providing adequate protein and caloric requirements. Percentage of protein calories should be established in an effort to minimize muscle wasting. It has been estimated that muscle loss can exceed more than 3 lbs (453.5gms) per day, and in a short two weeks critically ill patients can lose up to half of their admission total muscle mass (Cherry, 2013).

### **6.9 Limitations:**

The method used in this study was quantitative descriptive study, though qualitative study design best explores richest data from in-depth interviews; this was not possible due to language barriers to the investigator. Sampling technique was convenient as the investigator was dependent on number of admissions to the units. Sample size obtained from patients was small, due to reasons such as lack of proper functioning of the open heart surgery ICU during the study period and compromised level of consciousness in some of the patients which led to exclusion of the subjects from the study. A study with low statistical power has a reduced chance of detecting a true effect (Button et al., 2013). To maximize sample size and increase validity of the study, data collection period was extended twice from the initial allocated time period, but sample was still small.

The instruments used in this study were designed to measure sleep deprivation of ICU patients as reported by the patients themselves. Frequency of sleep interruptions and quantity of sleep time were not measured. The instrument also failed to collect data about patient's diagnoses and drugs administered to patients, and these were accepted as limitation of the measuring instrument. Though attention was given for the data collection process in order to ensure quality; language barrier was also a challenge in following the interviewer if he was consistent in the administration of the interview which may lead to information bias. Sleep in ICU can be confounded by other factors, such as medication, illness and mechanical ventilation. To reduce biases arising from mixed effects of these factors, mechanically ventilated patients were interviewed forty-eight hours after extubation and off the mechanical ventilation. Critically ill and unconscious patients were also enrolled the same way mechanically ventilated and intubated patients interviewed to ensure ethical concerns and to collect valuable information from the patients.

Patient study participants were selected from a single setting; consequently the research findings might not be generalized. Enrollment of patients after their transfer to the general ward may also have negative effects, since the information obtained from such patients can suffer from recall bias. This was reduced by narrowing the time between patients transfer of to the ward and data gathering. This time was limited to one week. Observation concerning sleep promoting practice was conducted for only eight nurses due to completion of time allocated for observation. Another limitation of data collection through observation may be Hawthorne effects, whereby nurses improve or modify an aspect of their behavior being observed which consequently change the result. To ensure such challenges efforts including delaying the observation schedule by two weeks after information given and use of structured questionnaire was made.

The outcomes of all limitations discussed in this section, may lead to draw-backs in making meaningful conclusions beyond the context, but this study may be used as a base for next studies involving larger sample size.

## **6.10 Conclusion**

The intensive care unit is a stressful environment influencing sleep for the critically ill due to several factors. Severity of illness, together with changes in the environment influences sleep in ICU patients, consequently affecting the recovery process. Contributing factors for sleep deprivation in the ICU include, care and treatment routines, environmental sources, physiological and psycho-social factors. Pain followed by noise, feeling of thirst and nursing care activities are among the major factors influenced sleep in the ICU in the study context. Limited resources necessary for sleep used to improve strategies and poor understanding of nurses concerning the impact of nursing care activities and their effect on sleep, affected quality of care in ICU.

Feeling of thirst influences sleep in both men and women at MNH ICU, but the severity of the problem varies among male and female patients. Women patients suffer more sleep deprivation due to pain and feeling of thirst than men. Therefore, provision of adequate fluid replacement and hydration of both men and women with critical illness may be important to improve patient's sleep. Both patients and nurses agreed noise and stress related to medical jargons used (terminologies that are not understood by the patients) and worries about family influenced sleep in ICU patients; but nurses assumed pain and stresses influencing sleep more than patients. Strategies that can improve care and treatment, environmental, physiological and psycho-social factors involves, adequate pain management, controlling ICU noise levels, use of appropriate lighting practices and pharmacologic interventions, providing adequate uninterrupted time for sleep and physiologic support.

### **6.11 Clinical implications/recommendations**

Sleep in critically ill patients can be improved by manipulating the modifiable factors such as, rationalized use of pharmacologic agents, improvised environment and minimized arousals due to procedures could help promote sleep.

