ASSESSMENT OF THE IMPACT OF NIGHT CALL DUTY ON SLEEP PATTERNS AMONG RADIOGRAPHERS WORKING IN BENIN CITY.

BY

EREWELE EVIDENCE AGBALE

BMS2001297

IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE AWARD OF BACHELOR OF RADIOGRAPHY (B.Rad) IN RADIOGRAPHY

DEPARTMENT OF RADIOGRAPHY,

SCHOOL OF BASIC MEDICAL SCIENCES,

UNIVERSITY OF BENIN, BENIN CITY, EDO STATE.

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A PROJECT SUBMITTED TO THE DEPARTMENT OF RADIOGRAPHY IN PARTIAL FULFILLMENT FOR THE REQUIREMENT OF THE AWARD OF BACHELOR DEGREE IN RADIOGRAPHY (B.RAD)

UNIVERSITY OF BENIN, BENIN CITY, NIGERIA

SUPERVISOR: MR. VICTOR .C. EGBUKICHI

OCTOBER, 2025.

CERTIFICATION

This is to certify that the project on **ASSESSMENT THE IMPACT OF NIGHT CALL DUTY ON SLEEP PATTERNS AMONG RADIOGRAPHERS IN THE UNIVERSITY OF BENIN TEACHING HOSPITAL** was written by **EREWELE EVIDENCE AGBALE** with Matriculation Number BMS2001297 and supervised by MR. EGBUKICHI VICTOR CHIMEZIE in partial fulfillment of the Bachelor in RADIOGRAPHY degree (B. RAD) in the DEPARTMENT OF RADIOGRAPHY, SCHOOL OF BASIC MEDICAL SCIENCES, UNIVERSITY OF BENIN.

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(HEAD OF DEPARTMENT).

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MR. VICTOR .C. EGBUKICHI DATE
(SUPERVISOR)

_____ _____

EXTERNAL EXAMINER. DATE

DEDICATION

This project is dedicated to God Almighty.

ACKNOWLEDGEMENT

I wish to express my profound gratitude to my supervisor, MR. EGBUKICHI VICTOR CHIMEZIE, for his expert guidance and consistent support, which were crucial to the successful completion of this project.

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ABSTRACT

This descriptive cross-sectional study investigated the impact of night call duty on the sleep patterns and associated symptoms among licensed radiographers and interns in Benin City, Nigeria. Given the very important 24-hour nature of diagnostic imaging services, this research addresses a critical gap in the body of knowledge regarding the occupational health impact of night call schedules within this specific group of professionals. A sample of 31 practicing radiographers filled structured questionnaires detailing their night call schedules, sleep duration and as well as the occurrence of related symptoms. Descriptive and inferential analysis (using SPSS v29.0), confirmed all respondents engage in night call duty, involving shifts exceeding 12 hours sometimes. A significant association between night call duty and poor sleep quality ($p < 0.05$), with a large proportion of radiographers reporting insufficient sleep (averaging less than 7 hours) and sleep disturbances, including multiple awakenings was discovered. These disturbances translate into a high prevalence of concerning symptoms such as fatigue, headaches, mood changes, and microsleep. The study concludes that the current night call duty model poses a substantial risk to the well-being of radiographers, potentially affecting their professional performance and, increasing the risk of procedural errors that may compromise the safety of patients and coworkers. Policy recommendations include implementing stricter maximum shift duration limits, establishing mandatory post-call recovery periods, and providing dedicated on-site rest facilities to mitigate these occupational hazards.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Radiographers play an important role in modern medicine and are essential in hospital emergency departments especially at night and during weekends. In Nigerian hospitals, radiographers are required to undertake night call duties to provide round the clock imaging services. This operational model can cause disruption in normal sleep patterns and affect their health and performance at work (Kalmbach, Anderson and Drake, 2018).

Sleep is an important biological function controlled by the circadian rhythm which is a neurohormonal mechanism involving the secretion of melatonin and cortisol that regulates sleep (Owen and Lach, 2025). The misalignment between an individual's biological clock and his or her day to day schedules can be caused by night work and this disruption usually leads to reduced sleep quality or quantity or even both (Boivin et al., 2022). Several studies have shown that healthcare workers involved in shift work and on-call duties experience sleep fragmentation much more, as well as shorter sleep duration and impaired sleep quality (Jaradat et al., 2020).

Research also shows that sleep deprivation among healthcare workers is associated with poor cognitive efficiency, mood disturbances, and a higher risk of occupational errors (Alreshidi & Rayani, 2023; Kaliyaperumal et al., 2017; Trockel et al., 2020). In a study by Yeo et al. (2025), it was found that healthcare professionals working rotational shifts like night calls were far more likely to report insomnia, daytime drowsiness, and poorer recovery after sleep compared to fixed day shift workers. While most literature focuses on nurses and doctors, the working conditions of radiographers particularly in low resource settings like Nigeria hint at similar or potentially

worse outcomes due to staffing shortage, higher workload, and lack of support facilities such as call rooms (Elliott et al., 2024).

1.2 Statement of the Problem

Sleep is a very important physiological process that is necessary for optimal cognitive performance, emotional stability and physical health. Among healthcare professionals, adequate sleep is crucial to sustaining safe and efficient patient care and night call duty has been strongly associated with sleep disruptions (Ganesan et al., 2019). Radiographers, who regularly undertake night calls to support the needs of patients are more susceptible to the adverse effects of sleep disturbance due to the physical and cognitive demands of their day to day work.

The impact of night call duties is worsened by constraints including staffing shortages, lack of adequate rest facilities, and an absence of formal fatigue management policies. Although extensive international research has stated how night work can contribute to sleep disorders such as insomnia there is still a huge gap in data focusing on radiographers in Nigerian tertiary health institutions.

Radiographic practice requires continuous attention to detail, precision in image acquisition, and quick clinical judgments all of which can be compromised by inadequate sleep. Mistakes made due to fatigue can lead to diagnostic errors, delays, and increased radiation dose for both the radiographer and clinical teams. Although these facts are well known on a global scale, radiographers have not been the primary focus of most on-call duty and sleep-related health studies, particularly in sub-Saharan Africa.

Therefore, this study seeks to expand the knowledge and understanding of how night call duties can affect the sleep patterns of radiographers in Benin City.

1.3 Research Questions

This study is guided by the following research questions:

1. What is the experience of radiographers who have been placed on night call duty in Benin City?

2. What are the sleep patterns of radiographers placed on night call duty in Benin city?

3. What specific sleep-related symptoms (e.g., insomnia, daytime fatigue, poor sleep duration) are commonly reported among radiographers who are regularly placed on night call duty?

1.4 Hypotheses

The hypotheses for this study are:

1. There is a significant relationship between night call duty and the sleep quality of radiographers working in Benin city

2. There is a significant relationship between the prevalence of sleep-related symptoms and night call duty among radiographers in Benin city.

1.5 Aim and objectives of the Study

Aim of the Study

The aim of this study is to assess the impact of night call duty on the sleep patterns among radiographers in Benin City, and to understanding how on-call duty influences sleep quality and quantity as well as related occupational outcomes.

1.6 Objectives of the Study

To evaluate the night call duty experience of radiographers in Benin City.

To determine the sleep patterns of radiographers engaged in night call duty in Benin city.

To assess the sleep-related symptoms (e.g., insomnia, fatigue, daytime sleepiness) among radiographers on night call duty.

1.6 Significance of the Study

To Government: To policymakers and employers in institutions of public health like government, this study would be beneficial as it will contain a critical discussion on occupational hazards that will be connected with night call responsibilities. Thereby allowing government agencies to make policies regarding on-call duty that will protect the health of radiographers.

To Hospital Administrators: Hospital administrators can improve staffing schedules in radiology departments with the help of the findings of this study as it will shed light on how poorly managed night call duties may affect employee efficiency, increase the occurrence of errors, and contribute to burnout.

To Radiographers: This study will provide radiographers with clarity on whether night call responsibilities affect their wellbeing. Radiographers will be more mindful and active in observing sleep hygiene habits and taking measures to improve their sleep quality.

To the Society: The findings of this study also have implications for patient safety and public health. By dealing with the challenges highlighted in this study the society will benefit from a safer and more efficient healthcare system.