Sleep deprivation can be reduced by employing the following measures:

- Optimal use of pharmacological agents such as analgesics and sedatives.
- Noise reduction strategies, including minimizing monitor and ventilator alarms, reducing staff and telephone conversations and instrument drop.
- Provision of adequate and uninterrupted time for sleep by implementing cluster procedures.

#### **Implications for nurse practice/education**

- The role of sleep in the recovery of critically ill patients and impacts of sleep disruptions needs to be incorporated into the nursing education.

#### **Implications for research**

- Intervention studies involving, larger sample size may be needed to establish pattern and quality and quantity of sleep in critically ill patients.



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## Appendix- A

### Questionnaire I

This questionnaire is designed to identify the factors contributing to sleep deprivation in intensive care unit (ICU), and these will be used as an input to improve client's sleep promoting strategies to enhance sleep in the intensive care unit. The data will be collected from clients admitted to the unit after their transfer to the ward and/or discharged during the data collection period. Informants are not required to write their names.

### I - Socio-demographic data

1. Date of birth \_\_\_\_\_
2. Sex  Male  Female
3. Occupation  Employed  Unemployed  Self-employed  
 House wife
4. Marital status  Single  Married  Widowed  
 Divorced other specify \_\_\_\_\_
5. Place of residence  Urban  Rural/village
6. Length of stay in ICU  1 -3 days  6 days,  
  $\geq 7d$
7. Mode of admission  Emergency  Referral  
 Transfer from wards
8. Level of consciousness at admission  Alert  Drowsy  
 Unconscious

### II. Possibly sleep affecting factors in ICU

1. Did you have inadequate sleep during your stay in the intensive care unit?  
 Yes  No
2. If your answer is "YES", how often?  
 Always  Sometimes  Rarely

3. If your answer is "YES" what was the cause for not sleeping?

**Environmental factors:**

- A. Noise caused by alarms
- B. Noise from outside of ICU
- C. Inadequate sleep due to light
- D. Noises from other patients
- E. Feeling hot at night
- F. Feeling cold at night
- G. ICU Nurses/doctors used cell phones
- H. Conversations between nurses at night

**Physiological factors:**

- A. Feelings of Thirst
- B. Feelings of Hunger
- C. Smoking urge/ smokers
- D. Patient's need for time orientation /day and night awareness

**Psycho-social factors:**

- A. Not knowing nurses names
- B. Stress, due to medical jargon spoken by health care workers,
- C. Dislike wearing hospital clothes
- D. Lack of privacy
- E. Worries about family
- F. Worries about work
- G. Worries from Nurses' talks about other patients
- H. Worries about visitors' travels
- I. Deaths occurring in the ICU
- J. Do not see the doctor often enough
- K. Doctors who talk to nurses about patients
- L. Bed bath male nurses to female and/or female to male patients
- M. Isolation due to bed position

**Care and treatment factors:**

- |   |                          |
|---|--------------------------|
| A. Pain   | <input type="checkbox"/> |
| B. Blood pressure cuff-restricts movement               | <input type="checkbox"/> |
| C. Monitors- restricting movement                       | <input type="checkbox"/> |
| D. Lines and tubes restricting movement                 | <input type="checkbox"/> |
| E. Ongoing activities in ICU                            | <input type="checkbox"/> |
| F. Urinary catheters cause discomfort                   | <input type="checkbox"/> |
| G. Uncomfortable ICU bed                                | <input type="checkbox"/> |
| H. Wrinkled bed sheets cause discomfort                 | <input type="checkbox"/> |
| I. Wet bed sheets cause discomfort                      | <input type="checkbox"/> |
| J. Sleep in same position for longer periods            | <input type="checkbox"/> |
| K. Fear of ventilators in close proximity to beds       | <input type="checkbox"/> |
| L. Ventilators dysynchrony                              | <input type="checkbox"/> |
| M. Discomfort from Endo-tracheal and naso-gastric tubes | <input type="checkbox"/> |
| N. Continuous intravenous fluids                        | <input type="checkbox"/> |
| O. Others specify _____                                 |                          |

4. Is there anything else you would like us to

know? \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_



## Appendix- B

### DODOSO LA MASWALI YA UTAFITI

Hii dodoso imeandaliwa kwa ajili ya kuchunguza visababishi vya kukosa usingizi kwa wagonjwa waliolazwa wadi ya wagonjwa mahututi

Uchunguzi huu utatumika kutatua matatizo ya ukosefu wa usingizi miongozi mwa wagonjwa wanaolazwa chumba cha wagonjwa mahututi. Uchunguzi huu utasaidia kuimarisha usingizi na mapumziko kwa wagonjwa waliolazwa wodi ya wagonjwa mahututi

Taarifa zitakusanywa kutoka kwa wagonjwa baada ya kuhamishwa kutoka chumba cha wagonjwa mahututi kwenda katika wodi walizotoka awali au wana porushusiwa kurudi nyaubani baeada ya matibabu watahiniwa hawatataja majina yao

#### 1. TAARIFA BINAFSI

1. Tarehe ya kuzaliwa) \_\_\_\_\_

2. JINSIA  Mwanamume  Mwanamke

3.Kazi yako  Muajiriwa  Sina kazi  Umejiajili  
 Mama wa nyumb

4. Hali ya ndoa

Umeolewa/Uameoa  Hujaolewa/hujaoa

Mjane  Umeachika

Ninaishi namwanamke/mwanamke

5. Mahali unapoishi  Mjini  Kijijini

6. Muda uliokaa chumba cha wagonjwa mahututi

Siku 1 -3  Siku 4 -6

Siku 7 au zaidi

7. Ulilazwa kama mgonjwa wa  Dharula  Rufaa

Umehamishwa toka wodi nyingine

8. kiwango cha kujitambua wakati wa kulazwa

- Nilikuwa najitambua       kizunguzungu  
 Kuzimia       Sikuwa najitambua

**II. Sababu zinazoweza kusababisha Ukosefu wa Usingizi :**

1. Je, ulipata tatizo la kukosa usingizi wakati umelazwa chumba cha wagonjwa mahututi?  
 Ndiyo       Hapana
2. Kama ndiyo, ukosefu wa usingizi uko:  
 Mara zote       Sio mara zote       Mara chache
3. Kama jibu lako ni ndiyo, Nini ilikuwa sababu ya kukosa usingizi?

**SABABU ZINAZOLETWA NA MAZINGIRA:**

- |   |                          |
|---|--------------------------|
| A. kengele zinazotolewa na mashine zilizopo wodini    | <input type="checkbox"/> |
| B. kelele kutoka nje ya chumba cha wagonjwa mahututi, | <input type="checkbox"/> |
| C. mwanga mkali kwenye chumba cha wagonjwa mahututi   | <input type="checkbox"/> |
| D. kelele/kukoroma kutoka kwa wagonjwa, wengine       | <input type="checkbox"/> |
| E. kujisikia joto wakati wa usiku,                    | <input type="checkbox"/> |
| F. Kusikia baridi wakati wa usiku,                    | <input type="checkbox"/> |
| G. Matumizi ya simu kwa wahundumu wa afya             | <input type="checkbox"/> |
| H. Maongezi ya wahundumu wa afya kipindi cha usiku.   | <input type="checkbox"/> |

**sababu za kimwili:**

- |                                |                          |
|--------------------------------|--------------------------|
| 1. kuhisi kiu,                 | <input type="checkbox"/> |
| 2. kuhisi njaa,                | <input type="checkbox"/> |
| 3. Hitaji la kuvuta sigara,    | <input type="checkbox"/> |
| 4. kutaka kujua wakati (muda). | <input type="checkbox"/> |

**Sababu za kiakili na kijamii:**

- A. kutokujua majina ya wauguzi,
- B. wasiwasi kutokana na maneno ya kitaaluma wanayotumia waganga
- C. Kutopenda kuvaa nguo za hospitalini,
- D. Kukosa nafasi ya usiri kujisitiri,
- E. wasiwasi juu ya familia,
- F. Wasiwasi juu ya kazi
- G. Woga kuhusu kusikia mazungumzo ya wauguzi kuhusu wagonjwa wengine,
- H. vifo vinavyotokea katika chumba cha wagonjwa mahututi,
- I. kutokumuona tabibu kila wakati,
- J. Tabibu wanaoongea na wauguzi juu ya mgonjwa
- K. Kuogeshwa na muuguzi wa jinsia tofauti
- L. Kutengwa kwa sababu ya sehemu kitanda kilipo