1.7 Scope of the Study

This study will focus on assessing the impact of night call duty on the sleep patterns of radiographers in Benin City.

1.8 Operational Definition of Terms

- Radiographers: Licensed healthcare professionals trained in the acquisition of medical images using modalities such as X-rays, CT scans, Ultrasound, MRI, etc.
- Call Duty: On-call duty in radiography is an operational model which requires radiographers to be available outside of regular working hours to perform imaging procedures, typically for emergency cases, often requiring them to either be reachable by phone and potentially return to the hospital within a short timeframe (passive call duty) or physically present at the hospital outside regular working hours (active call duty).
- Shift Work: Any work schedule that falls outside the traditional 9 a.m. to 5 p.m. timeframe, including rotating shifts, night shifts, and on-call duties.
- Sleep Hygiene: Behavioural and environmental practices that affect sleep quality and quantity.
- Sleep Patterns: The regular, recurring sequences of sleep stages that individuals experience throughout the night
- Sleep Quality: An assessment of how restful an individual's sleep is.
- Sleep Duration: The amount of time an individual sleeps in a single sleep period.
- Sleep Disturbance: Any interruption or difficulty in getting restful sleep.
- Sleep Pressure: It is the biological drive to sleep
- Sleep Fragmentation: This refers to repeated interruption of sleep by short awakenings preventing the body and brain from entering deeper stages of sleep

- Sleep Latency: It is the amount of time taken to fall asleep when intentionally trying to
- Sleep Competitors: This refers to a variety of things which can make an individual stay alert/awake even when feeling tired or sleepy
- Insomnia: A condition in which an individual experiences persistent difficulty in initiating or maintaining sleep even without external disturbances.
- Daytime Sleepiness: A condition where individuals feel unusually sleepy or during the day.
- Burnout: A state of physical, emotional, and mental exhaustion related to prolonged stress.
- Microsleep: Brief and unintended sleep lasting for only seconds.
- Circadian Rhythm: The natural, internal biological clock that regulates the sleep-wake cycle of an individual during every 24 hour period
- Occupational Fatigue: A state of physical or mental exhaustion resulting from prolonged work demands, particularly under irregular or extended shifts such as night call duties.

CHAPTER TWO

LITERATURE REVIEW

2.1 Conceptual Review

2.1.1 Concept of Shift Work

On-call duty refers to a work arrangement in which healthcare employees must remain available to be summoned to work outside normal scheduled hours. In practice, this often means being reachable or on standby in case of emergencies. On-call schedules typically do not guarantee fixed working periods; instead, workers may be called in unpredictably. For example, Gupta et al. (2022) define on-call duty as a system "where employees may be called to work outside of scheduled hours to provide 24/7 coverage". This arrangement is common among hospital staff (e.g. radiographers, physicians, nurses) who must cover nights and weekends. The key feature of on-call work in most cases is its unpredictable nature: employees often cannot predict if or when they will be called, or how long they will work once called. This is different from fixed shift work, where the schedules are known in ahead of time. On-call duty blends standby availability with the possibility of hectic work demands at irregular times (Gupta et al., 2022).

2.1.2 On-Call Duty and Sleep Disturbances

The unpredictable nature of on-call duty creates stress that disrupts normal sleep patterns. Workers on call experience anxiety about receiving a call at any time, which can fragment their sleep both before and after call events. Empirical reviews note that "the unpredictable nature of on-call work can lead to disrupted sleep both pre-call and post-call". Before a call, workers often do not sleep deep, they may wake frequently because they are worried about missing a call.

After a call, resuming sleep can also be difficult, in one study, 70% of on-call workers reported trouble falling back asleep after waking up for a call. Jaradat et al. (2020) found that physicians who averaged six or more on-call shifts per month reported significantly poorer overall sleep quality than those with fewer calls. In short, both the anticipation of being called and the interruptions caused by calls are major sources of sleep disturbance in on-call workers (Gupta et al., 2022; Jaradat et al., 2020).

2.1.3 On-Call Duty and Its Types

On-call duties can be classified by how the employee is engaged during the call period. Commonly, two broad types are distinguished: active on-call and passive on-call. In an active on-call shift, the employee remains physically present on-site (e.g. in the hospital) and works as needed throughout the call period. In contrast, passive on-call (sometimes called "standby") allows the employee to stay at home or off-site but remain reachable by phone. For example, one study of medical officers found that 38% were placed on active on-call duty and 8% were passive, 34% of the target population combined both types. Many systems use mixed on-call schedules. Both types have negative effects on sleep, but active duty typically guarantees almost no sleep at all, and those on passive duty face the stress of being on alert even when in an environment conducive for rest. Understanding these types is important because their demands on sleep and alertness can differ (Gupta et al., 2022; Amen 2024).

2.1.4 Effects of Night Call Duty on Sleep Quality, Duration, and Disturbances

A number of studies have shown that on-call duty severely reduces sleep quality and duration. Cannon et al. (2020) reported that pharmacy residents working on-call overnight got only about

1.2 hours of sleep during the entire shift, with many getting none at all. This led to immensely increased sleepiness towards the end of night call. Similarly, Jaradat et al. (2020) found that an increased on-call interval was related to insomnia symptoms in resident physicians and physicians with a 6-month duration, with 90% of them also having poorer sleep in general than physicians with less frequent calls. Among radiographers, recent studies have shown similar results. Callanan et al. (2025) surveyed found that 32% of radiographers suffer from insufficient sleep throughout the past month, this was mush higher than the 14% seen in the general population. The study also showed a significant correlation between the number of on-call duties and sleep quality as radiographers working more on-call nights perceived their sleep to be poorer.

2.1.5 Impact of Call Duty on Healthcare Professionals

On-call work can harm healthcare workers overall health and well-being. High on-call loads have been linked to increased fatigue, stress, and burnout. Nagle et al. (2024) identified the number of on-call hours per week and the type of on-call duty as key factors linked to an elevated risk of burnout among healthcare staff. These findings support Gupta et al. (2022) who stated that on-call duty was a predictive factor for mental health outcomes such as depression and anxiety among general practitioners. Healthcare workers on call are more likely to experience emotional exhaustion, mood disturbances, and reduced job satisfaction as a result of the increased work demand (Nagle et al., 2024; Gupta et al., 2022).

2.1.6 Specific Challenges Faced by Radiographers Working On-Call Duty

Radiographers on call face all the general burdens above, plus profession-specific pressures. Night-call radiographers must perform complex imaging and interventions (often with radiation safety demands) while fatigued. Staffing shortages exacerbate the issue, one review notes that many imaging departments have a 10% vacancy rate, forcing existing staff to cover extra shift allocations and "short notice" changes between day and night work. Such conditions raise the risk of fatigue and burnout which leads to lower professionalism and patient safety (Tawfik et al., 2019). Elliott et al. (2024) argues that although no studies have directly measured these outcomes in diagnostic radiographers, the evidence from related fields suggests radiographers "may suffer fatigue, burnout and poor mental health from stretched shift working patterns". This supports Callanan et al.'s (2025) Irish study in which one third of radiographers reported a lack of sleep that they attributed to being on call.

2.1.7 Strategies for Mitigating the Impact of On-Call Duty on Sleep Patterns

Strategies for improving sleep health of on-call workers have been proposed. On a workplace level, limiting frequencies of on-call periods and ensuring rest sufficiency are critical. Callanan et al. (2025) suggest institution of guidelines for a ceiling of on-call shifts per month alongside arranging compensatory rest break rosters to prevent chronic sleep debt. On a personal level, Jeon, Kim & Shin (2023) review a range of nonpharmacologic interventions including controlled light exposure (bright light for nighttime alertness, darkness for daytime sleep), timed napping, and sleep hygiene training as being amongst the most commonly used measures and these reports concur with that of McKenna & Wilkes (2018) as well as that of Dutheil et al. (2020). Active cognitive-behavioral interventions (e.g. customized CBT-I) are also recommended (Tout et al., 2024; Reynolds et al., 2022). Bright light exposure, caffeine use, or mild exertion on rising have

been investigated as ways to improve alertness, yet their time has to be carefully managed so they don't make it more difficult to get back to sleep. Sleep hygiene training (predictability of habits, stimulation limitation before set sleep) alongside support for staff (e.g. flexibility, rest break) are emphasized.