**Sababu za kihuduma na za kimatitabu**

- A..maumivu,
- B. Mashine Iliyowekwa kwa ajili ya kupimia presha ya msukumo wa damu inazuia kujigeuza
- C. Mashine ya uchunguzi wa mapigo wa moyo, upumuaji, kiwango cha oxygen inanzuia kujigeuza
- D. Mipira ya mashine na dripu inazuia kujigeuza,
- E. shughuli zinazofanyika katika chumba cha wagonjiwa mahututi-zinanzuia ku usingizi
- F. mipira ya kukojolea inanifanya nishindwe kuvaa chupi halafu nijisikie vibaya,
- G. vitanda vilivyopo kwenye chumba cha wagonjwa vinanifanya nijisikie vibaya,
- H. Shuka iliyokunjamana inakufanya usijisikie vizuri
- I. Shuka yenye unyevunyevu inakufanya usijisikie vizuri
- J. Kulalia upande mmoja kwa muda mrefu unasababisha usijisikie vizuri
- K. Woga wa mashine ya kupumulia iliyopo karibu na kitanda,
- L. Mashine ya kupumulia Haishabihiani na kupumua

M. kujisikia vibaya kutokana na mipira ya kupumulia na kulia chakula

N. kuweka chupa (drip) za maji ya mishipa kwa mfululizo,

O. Sababu nyingine, elezea

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Kuna kitu kingine unataka sisi kujua?

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## Appendix- C

### Questionnaire II

This questionnaire is designed to assess the practice and strategies currently used by nurses working in the intensive care units **to promote sleep of critically ill patients in ICU**. Information given will help to improve the quality of care of the intensive care unit. The questionnaire is designed to collect data from nurses working the unit during the data collection period. Informants (participants) are not required to write their names.

#### I - Socio-demographic data **Put "X" mark in the box**

1. Date of birth \_\_\_\_\_
2. Sex  Male  Female
3. Year of service in ICU  0-5 yrs  6- 10yrs  11- 20 yrs  
 21-35  above 35 yrs
4. Level of education  Diploma  Bachelors  
 Masters  Certificate e) Other \_\_\_\_\_

#### II- Knowledge related questions:

1. Which of the listed factors do you think is/are responsible for sleep deprivation of patients in your intensive care unit?

##### 1. Environmental

- |   |                          |
|---|--------------------------|
| 1.1 Noise                                   | <input type="checkbox"/> |
| 1.2 Light                                   | <input type="checkbox"/> |
| 1.3 Unpleasant smell                        | <input type="checkbox"/> |
| 1.4 Increased or decreased room temperature | <input type="checkbox"/> |

##### 2. Physiological

- |                      |                          |
|----------------------|--------------------------|
| 2.1 Hunger           | <input type="checkbox"/> |
| 2.2 Thirst           | <input type="checkbox"/> |
| 2.3 Need for smoking | <input type="checkbox"/> |

2.4 Time awareness,

**3. Psycho-social factors:**

1.1 Not knowing nurses names

1.2 Stress, Medical jargon spoken by doctors

1.3 Dislike to wear hospital closings,

1.4 Lack of privacy

1.5 Worries about work

1.6 Worries about family

1.7 need of ICU phone to call family

1.8 Deaths in the ICU

1.9 Do not see the doctor often enough

1.10 Isolation due to bed position

**4. Care and treatment factors:**

4.1 Pain,

4.2 Blood pressure cuff-restricts movement

4.3 Monitors- restricting movement,

4.4 IV lines and tubes restricting movement,

4.5 . Ongoing activities in ICU,

4.6 Urinary catheters cause discomfort,

4.7 Uncomfortable ICU bed,

4.8 Ventilators dysynchrony,

4.9 Discomfort from Endo-tracheal and naso-gastric tubes

4.10 Others specify \_\_\_\_\_

**Practice related questions:**

**Make a "X" to the appropriate one's that apply:**

1. Do you think noise is a challenge to sleep deprivation of patients in ICU?

Yes

Never

I do not know

2. What strategy/ies is/are used to reduce risk of sleep disruption related to noise in your ICU?
- Reduce alarms & telephone tone
- Use ear plugs in patients ears       sedate pt
3. Is light a source of sleep disruption in your ICU?
- Yes       Never
4. What strategy do you apply to reduce risk of sleep disruption related to light?
- Close shutters       Use eye cover masks
- Give sedative       Reduce/dim light
5. Do you think room temperature change will affect sleep in critically ill patients in ICU?
- Yes       Never
6. What is the common practice in your setting to make the room temperature conducive to pts?
- Use heater &/or air conditioner according to the weather
- Reduce source or cover clothing
- Shut doors and windows and /or open to let fresh air move in the room
7. How do you address feeding needs of clients in your setting?
- Feed based on prescription       Feed on patients demand
8. How do you address thirst needs of clients in the ICU?
- Adequate pt hydration (IV)       Give water on patient's demand
- Assess tongue & lips for dryness and reduction of urine output.
9. Do you address smoking needs of clients in your ICU?
- Yes       Rarely       Never at all
10. If your response is yes, how is it addressed?
- They are allowed to smoke in the bed       Indicate to the smoking area
11. How do you address time awareness of critically ill pts?
- Respond to clients' questions       Use wall watch situated visible to them

12. How do clients in intensive care unit call you when they need your help?
- They can read from my badge       I Introduce my-self to patients at admission
13. What is/ are the strategies used to reduce client's emotional stress in the intensive care unit?
- Emotional and psychological support,  
 Discuss on progress of patient  
 Intervene to possible psychosocial issues  
 Allow patient to call family & talk in the hospital and/ or own telephone
14. Do nurses and doctors use medical terminologies/speaking English at bed side?
- Always       Sometimes       Never
15. Are patients allowed to wear their own night wear in the unit?
- Yes it is possible if patient wishes       It is not allowed
16. How is it handled when death occurs in the ICU?
- Immediately move dead body to another room for care  
 Care is given within same room and waits in place until taken to morgue
17. What is/are the protocol for pain management in your setting?
- Administer before medical procedures  
 Administer routinely as prescribed  
 Administer on demand of patient
18. What strategies do you apply to reduce frequent sleep interruptions of patients in ICU?
- Reduction of stimuli       cluster procedures to give time for sleep  
 Maintain patients comfort by smoothing bed linens      other specify \_\_\_\_\_
19. What strategies do you use to minimize restriction of movement of patients?
- Move IV stand and tubing to more comfortable position  
 Give sedatives so that patient can sleep & cannot be wake



20,. What other strategies do you use in your setting to facilitate sleep of critically ill patients?

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**Appendix- D****Observation checklist**

Availability of necessary materials, and actual nursing practice in relation to sleep promotion in ICU.

Date of observation \_\_\_\_\_ Start time \_\_\_\_\_ End time \_\_\_\_\_

Observation site \_\_\_\_\_

**I. Resource availability**

<b>Category</b>	Resources needed for sleep promoting practice in ICU	<b>yes</b>	<b>No</b>
<b>Noise</b>			
	Ear plug		
	Player (music)		
	Water flow sound		
<b>Light</b>			
	Adjustable light source		
	Eye masks		
	Window curtain		
<b>Temperature</b>			
	Air conditioner		
	Blanket		
	Bed sheets		

	Warming device		
<b>Nutrition</b>			
	Diet		
	Feeding utensils		
	Glass for water		
	Spoon		
<b>Medication</b>			
	Recommended pain medication		
	Recommended sedatives		
	Recommended anti-pyretic		
<b>Hygiene &amp; massage</b>			
	Bathing equipment		
	Pneumatic compression massage device		
	Lotion		
<b>Time orientating</b>			
	Clock		
<b>Visits</b>			
	Family		

	Doctors		
Privacy			
	Screen/shatters		
Space Between patients bed			
	Wide		
	Fair		
	Narrow		
Window			
	One per patient		
	In common		
Access of each patient to light source			