2.2 Empirical Review

There is currently not enough empirical studies focused on radiographers night-call duty and sleep, so this review makes use of findings from related medical fields as well. Jaradat et al. (2020) surveyed 201 resident physicians in Jordan and found that 90% reported poor sleep quality; those doing six or more monthly on-call shifts had significantly worse sleep than those with fewer. Similarly, Cannon et al. (2020) measured actual sleep in pharmacy residents during overnight call, they found nearly zero sleep for many shifts (average 1.2 hours), and residents reported much higher sleepiness at the end of call than at baseline. These quantitative findings are echoed by workforce studies; for example, a European review noted that 85% of shift-work studies (in non-physician staff) reported a negative impact on sleep or fatigue when rotations were implemented, implying radiographers likely experience similar effects.

Callanan et al. (2025) administered a national survey of radiographers in Ireland, 32% reported insufficient sleep in the past month which was far above that of general population, and the data showed a clear trend of poorer sleep with more on-call shifts. Elliott et al. (2024) conducted a systematic review of allied health and concluded that, although diagnostic radiographers have not been individually studied to a great extent, the existing evidence indicates they will suffer significant fatigue and burnout as a result of excessive on-call duties.

In Nigeria (where Benin City is located), sleep research on healthcare workers is limited. A study in Kano State carried out by kalo et al. (2017) found that over half of hospital staff had poor sleep quality, and nurses on shift work were much more likely to have sleep problems than day workers. While this study was not focused on radiographers, it shows that night healthcare work in Nigeria is linked to sleep impairment. Empirical literature both global and local clearly shows that night on-call duty has negative impact on sleep health and by extension the wellbeing and performance of healthcare professionals.

2.3 Theoretical Framework

2.3.1 Circadian Rhythm Theory

The Circadian rhythm hypothesis provides a biological explanation for why night on-call duties disrupt sleep. Humans have an internal 24-hour clock (circadian pacemaker) that generates daily cycles for sleep-wakefulness, endocrine hormone release, body temperature, and numerous other functions. This clock is synchronized by external signals (zeitgebers) such as light so that sleep tends to be synchronized with night time. On-call nights desynchronize the internal clock with external conditions so that circadian misalignment occurs. In practice: this means that when an individual is on night call, his or her body is more alert than it otherwise would be, yet following a night time interval of work that individual cannot sleep during daylight even if one is fatigued. Circadian misalignment due to shift work was for example noted by Jeon, Kim & Shin (2023), who reported that it generates insomnia during periods of sleep yet excessive sleepiness during periods of alertness. This hypothesis explains why radiographers who are on on-call experience

difficulty in sleeping. It also informs preventive control of light exposure itself can be employed so as to shift the circadian clock toward a more synchronous state.

2.3.2 Job Demand-Control (JDC) Model

The Job Demand-Control (JDC) model proposes a psychosocial theory for occupational stress in on-call work. Developed by Karasek and Theorell, it suggests that overly demanding jobs with minimal job control (autonomy for schedules, freedom for decision-making) produce the most stress strain and ill-health risk. That means employees under strong demands with no way to manage them exhibit worst results including negative health problems and burnout. Night call duty is a classic example of a situation with high demands, low control. Radiographers on call face critical tasks that must be done immediately (high demand) but usually have minimal control over their schedules or workload while they're on call (Karasek & Theorell, 1990; Christiansen et al., 2024)

CHAPTER THREE

METHODOLOGY

3.1 Research Setting

The research was conducted in the University of Benin Teaching Hospital (UBTH) in Benin City, Edo State, Nigeria. UBTH is one of Nigeria's leading tertiary healthcare centres and a reference point for South-South Nigeria. The hospital enjoys a linkage with the University of Benin with general services as well as specialized services in most departments, including Internal Medicine, Surgery, Paediatrics, Obstetrics and Gynaecology, and importantly, Radiology. UBTH's Radiology Department is equipped with a variety of diagnostic imaging technologies, including X-ray and computed tomography (CT) scanners, and operates a 24-hour operations model emergency services as well as inpatient care. Radiographers in this hospital's department of radiology are often placed on night and weekends calls, thus making this setting very suitable for examining night call duty's impact on sleep behaviour.

3.2 Study Design

This study adopted a descriptive cross-sectional research design. This design was deemed appropriate because it enabled the researcher to assess and analyse the relationship between night call duty and sleep patterns among radiographers at a specific point in time, without manipulating the variables under investigation.

3.3 Target Population

The target population for this study includes all 31 licensed and practicing radiographers and radiography interns currently working in the Radiology Department of the University of Benin Teaching Hospital (UBTH), Benin City, Nigeria.

INCLUSION CRITERIA

- Must be currently employed or intern in the Radiology Department of UBTH.
- Must give informed consent to participate in the study.

EXCLUSION CRITERIA

- Radiographers who have worked in the department for less than one month.
- Staff from other departments in the hospitals.
- Individuals who are unwilling to fully complete the survey.
- Radiographers who are on extended leave or inactive duty during the data collection period.

3.4 Sample Size

The sample size for this study was 31 participants, this includes all 31 radiographers and interns from UBTH.

3.5 Sampling Technique

This study employed a purposive sampling technique to select participants from the target population it will allow selection based on specific characteristics relevant to the objectives of the study.

3.6 Instrument for Data Collection

The data gathering instrument for this study was a structured and self-administered questionnaire that was specifically developed for the purpose of acquiring data on night call duty and sleep behaviour from respondents. It was developed from previous validated studies on occupational health, sleep quality and on-call duty or shift work of professional healthcare providers. It adopted some questions from the Pittsburgh Sleep Quality Index (PSQI) that is a validated instrument for assessing sleep quality and disturbances.

3.7 Validity of the Instrument

To ensure the validity of the research instrument, the questionnaire was also be subject to content validity review by a panel of experts in health sciences, radiography, and research methodology in medicine. The experts will examine questionnaire items for relevance, clarity and appropriateness of language. Suggested adjustments were made to the final version of the instrument to improve focus and clarity. Construct validity was obtained by adopting items from already valid instruments such as the Pittsburgh Sleep Quality Index (PSQI) and corresponding studies conducted on healthcare providers and on-call responsibilities. This agreement with already reliable instruments strengthened the conceptual framework of the questionnaire and led to each item measuring a construct of intention.

3.8 Reliability of the Instrument

To attain questionnaire reliability for this research study, a pilot test was conducted with a small sample of five (4) radiographers from a similar healthcare facility that isn't within participating hospitals. Participants met the same selection conditions set for respondents for the main study but not included in the final sample. The pilot study was conducted primarily for instrument internal consistency evaluation as well as determination of ambiguities or inconsistencies in responding to items. Small-scale fine-tuning linguistically will be made to refine clarity based on respondents' suggestions. Upon piloting, response were assessed for reliability by use of Cronbach's alpha coefficient, a statistical value that is usually put to use to approximate internal consistency of multi-item scales. A Cronbach's alpha value of 0.79 was considered acceptable for this study.

3.9 Method of Data Collection

Data for this study was collected using a structured, self-administered questionnaire distributed to eligible radiographers working at the selected hospitals. Each participant was provided with; A briefing sheet explaining the purpose, importance, and confidentiality of the study, an informed consent form, which they were required to sign before completing the questionnaire and a hard copy of the questionnaire, with instructions for completion.

3.10 Method of Data Analysis

Data collected through structured questionnaires were analysed using SPSS version 29.0. Descriptive statistics were used to give a clear summary of the participants' demographic details and their night call duty experience, sleep patterns and sleep related symptoms. To explore how night call duty affects sleep, inferential statistics including Chi-square test was carried out. All tests were conducted at a 0.05 significance level, and the results was displayed in tables to make

interpretation easier. TO access sleep quality, responses from questions 3,4,5 and 7 (section C) were ranked from 0 to 3 based on duration of time (questions 3 and 4), frequency (question 5) and degree of satisfaction (question 7). A cumulative score was calculated for each individual and this score was subsequently assigned to a five point sleep quality index categorized as Optimal, Good, Moderate, Poor and Terrible. Similarly a sleep symptom index was developed by ranking the reported frequency of ten sleep related symptoms(section D) from 0 to 3 the cumulative symptom score for each individual was then assigned to a five point scale categorized as Optimal, Good, Moderate, Poor and Terrible.

3.11 Ethical Consideration

Ethical approval for the study was obtained from the Ethics and Research Committee of the University of Benin Teaching Hospital (UBTH). The study was governed by ethical considerations of autonomy, beneficence, non-maleficence, and justice. Participants were adequately informed of purpose of study, as well as their rights including that of withdrawal at any stage without any penalty. Extremely strict confidentiality will be maintained without any identification information being gathered. The study findings will be for academic purposes only.

CHAPTER FOUR

DATA ANALYSIS AND RESULTS

4.1 Analysis of Research Questions

Analysis of Socio-Demographic Characteristics of the Respondents

Table 4.1: Socio-Demographic Characteristics of the Respondents

Variables	Frequency (n=31)	Percent (%)
Gender		
Male	18	58.06
Female	13	41.94
Age		
18–25	10	32.26
26-40	21	67.74
41-60	0	-
60 years and above	0	-
Marital status		
Single	27	87.10
Married	4	12.90
Divorced	0	-
Widowed	0	-
Educational level		
Diploma	0	-
BSC	26	83.87
MSC/PhD	5	16.13
Others	0	-
Do you smoke		
yes	0	-
No	31	100.00
Do you consume alcohol regularly		
Yes	2	6.45
No	29	93.55

A total of 31 respondents participated in the study. Majority of the respondents were males 18(58.06%) and the remaining 13(41.94%) were females. Majority of the respondents were

between the ages old 26-40 (67.74%), and the remaining 10(32.26%) were between the ages of 18-25. As regards marital status, 27 (87.10%) stated single and 4(12.9%) stated married. As regards educational level 26 (83.87%) stated they had BSC and the remaining 5(16.13%) stated they had MSC/PhD. When asked if they smoked; all 31(100%) respondents stated no. And 29(93.55%) stated that they do not consume alcohol regularly and the remaining 2 stated that they do.

Analysis of **night call duty exposure**

Table 4.2: N**ight call duty exposure of respondents**

S /N	QUESTIONS	Frequency	Percentage
1	How long have you been working as a radiographer?		
	Less than 1 year	11	35.48
	1–5 years	15	48.39
	6–10 years	5	16.13
	Over 10 years	0	-
2	Do you currently participate in night call duty?		
	Yes	31	100
	No	0	0
3	Average number of night calls per month		
	0–1	2	6.45
	2–3	16	51.61
	4–5	8	25,81
	More than 5	5	16.13
4	On average how long does each night call duty last:		
	Less than 6 hour	1	3.23
	6–8 hours	12	38.71
	9–12 hours	9	29.03
	More than 12 hours	9	29.03
5	Are rest breaks provided during your night call shifts?		
	Yes	11	35.48
	No	20	64.52
6	How long are these rest breaks		
	1-15	0	0
	16-30	1	9.09
	31-60	2	18,18
	More than 60	8	72.73
7	How would you rate the workload intensity during your night shifts?		
	Low	1	3.23
	Moderate	20	64.52
	High	10	32.26
	Very High	0	0
8	How many weeks in a month are you placed on night call duty?		
	0	0	0
	1	17	54.84
	2	9	29.03
	3	3	9.68
	4	2	6.45
9	Do you think your night call schedule allows for enough rest and recovery?		
	Yes	11	35.38
	No	11	35.38
	Sometimes	9	29.03
10	How much time (hours or days) do you usually have to recover after night calls?		
	Less than 4 Hours	6	19.35
	4-8 Hours	13	41.94
	8-12 Hours	4	12.90
	1 day	7	22.58
	2 days	1	3.23
	More than 2 days	0	0

Table 4.2 is the result of the analysis of the night call duties of licensed and registered radiographers in UBTH. On the first question, 11(55.48%) stated that they have worked for less than a year, 15(48.39%) stated 1-5 years, and 5 (16.13%) stated 6-10 years. All respondents stated that they do participate in night call duty. On the question average number of night calls per month, 2(6.45%) stated 0-1 calls, 16(51.61%) stated 2-3 calls, 8(25.81%) stated 4-5 calls and 5(16.13%) stated more than 5 calls per month. On the question; on average how long does each night call duty last, 1 (3.23%) stated less than 6 hours, 12(38.71%) stated 6-8 hours, 9(29.03%) stated 9-12 hours and the remaining 9(29.03%) stated more than 12 hours. 11(35.48%) stated that rest breaks are provided during night calls and 20(64.52%) stated that there are no rest breaks. When asked how long are these rest breaks, 1(9,09%) stated 16-30 minutes, 2(18.18%) stated 31-60% and 8(72.73%) stated more than 60 minutes of rest. 1(3.23%) rated the workload intensity during night calls as low, 20(64.52%) stated that it is moderate and 10(32.26%) stated that it is high. On the question, how many weeks in a month are you places on night call duty?, , 17 (54.84%) stated 1 week, 9(29.03%) stated 2 weeks, and 3 (9.68%) stated 3 weeks and 2(6.45%) stated 4 weeks. 11(35.48%) stated that they believed that their night call schedule allowed for adequate rest and recovery, 11(35.48%) stated otherwise and the remaining 9(29.03%) stated that it does sometimes. On the last question; how much time do you usually have to recover after night calls?, 6(19.35%) stated less than 4 hours, 13(41.94%) stated 4-8 hours, 4(12.9%) stated 8-12 hours, 7(22.58%) stated 1 day, and 1(3.23%) stated 2 days.

Analysis of **sleep patterns**

Table 4.3: **Sleep patterns of respondents**

S /N	QUESTIONS	Frequency	Percentage
1	Between 8-9 PM	3	9.68
	Between 9-10 PM	5	16.13
	Between 10-11PM	13	41.94
	Between 11 PM-12 AM	3	9.68
	After Midnight	7	22.58
2	Before 4 AM	0	0
	Between 4-5 AM	4	12.90
	Between 5-6 AM	20	64.52
	Between 6-7 AM	6	19.35
	After 8 AM	1	3.23
3	More than 8 Hours	3	9.68
	8 Hours	5	16.13
	7 Hours	5	16.13
	6 Hours	8	25.81
	5 Hours	5	16.13
	4 Hours	2	6.45
	Less than 4 Hours	3	9.68
4	1-10	14	45.16
	11-20	5	16.13
	21-30	5	16.13
	31-40	1	3.23
	41-50	0	0
	51-60	2	6.45
	More than 60	4	12.90
5	a. Cannot get to sleep within 30 minutes?		
	Not within the last month	18	58.06
	Less than 4 times last month	7	22.58
	1-2 Times a week	2	6.45
	3 or more times a week	4	12.90
	b. Wake up in the middle of the night?		
	Not within the last month	8	25.81
	Less than 4 times last month	5	16.13
	1-2 Times a week	5	16.13
	3 or more times a week	13	41.94
	c. Have to get up to use the bathroom?		
	Not within the last month	4	12.90
	Less than 4 times last month	6	19.35
	1-2 Times a week	9	29.03
	3 or more times a week	12	38.71
	d. Cannot breathe comfortably?		
	Not within the last month	27	87.10
	Less than 4 times last month	2	6.45
	1-2 Times a week	1	3.23
	3 or more times a week	1	3.23
	e. Have pain?		
	Not within the last month	24	77.42
	Less than 4 times last month	5	16.13
	1-2 Times a week	1	3.23
	3 or more times a week	1	3.23
6	Not within the last month	29	93.55
	Less than 4 times last month	1	3.23
	1-2 Times a week	1	3.23
	3 or more times a week	0	0

7	Refreshing Mildly refreshing Unrefreshing	7 14 10	22.58 45.16 32.26

Table 4.3 is the result of the analysis of the sleep patterns of radiographers working in UBTH. On the first question, during the past week what time have you usually gone to bed? 3 (9.68%) stated between 8-9 pm, 5(16.13%) stated between 9-10 pm, 13(41.94%) stated between 10-11pm, 3(9.68%) stated between 11pm-12am, and the remaining 7(22.58%) stated after midnight. On the question, , 4(12.9%) stated that during the past month they usually get up in the morning between 4-5 am, 20 (64.52%) stateed between 5-6am, 6(19.35%) stated between 6-7am and the remaining 1(3.23%) stated after 8 am. 3(9.68%) stated that they sleep for more than 8 hours at night, 5(16.13%) stated 8 hours, 5(16.13%) stated 7 hours, 8(25.81%) stated 6 hours, 5 (16.13%) stated 5 hours, 2(6.45%) stated 4 hours and 3(9.68%) stated less than 4 hours. 14(45.16%) stated that it takes 1-10 minutes to fall asleep at night, 5(16.13%) stated 11-20 minutes, 5(16.13%) stated 21-30 minutes, 1(3.23%) stated 31-40 minutes, 2(6.45%) stated 51-60% and 4(12.9%) stated more than 60 minutes. This shows that it took majority of respondents between 1-10 minutes to fall asleep.