## II. Observation, Actual nursing practice

Date of observation \_\_\_\_\_ Start time \_\_\_\_\_ End time \_\_\_\_\_

Observation site \_\_\_\_\_

S/N	Intervention used by nurses , to promote sleep	Yes	No
	<b>Noise</b>		
1.	use of ear plugs to reduce noise in ICU		
2.	use of sound devise (music) in ICU,		
3.	reduce levels of noise from monitors (alarm)		
4.	control own voice during conversation in ICU		
5.	control voice during telephone conversation in ICU		
6.	taking care of equipment drop s during procedures in ICU		
	<b>Light</b>		
7	use of eye mask to reduce light in ICU,		
8	use of curtain/shatters reduce light in ICU		
9	use of dim light to reduce light in ICU		
	<b>Temperature</b>		
10	use air conditioner to control temperature in ICU		
11	increase/decrease blankets, bed sheets to control temperature		
12	use of warming device when patient feels cold in ICU		

13	use of anti-pyretic drugs to reduce temperature in ICU		
14	open windows and allow ventilation reduce warmth & aerate room		
15	give warm/sponge bath to control patients temperature in ICU		
	<b>Privacy</b>		
16	Use of screen to maintain patients' privacy.		
17	Bed bath options male nurse to male patient & vice versa, when conditions allow.		
	<b>Nutrition</b>		
18	feed patients timely to address nutritional requirements		
19	Assess & address fluid (water) needs of patient.		
20	administer pain relieving drugs to control pain		
21	administer sedatives to enhance sleep and rest		
22	use of pneumatic compression device for massaging patients		
23	use manually to massage patients		
24	allow family visits		
25	Doctors visit patients per schedule and on when necessary.		
26	move dead body from ICU, as soon as possible, when death occurs		

**Appendix- E****TRAINING MODULE FOR DATA COLLECTORS:****1. INSTRUCTION**

- Identify target subjects to be interviewed
- Procedures to be followed during interview of subjects, care of use of non leading questions
- When to interview /convenient time
- When to start data collection, and when to end

**2. METHODS OF TRAINING**

- Pass through the instrument with data collectors to point out specific instructions.
- Provide an example of a completed instrument or interview transcript for your data collectors.
- Allow data collectors to practice with the tool

**Table I**

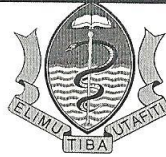
<b>Data Collection Method/Instrument</b>	<b>Data collector</b>	<b>Training needs</b>	<b>Training activities</b>
Patient interview	Nurse /research assistants	<ul style="list-style-type: none"> <li>- Interviewing techniques</li> <li>- How to follow &amp; feel the instrument</li> </ul>	<ul style="list-style-type: none"> <li>- Interview instructions,</li> <li>- how to ask questions,</li> <li>- Trainee interview practice.</li> </ul>

**Appendix- F**

# MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES

## *Directorate of Postgraduate Studies*

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Ref. No. MU/PGS/SAEC/Vol. VI/

8<sup>th</sup> April, 2013

Mr. Tigistu G. Gebretensaye  
MSc. Critical Care and Trauma,  
**MUHAS.**

**RE: APPROVAL OF ETHICAL CLEARANCE FOR A STUDY TITLED "FACTORS CONTRIBUTING TO SLEEP DEPRIVATION AND NURSING STRATEGIES TO FACILITATE SLEEP IN INTENSIVE CARE UNIT, AT MUHIMBILI NATIONAL HOSPITAL, DAR ES SALAAM, TANZANIA"**

Reference is made to the above heading.

I am pleased to inform you that, the Chairman has on behalf of the Senate approved ethical clearance for the above-mentioned study.

Thus ethical clearance is granted and you may proceed with the planned study.

Prof. O. Ngassapa  
**DIRECTOR, POSTGRADUATE STUDIES**

/emm

cc Vice Chancellor, MUHAS  
cc Deputy Vice Chancellor – ARC, MUHAS  
cc Dean, School of Nursing, MUHAS

**Appendix- G**



Consent form English version



**MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES  
DIRECTORATE OF RESEARCH AND PUBLICATIONS, MUHAS**

**CONSENT FORM**

**ID NO**

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**Consent to participate in a study: entitled “FACTORS CONTRIBUTING TO SLEEP DEPRIVATION AND NURSING STRATEGIES TO FACILITATE SLEEP IN THE INTENSIVE CARE UNIT”**

Greetings! My name is Tigistu G/yohannis, 2<sup>nd</sup> year student MSc, critical care and trauma at Muhimbili University of Health and Allied Sciences (MUHAS), working on this research project with the objective of identifying modifiable factors that contribute to sleep deprivation among critically ill patients and assess nursing strategies to enhance sleep in the intensive care unit.