On the fifth question, during the past month how often have you had trouble sleeping because you; (a) cannot get to sleep within 30 minutes: 18(58.06%) stated not within the last month, 7(22.58%) stated less than 4 times last month, 2(6.45%) stated 1-2 times a week and 4 (12.9%) stated 3 or more times a week. (b) wake up in the middle of the night: 8(25.81%) stated not within the last month, 5(16.13%) stated less than 4 times last month, 5(16.13%) stated 1-2 times a week and 13(41.94%) stated 3 or more times a week. (c) have to get up to use the bathroom:

4(12.9%) stated not within the last month, 6(19.35%) stated less than 4 times last month, 9(29.093%) stated 1-2 times a week and 12(38.71%) stated 3 or more times a week. (d) cannot breathe comfortably: 27(87.1%) stated not within the last month, 2(6.45%) stated less than 4 times last month, 1(3.23%) stated 1-2 times a week and 1(3.23%) stated 3 or more times a week. (e) have pain: 24(77.42%) stated not within the last month, 5(16.13%) stated less than 4 times last month, 1(3.23%) stated 1-2 times a week and 1(3.23%) stated 3 or more times a week. On the last question During the past month, how often have you taken medicine to help you sleep? 29(93.55%) stated not within the last month, 1(3.23%) stated less than 4 times last month, 1(3.23%) stated 1-2 times a week and none stated 3 or more times a week. 7(22,58%) participants believed that their sleep over the last month was refreshing while 10(32.26%) believed it wasn't and 14(45.16%) believed it was only mildly refreshing,

Analysis of **sleep related symptoms**

4.4 S**leep related symptoms of respondents**

S/N	QUESTIONS	Never	Rarely	Sometimes	Often	mean
1	Fatigue and daytime sleepiness:	5 (16.13)	8 (25.81)	15 (48.39)	3 (9.68)	6.2
2	Have you ever experienced microsleep (nodding off) at work?	11 (35.48)	7 (22.58)	10 (32.26)	3 (9.68)	6.2
3	Headaches:	5 (16.13)	11 (35.48)	9 (29.03)	6 (19.35)	6.2
4	Difficulty concentrating:	8 (25.81)	12 (38.71)	9 (29.03)	2 (6.45)	6.2
5	Mood disturbances (e.g., irritability, anxiety, depression):	5 (16.13)	16 (51.61)	7 (22.58)	3 (9.68)	6.2
6	Gastrointestinal issues	16 (51.61)	8 (25.81)	7 (22.58)	0 (0)	6.2
7	Memory problems	19 (61.29)	8 (25.81)	4 (12.9)	0 (0)	6.2
8	Reduced motivation:	9 (29.03)	8 (25.81)	12 (38.71)	2 (6.45)	6.2
9	Impaired work performance	13 (41.94)	12 (38.71)	4 (12.9)	2 (6.45)	6.2
10	Frequent illnesses or reduced immunity:	13 (41.94)	11 (35.48)	7 (22.58)	0 (0)	6.2

Table 4.4 is the result of the analysis of the percentages and mean responses of respondents on the sleep related symptoms of radiographers working in UBTH. The 10 items had mean scores of 6.2. On the first sleep relate symptom fatigue and daytime sleepiness 5(16.13%) stated never, 8 (25.81%) stated rarely, majority 15(48.39%) stated sometimes and 3(9.68%) stated often. When asked have you ever experienced microsleep at work? 11(35.48%) stated never, 7(22.58%) stated rarely, 10(32.26%) stated sometimes and 3(9.68%) stated often. On the other symptom; headache 5(16.13%) stated never, 11(35.48%) stated rarely, 9(29.03%) stated sometimes and 6(19.35%) stated often. Difficulty concentrating; 8 (25.81%) stated never, 12(38.71%) stated rarely, 9(29.03%) stated sometimes and 2(6.45%) stated often. Mood disturbances: 5(16.13%) stated never, 16(51.61%)) stated rarely, 7(22.58%) stated sometimes and 3(9.68%) stated often. Gastrointestinal issues 16(51.61%) stated never, 8(25.81%) stated rarely, and 7(22.58%) stated sometimes. Memory problems 19(61.29%) stated never, 8(25.81%) stated rarely, and 4(12.9%) stated sometimes. Reduced motivation 9(29.03%) stated never, 8(25.81%) stated rarely, 12(38.71%) stated sometimes and 2(6.45%) stated often. Impaired work performance: 13(41.94%) stated never, 12(38.71%) stated rarely, 4(12.9%) stated sometimes and 2(6.45%) stated often. And lastly frequent illness or reduced immunity: 13(41.94%) stated never, 11(35.48%) stated rarely, and the remaining 7(22.58%) stated sometimes.

4.2 Test of Hypothesis

Hypothesis 1: There is a significant relationship between night call duty and the sleep quality of radiographers working in Benin city

TABLE 4.5: Computation of Calculated Chi-Square Value on Hypotheses 1

SLEEP QUALITY	OBSERVED FREQUENCY (O)	EXPECTED FREQUENCY (E)	O - E	(O - E)^2	(O - E)^2 / E
OPTIMAL	4	6.2	-2.2	4.84	0.78
GOOD	4	6.2	-2.2	4.8	0.77
MODERATE	12	6.2	5.8	33.64	5.43
POOR	11	6.2	4.8	23.04	3.72
TERRIBLE	0	6.2	-6.2	38.48	6.21
TOTAL	31	31			16,91

$X^2 = 16.91$

Decision: Since $X^2 = 16.91$ was greater than the critical value 9.488 we reject the null hypothesis at the 0.05 level of significance and accept the alternate hypothesis which state that there is a significant relationship between night call duty and the sleep quality of radiographers working in Benin city

Hypothesis 2: There is a significant relationship between the prevalence of sleep-related symptoms and night call duty among radiographers in Benin city.

TABLE 4.6: Computation of Calculated Chi-Square Value on Hypotheses 2

Using table 4.4

SLEEP SYMPTOM	OBSERVED FREQUENCY (O)	EXPECTED FREQUENCY (E)	O - E	$(O - E)^2$	$(O - E)^2 / E$
OPTIMAL	3	6.2	-3.2	10.24	1.65
GOOD	8	6.2	1.8	3.24	0.52
MODERATE	13	6.2	6.8	46.24	7.46
POOR	5	6.2	-1.2	1.44	0.23
TERRIBLE	2	6.2	-4.2	17.64	2.84
Total	31	31			12.70

Decision: Since $X^2 = 12.70$ was greater than the critical value 9.488 we reject the null hypothesis at the 0.05 level of significance and accept the alternate hypothesis which state that there is a significant relationship between the prevalence of sleep-related symptoms and night call duty among radiographers in Benin city.

4.3 Key Findings

Socio-Demographic Profile

The lifestyle habits of participants appeared to be healthy, as 100% of respondents were non-smokers and 93.55% did not consume alcohol regularly.