**Purpose of the study:**

The study will involve patients admitted to intensive care unit and spent longer than two days in ICU, and nurses working in the intensive care unit. Conducting the study will enable to identify what factors contribute to sleep deprivation of patients admitted to the intensive care units and assess what strategies are designed by nurses to enhance sleep of patients in ICU.

**Participation in this study:**

The study will involve two groups of participants, patients and nurses. If you agree to participate in the study patient participants will be required to answer interview questions, attended by research assistant and nurses will be required to respond for self administered questions.

**Confidentiality:**

All information collected during this study will be kept strictly confidential and will not be revealed to anybody outside the research team.

**Risks:**

We do not expect that any harm will happen to you because of joining this study. Sometimes you may feel tired/exhausted, due to the nature of the illness, but you will be able to stop the interview temporarily or decline at any time if you feel too uncomfortable.

**Rights to withdraw and alternatives**

Taking part in this study is completely your choice. If you choose not to participate in the study, or if you decide to stop participating in the study you will continue to receive all services that you would normally get from ICU. You can stop participating in this study at any time even if you have already given your consent.

**Benefits:**

There will be no direct benefit to you from participating in this study. However, the information that you provide may help health professionals to better understand how client's sleep in ICU can be promoted.

**In case of injury**

We do not anticipate that any harm will occur to you as a result of participation in this study. However if any physical injury resulting from participation in this study should occur, we will

provide you with medical treatment according to the current standards of care in Tanzania. There will be no additional compensations to you.

**Who to contact:**

If you ever have questions about this study, you should contact the study coordinator or principal investigator Mr, Tigistu G/yohannis, Tel- 0762-106-354 Muhimbili University of Health and Allied Sciences, P.O. Box 65001 Dar es Salaam. If you ever have questions about your rights as a participant, you may call Prof. Mainen J. Moshi, Chairman of the Senate Research and Publications Committee. P.O. Box 65001, Dar es Salaam. Tel 2150302-6 2152489

**Signature:**

Participant agrees..... Participant does NOT agree .....

I \_\_\_\_\_ have read the contents in this form. My questions have been answered. I agree to participate in this study.

Signature of participant \_\_\_\_\_

Signature of witness (if mother/ caretaker cannot read) \_\_\_\_\_

Signature of research assistant \_\_\_\_\_

Date of signature \_\_\_\_\_

**Appendix- H**

Form ya utafiti  
Kichwa cha utafiti-



**MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES  
DIRECTORATE OF RESEARCH AND PUBLICATIONS, MUHAS**

**FOMU YA IDHINI YA KUSHIRIKI UTAFTI**

**Namba ya Utambulisho**

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**Idhini ya kushiriki katika utafiti unaohusu “SABABU ZINAZOCHANGIA KUKOSA USINGIZI NA NINI MIKAKATI/HATUA ZA KIUUGUZI KATIKA KUSAIDIA KUBORESHA USINGIZI KWA WAGONJWA WALIOKATIKA WODI/KITENGO CHA WAGONJWA MAHUTUTI”**

Salaam! Jina langu ni Tigistu G/yohannis, mwanafunzi wa mwaka wa pili wa shahada ya Uzamili (MSc, **critical care and trauma**) katika Chuo Kikuu cha Afya na Sayansi Shirikishi Muhimbili, ninafanya kazi ya utafiti huu nikiwa na madhumuni ya kugundua/kubaini sababu zinazochangia kukosa usingizi miongoni mwa wagonjwa mahututi na pia kuangalia nini mikakati/hatua za kiuuguzi katika kuboresha usingizi kwa wagonjwa waliokatika wodi/kitengo cha wagonjwa mahututi.