Night Call Duty Experience

The largest group of respondents (48.39%) had been working as radiographers for 1-5 years. The most common night call frequency was 2-3 times per month (51.61%). While 38.71% reported shifts lasting 6-8 hours, a significant portion (29.03%) reported shifts lasting more than 12 hours. The workload during night shifts was mostly rated as "moderate" (64.52%). Opinions on adequate rest were mixed with 35.48% feeling their schedule allowed for enough recovery, while another 35.48% believed it didn’t and 29.03% said it did sometimes. Most importantly the time allowed for recovery after calls was limited. The largest group (41.94%) had only 4-8 hours to recover, and 19.35% had less than 4 hours.

Sleep Patterns and Quality

The most commonly reported duration of actual sleep was 6 hours per night (25.81%). A combined 32.26% of respondents reported getting 5 hours or less of sleep per night. Most respondents (45.16%) fell asleep quickly, typically within 1-10 minutes. The primary issue identified was not falling asleep, but staying asleep. A significant portion of respondents reported waking up in the middle of the night (41.94% experienced these 3 or more times a week) and having to get up to use the bathroom (38.71% experienced these 3 or more times a week). The use of sleep medication was extremely rare, with 93.55% stating they had not taken any in the past month.

Sleep-Related Symptoms

The most prevalent symptom was fatigue and daytime sleepiness, 48.39% of respondents experienced this "sometimes". 32.26% also reported "sometimes" experiencing microsleep (nodding off) at work. Reduced motivation was experienced "sometimes" by 38.71% of respondents. Other symptoms like difficulty concentrating, mood disturbances, and headaches were most commonly reported as occurring "rarely."

Gastrointestinal issues, memory problems, and frequent illnesses were reported as "never" experienced by the majority of participants.

Hypothesis Testing

The study's two hypotheses were both accepted based on Chi-Square analysis:

A significant relationship was found between night call duty and the sleep quality of radiographers ($X^2 = 16.91 > 9.488$ critical value).

A significant relationship was found between the prevalence of sleep-related symptoms and night call duty ($X^2 = 12.70 > 9.488$ critical value).

4.4 Discussion On Findings

The findings of this study, which aimed to assess the impact of night call duty on the sleep patterns of radiographers in Benin City, largely align with and extend the existing literature. This study found that night call duty is a universal component of the radiographer's job in the surveyed hospital. This confirms the assertion in the literature that such schedules are common for essential hospital staff like radiographers.

A wide variance was observed in the self reported duration of call duty, rest breaks and recovery time, despite all participants having the same scheduled off duty period, answers concerning recovery time after a night call varied from 1 day to less than 4 hours. This suggest that actual available rest time may be significantly less than scheduled rest time after accounting for sleep competitors such as commuting, domestic duties and social responsibilities. A disturbing finding of this research was the very small recovery time after night calls. A combined 48.38% of respondents reported having 8 hours or less to recover, with a significant group (19.35%) having less than 4 hours. This finding provides a practical example of the Job Demand-Control (JDC) model. Radiographers face high psychological demands (performing critical imaging tasks) while having extremely limited control over their recovery schedules. This lack of "rest sufficiency," which Callanan et al. (2025) identified as critical, creates a high-strain environment that directly contributes to the negative sleep outcomes seen in the sample population.

The study's finding of a significant link between night call and poor sleep quality validates a large body of research. The results mirror findings from Jaradat et al. (2020) and Kalo et al. (2017), who both found that a high frequency of on-call shifts or night work leads to poor sleep quality in healthcare workers.

The largest group of respondents (25.81%) reported getting only 6 hours of sleep, with 32.26% getting 5 hours or less. This aligns closely with the findings of Callanan et al. (2025), where 32% of radiographers reported insufficient sleep.

Interestingly, this study revealed that the primary sleep issue was sleep fragmentation, not sleep latency. Most respondents (45.16%) fell asleep quickly (1-10 minutes), suggesting high sleep pressure (i.e., they were very tired). However, they struggled to stay asleep, a classic manifestation of the Circadian Rhythm Theory.

The acceptance of the second hypothesis confirms that the sleep disturbances experienced by radiographers results in negative symptoms. The most prevalent symptom was fatigue and daytime sleepiness, which 48.39% of respondents experienced "sometimes". This was further evidenced by 32.26% reporting microsleep (nodding off) at work. This finding is a direct real-world example of the Circadian Rhythm Theory's prediction of "excessive sleepiness during periods of alertness" and supports Cannon et al. (2020), who noted "immensely increased sleepiness" post-call. The findings also support literature linking on-call work to burnout, as predicted by Elliott et al. (2024). While overt mood disturbances were less common (reported "rarely" by 51.61%), a significant 38.71% of respondents reported experiencing reduced motivation "sometimes". This, combined with fatigue, is a key indicator of burnout.

In summary, the findings from this study in Benin City are consistent with national and international research, confirming that night call duty is a significant occupational hazard for radiographers. It degrades sleep quality by causing fragmentation, reduces overall sleep duration, and leads to predictable symptoms of fatigue, daytime sleepiness, and reduced motivation, as explained by both the Job Demand-Control model and Circadian Rhythm Theory.

4.5 Implication of Findings

1. Chronic Sleep Debt and Inevitable Burnout

The data strongly implies that a significant portion of the radiographers in Benin City who participate in night call duty operate in a state of chronic sleep debt. With nearly a one-third of respondents getting five hours of sleep or less and close to half having less than eight hours to recover after night calls, there is insufficient time for physiological and psychological recovery. This is not a temporary state of tiredness but a cumulative condition. This reflects the concerns

raised by Nagle et al. (2024) and Gupta et al. (2022) who identified on-call hours as a key predictor for burnout, emotional exhaustion, and adverse mental health outcomes. The finding that 38.71% of radiographers in this study experience reduced motivation is a cause for alarm as it serves as a tangible, early indicator of burnout among the population. Radiographers participating in night call duty in Benin city are at high risk of an elevated level of job dissatisfaction as well as emotional exhaustion, and potential departure from the profession.

2. Elevated Risk to Patient Safety and Quality of Care

The finding that nearly one-third (32.26%) of radiographers have experienced microsleep while at work is alarming. When combined with prevalent "fatigue" and "difficulty concentrating," the potential for clinical error increases substantially.

In the context of radiography, such impairment could manifest in several dangerous ways such as;

- Procedural Errors: Mistakes in patient positioning, selection of imaging protocols, or administration of contrast media.
- Cognitive Lapses: Failure to notice or pay attention to important details or lapses in adhering to radiation safety protocols, endangering both patient and staff.
- Reduced Professionalism: As warned by Tawfik et al. (2019), fatigue is directly linked to a decline in professional conduct and communication with patients.
- This study provides direct, localized evidence for the concerns raised in the systematic review by Elliott et al. (2024), confirming that radiographers are indeed suffering from fatigue that could compromise patient care. The implication is that the current scheduling practices are not just harming the employees; they are creating an environment where the risk of adverse patient events is significantly elevated.

3. Unsustainable Workforce Pressure and Staffing Crises

The working conditions shown by the findings are characteristic of a high-strain job as defined by the Job Demand-Control (JDC) model. Radiographers face high demands (complex, urgent imaging tasks) with minimal control over their schedules and recovery time. The implication of maintaining such a high-strain environment is that it is fundamentally unsustainable.

It can also create a continuous cycle that exacerbates the very staffing shortages mentioned by Tawfik et al. (2019). A work environment that is so demanding leads to higher rates of brain drain as experienced staff tend to leave. The remaining staff must then take up the on-call shifts of their ex-colleagues thereby increasing their fatigue and burnout risk, and accelerating the cycle. Current on-call duty may be actively contributing to a long-term workforce and staffing crisis within the radiology departments.

CHAPTER FIVE

CONCLUSION

5.1 Conclusion

The data, collected from 31 radiographers and analysed using descriptive and inferential statistics, consistently showed that an overwhelming majority of the workforce participates in night call duty, often involving shifts lasting longer than 12 hours. This high prevalence of on-call work has been proven to be significantly associated with insufficient sleep duration (with only a minority achieving the recommended 7+ hours) and significant sleep fragmentation, characterized by multiple awakenings.

Consequently, these disrupted sleep patterns lead to a high incidence of sleep-related symptoms, including fatigue, headaches, mood disturbances, and the dangerous occurrence of microsleep during regular working hours(during the day). By demonstrating a clear link between current scheduling practices and below optimal sleep quality, this study concludes that the current operational model places unsustainable pressure on radiographers. This situation not only affects staff well-being negatively and heightens the risk of burnout but also introduces worrying and significant risks to the safety of patients by increasing the potential for occupational errors due to impaired cognitive function and vigilance. The research confirms that the current night call duty system creates a high-strain work environment that requires intervention.

5.2 Recommendation

Policy and Scheduling Reform: Hospital administrations should implement mandatory rest policies and restructure night-call schedules. This includes strictly limiting the frequency of

monthly calls, enforcing a maximum shift duration, and ensuring mandatory, undisturbed post-call recovery periods.

Infrastructure for Rest: There should be adequate provision of dedicated, comfortable, and dark on-site sleeping facilities to ensure radiographers on active call duty can utilize rest breaks effectively so as to reduce the strain that comes with opposing their normal sleep cycle.

Educational Intervention: There should be Implementation of comprehensive educational programs focused on effective sleep hygiene practices, tailored specifically for radiographers engaged in night call duty, helping them optimize their recovery time by increasing sleep quality even when sleep quantity cannot be increased thus managing their circadian rhythm disruption.

5.3 Limitation

Cross-Sectional Design: The descriptive cross-sectional design which was more suited to the relatively short time we had to collect and analyse data, captures data at a single point in time. This prevents the establishment of a definitive cause-and-effect relationship.

Reliance on Self-Reported Data: The data on sleep quality, duration, and associated symptoms were collected via structured questionnaires. Self-reported data are susceptible to recall bias (inaccurate memory of past sleep) and social desirability bias (participants over-reporting good habits or under-reporting symptoms).

Small, Specific Sample Size: The study was conducted on a small, specific sample (n=31) from a hospital that engages in night call duty in Benin City. While providing strong localized evidence, the findings may not be fully generalizable to the entire population of radiographers across Nigeria or those working in primary/secondary healthcare settings who may also participate in night call duty.

Absence of Objective Sleep Measures: The study did not employ objective measures of sleep (e.g., actigraphy or polysomnography). Relying solely on subjective questionnaires may have limited the precision and depth of the sleep pattern assessment.

Exclusion of Performance Metrics: The research focused exclusively on physiological and symptomatic outcomes related to sleep. It did not directly measure the impact of poor sleep on occupational performance metrics, such as diagnostic accuracy, procedural errors, or efficiency, thus limiting the direct quantification of risk to patient safety.

5.4 Suggestions for further studies

Longitudinal and Observational Studies: Future research should adopt a longitudinal design to track the sleep patterns and health outcomes of groups of radiographers over an extended period (e.g., six to twelve months). This would allow researchers to better establish temporal relationships and track the progression of sleep deficiencies over time.

Inclusion of Objective Sleep Measurement: Studies should integrate objective tools, such as actigraphy wristbands or portable electroencephalography (EEG) devices, to provide accurate, non-subjective data on sleep duration, sleep latency, and sleep efficiency during on-call cycles.

Expansion of Scope and Sample: Researchers should replicate this study across a larger and more geographically diverse sample, including radiographers from different levels of care (primary, secondary, and private hospitals) and other geopolitical zones in Nigeria. This would enhance the external validity and generalizability of the findings.

Correlation with Performance and Error Rates: Future studies should aim to correlate measured fatigue levels and poor sleep quality with hard clinical outcomes, such as the number of reported

imaging errors, near-misses, or delays in report turnaround times. This evidence is vital for policy advocacy aimed at improving patient safety.

Interventional Research: Once robust associations are confirmed, future studies should focus on interventional trials to test the effectiveness of proposed solutions, such as restructured call schedules (e.g., 8-hour maximum shifts), mandatory nap policies, or structured light therapy, in improving radiographers' sleep and reducing adverse symptoms.

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APPENDIX

I. Research instrument

QUESTIONNAIRE

ASSESSING THE IMPACT OF NIGHT CALL DUTY ON SLEEP PATTERNS AMONG RADIOGRAPHERS IN BENIN METROPOLIS.

The aim of this questionnaire is to assess the impact of night call duty on the sleep patterns and related health outcomes among radiographers working in Benin City. It seeks to evaluate the frequency and nature of night call duty, examine changes in sleep quality using the Pittsburgh Sleep Quality Index (PSQI), and identify physical and mental symptoms associated with disrupted sleep. The researcher, EREWELE EVIDENCE AGBALE, is a 500 Level student of the Radiography Department of University of Benin. Can you please spare your valuable time to fill out this questionnaire? The information obtained will be used solely for academic purposes and will be treated with the highest confidentiality. Your cooperation and support are deeply appreciated.

Consent:

I have read and understood the aim of this study and willingly consent to participate.

Signature: _____ **Date:** _____

INSTRUCTIONS

Do not provide personal details not requested, such as names, addresses, or phone numbers. Tick (✓) where appropriate and answer all questions

SECTION A: SOCIO-DEMOGRAPHIC INFORMATION

Gender: [ ] Male [ ] Female

Age: [ ] 18–25 [ ] 26–40 [ ] 41–60 [ ] Above 60

Marital Status: [ ] Single [ ] Married [ ] Divorced [ ] Widowed

Educational Level: [ ] Diploma [ ] B.Sc [ ] M.Sc/PhD [ ] Others:

Do you smoke? [ ] Yes [ ] No

Do you consume alcohol regularly? [ ] Yes [ ] No

SECTION B: NIGHT CALL DUTY EXPOSURE

How long have you been working as a radiographer?

[ ] Less than 1 year [ ] 1–5 years [ ] 6–10 years [ ] Over 10 years

Do you currently participate in night call duty?

[ ] Yes [ ] No

Average number of night calls per week:

[ ] 0–1 [ ] 2–3 [ ] 4–5 [ ] More than 5

On average how long does each night call duty last:

[ ] Less than 6 hours [ ] 6–8 hours [ ] 9–12 hours [ ] More than 12 hours

Are rest breaks provided during your night call shifts?

[ ] Yes [ ] No

How long are these rest breaks _____ minutes

[ ] 1-15 [ ] 16-30 [ ] 31-60 [ ] More than 60

How would you rate the workload intensity during your night shifts?

[ ] Low [ ] Moderate [ ] High [ ] Very High

How many weeks in a month are you placed on night call duty?

[ ] 0 [ ] 1 [ ] 2 [ ] 3 [ ] 4

Do you think your night call schedule allows for enough rest and recovery?

[ ] Yes [ ] No [ ] Sometimes

How much time (hours or days) do you usually have to recover after night calls?

[ ] Less than 4 Hours [ ] 4-8 Hours [ ] 8-12 Hours [ ] 1 day [ ] 2 days

[ ] More than 2 days

SECTION C: SLEEP PATTERNS

The following questions refer to your sleep habits during the past month. Please answer all questions as accurately as possible. Usual sleep schedule:

During the past month, what time have you usually gone to bed at night?

[ ] Between 8-9 PM [ ] Between 9-10 PM [ ] Between 10-11PM

[ ] Between 11 PM-12 AM [ ] After Midnight

During the past month, what time have you usually gotten up in the morning?

[ ] Before 4 AM [ ] Between 4-5 AM [ ] Between 5-6 AM

[ ] Between 6-7 AM [ ] After 8 AM

During the past month, how many hours of actual sleep did you get at night? (This may be different than the number of hours you spend in bed.)

[ ] More than 8 Hours [ ] 8 Hours [ ] 7 Hours [ ] 6 Hours [ ] 5 Hours

[ ] 4 Hours [ ] Less than 4 Hours

During the past month, how long (in minutes) has it usually taken you to fall asleep each night?

_____ minutes

[ ] 1-10 [ ] 11-20 [ ] 21-30 [ ] 31-40 [ ] 41-50 [ ] 51-60

[ ] More than 60

During the past month, how often have you had trouble sleeping because you:

a. Cannot get to sleep within 30 minutes?

[ ] Not within the last month [ ] Less than 4 times last month

[ ] 1-2 Times a week [ ] 3 or more times a week

b. Wake up in the middle of the night?