**Lengo la Utafiti:**

Utafiti huu utahusu wagonjwa waliolazwa katika wodi/kitengo cha wagonjwa mahututi na wawe wamelazwa zaidi ya siku mbili katika wodi/kitengo cha wagonjwa mahututi, na Wauguzi wanaofanya kazi katika wodi/kitengo cha wagonjwa mahututi. Kufanya utafiti huu kutasaidia kugundua/kubaini sababu zinazosababisha wagonjwa waliolazwa katika wodi/kitengo cha wagonjwa mahututi kukosa usingizi na hivyo kuangalia ni nini/ni mikakati

gani inafanywa na wauguzi kusaidia wagonjwa kupata usingizi katika wodi/kitengo cha wagonjwa mahututi.

**Ushiriki katika Utafiti huu:**

Utafiti huu utahusisha makundi mawili ya washiriki; wagonjwa na wauguzi. Ukikubali kushiriki; kwa upande wa wagonjwa watakao shiriki watahitajika kujibu maswali ya usaili yatakayotolewa na mtafiti msaidizi na kwa upande wa wauguzi watakaoshiriki watahitajika kujibu maswali binafsi watakayopewa.

**Usiri:**

Taarifa zote zitakazotolewa/kupatikana katika utafiti huu zitahifadhiwa na kulindwa kwa siri na hazitaonyeshwa wala kutolewa kwa mtu yeyote asiye miongoni mwa watafiti.

**Madhara:**

Hatutarajii kuwa madhara yeyote yanaweza kukupata iwapo utashiriki katika utafiti huu. Wakati mwingine unaweza kujisikia kuchoka/kuugua, lakini kulingana na hali utakayokuwa nayo utaweza kusimamisha usaili dhidi yako kwa muda au kueleza kufanya usaili huo kwa wakati mwingine wowote kama hali yako si nzuri kabisa.

**Haki ya Kujiondoa katika Utafiti/Vinginevyo:**

Kuhusika kwako hakika ni uchaguzi wako. Kama hautataka kushiriki katika utafiti huu, au kama utaamua kusimamisha ushiriki wako katika utafiti huu, utaendelea kupata huduma zote kama kawaida ulizokuwa ukizipata awali katika wodi/kitengo cha wagonjwa mahututi. Unaweza kuacha kushiriki katika utafiti huu muda wowote hata kama umeshapatiwa fomu ya idhini ya kushiriki.

**Faida:**

Hakutakuwa na faida ya moja kwa moja kwako kutokana na kushiriki katika utafiti huu,

ingawa taarifa utakazotoa zinaweza kuwasaidia wataalam kada ya afya kuelewa namna gani tatizo la kukosa usingizi kwa wagonjwa waliokatika wodi/kitengo cha wagonjwa mahututi linaweza kuondolewa.

**Endapo Madhara yatatokea:**

Hatutarajii kuwa madhara yeyote yatatokea kukupata iwapo utashiriki katika utafiti huu. Iwapo kama madhara/majeraha yeyote yatatokea kutokana na kushiriki kwako katika utafiti huu, tutakupatia matibabu kulingana na Mwongozo wa Utoaji huduma kwa Wagonjwa nchini Tanzania. Hakutakuwa na fidia nyingine dhidi yako.

**Kwa Mawasiliano:**

Kama una maswali kuhusu utafiti huu, wasiliana na Mtafiti; Bwana, Tigistu G/yohannis, simu-0762-106-354, kutoka Chuo Kikuu cha Afya na Sayansi Shirikishi Muhimbili, S.L.P. 65001 Dar es Salaam. Kama una maswali zaidi kuhusu haki zako za kushiriki katika utafiti huu, wasiliana na Prof. Mainen J. Moshi; Mwenyekiti wa Baraza la Tafiti na Machapisho, S.L.P. 65001, Dar es Salaam. Simu- 2150302-6 2152489.

**Sahihi:**

Kukubali kwa Mshiriki.....Kukataa kwa Mshiriki .....

Mimi \_\_\_\_\_ nimeisoma na kuelewa fomu hii ya idhini ya kushiriki. Maswali yangu yamejibiwa na nakubali kushiriki katika utafiti huu.

Sahihi ya Mshiriki \_\_\_\_\_

Sahihi ya Shahidi (kama mama/mhudumu hawezi kusoma) \_\_\_\_\_

Sahihi ya Mtafiti msaidizi \_\_\_\_\_

Tarehe \_\_\_\_\_