[ ] Not within the last month [ ] Less than 4 times last month

[ ] 1-2 Times a week [ ] 3 or more times a week

c. Have to get up to use the bathroom?

[ ] Not within the last month [ ] Less than 4 times last month

[ ] 1-2 Times a week [ ] 3 or more times a week

d. Cannot breathe comfortably?

[ ] Not within the last month [ ] Less than 4 times last month

[ ] 1-2 Times a week [ ] 3 or more times a week

e. Have pain?

[ ] Not within the last month [ ] Less than 4 times last month

[ ] 1-2 Times a week [ ] 3 or more times a week

f. Other reason(s), please describe: _____

During the past month, how often have you taken medicine to help you sleep?

[ ] Not within the last month [ ] Less than 4 times last month [ ] 1-2 Times a week

[ ] 3 or more times a week

How restful has your sleep been over the last month

[ ]Refreshing [ ]Unrefreshing [ ]Mildly refreshing

SECTION D: SLEEP RELATED SYMPTOMS

For each of the following symptoms, please indicate how frequently you have experienced it during the past month by selecting one of: Never, Rarely, Sometimes, Often, Always.

Fatigue and daytime sleepiness:

[ ] Never [ ] Rarely [ ] Sometimes [ ]Often

Have you ever experienced microsleep (nodding off) at work?

[ ] Never [ ] Rarely [ ] Sometimes [ ]Often

Headaches: [ ] Never [ ] Rarely [ ] Sometimes [ ]Often

Difficulty concentrating:

[ ] Never [ ] Rarely [ ] Sometimes [ ]Often

Mood disturbances (e.g., irritability, anxiety, depression):

[ ] Never [ ] Rarely [ ] Sometimes [ ]Often

Gastrointestinal issues:

[ ] Never [ ] Rarely [ ] Sometimes [ ]Often

Memory problems: [ ] Never [ ] Rarely [ ] Sometimes [ ]Often

Reduced motivation: [ ] Never [ ] Rarely [ ] Sometimes [ ]Often

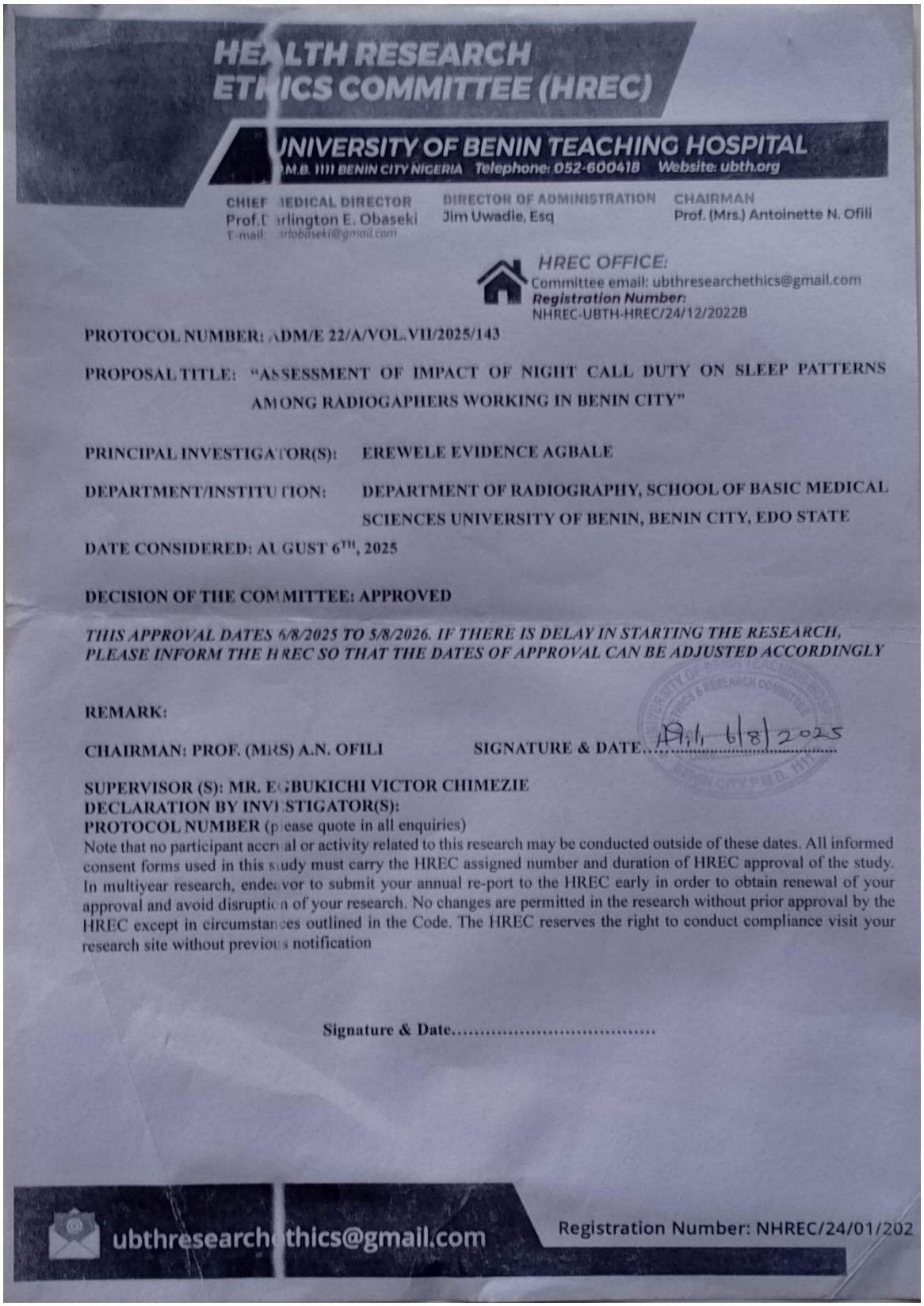
Impaired work performance:

[ ] Never [ ] Rarely [ ] Sometimes [ ] Often

Frequent illnesses or reduced immunity:

[ ] Never [ ] Rarely [ ] Sometimes [ ]Often

II. ETHICAL APPROVAL



HEALTH RESEARCH ETHICS COMMITTEE (HREC)

UNIVERSITY OF BENIN TEACHING HOSPITAL

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Registration Number:
NHREC-UBTH-HREC/24/12/2022B

PROTOCOL NUMBER: ADM/E 22/A/VOL.VII/2025/143

PROPOSAL TITLE: "ASSESSMENT OF IMPACT OF NIGHT CALL DUTY ON SLEEP PATTERNS AMONG RADIOGAPHERS WORKING IN BENIN CITY"

PRINCIPAL INVESTIGATOR(S): EREWELE EVIDENCE AGBALE

DEPARTMENT/INSTITUTION: DEPARTMENT OF RADIOGRAPHY, SCHOOL OF BASIC MEDICAL SCIENCES UNIVERSITY OF BENIN, BENIN CITY, EDO STATE

DATE CONSIDERED: AUGUST 6TH, 2025

DECISION OF THE COMMITTEE: APPROVED

THIS APPROVAL DATES 6/8/2025 TO 5/8/2026. IF THERE IS DELAY IN STARTING THE RESEARCH, PLEASE INFORM THE HREC SO THAT THE DATES OF APPROVAL CAN BE ADJUSTED ACCORDINGLY

REMARK:

CHAIRMAN: PROF. (MRS) A.N. OFILI SIGNATURE & DATE 6/8/2025

SUPERVISOR (S): MR. EGBUKICHI VICTOR CHIMEZIE
DECLARATION BY INVESTIGATOR(S):
PROTOCOL NUMBER (please quote in all enquiries)
Note that no participant accrual or activity related to this research may be conducted outside of these dates. All informed consent forms used in this study must carry the HREC assigned number and duration of HREC approval of the study. In multiyear research, endeavor to submit your annual re-port to the HREC early in order to obtain renewal of your approval and avoid disruption of your research. No changes are permitted in the research without prior approval by the HREC except in circumstances outlined in the Code. The HREC reserves the right to conduct compliance visit your research site without previous notification

Signature & Date.....

ubthresearchethics@gmail.com

Registration Number: NHREC/24/01/202