

Dongola University
Faculty of Medicine and Health Sciences
Department of Community Medicine

Research Proposal:

Association Between Night Shift Work, Sleep Quality, and Physical Well-Being Among Healthcare Providers in Dongola Locality, Sudan, 2026

By

Asawer Ibrahim Idris Ibrahim

Sahar Ammar Ibrahim Ahmed

Supervised by:

Dr:Kamal Abdalla

Academic Year 2026

1. Introduction

1.1 Background

Shift work, particularly night shift work, is a structural feature of modern healthcare delivery because healthcare services require continuous patient care. A cross-sectional study of 686 clinical nurses found poor sleep quality in 62.11% of nurses currently working consecutive night shifts and 55.75% of nurses who had worked night shifts in the past; sleep quality worsened with longer exposure to consecutive night shifts (1). Globally, close to one-fifth of the workforce works shifts outside standard daytime hours, and the healthcare sector consistently ranks among the industries most affected by insomnia and short sleep duration, with healthcare workers forming the largest single group of shift workers in many countries (2).

This burden is reflected in a wide and consistent body of prevalence data. A recent systematic review and meta-analysis of 26 studies covering 18,857 nurses across 12 countries found the global prevalence of shift work disorder among nurses to be 45.5%, with the highest regional prevalence found in Africa (51.0%) (3). A separate meta-analysis of over 12,000 Chinese healthcare workers during the COVID-19 pandemic found a comparable pooled prevalence of sleep disturbances of 45.1% (4). Individual cross-sectional studies report figures well above these pooled estimates: a Chinese hospital-based study found 90.1% of night-shift nurses had poor sleep quality (5); an e-mail-based survey of nurses in Newcastle upon Tyne, North East England, found 78% prevalence of poor sleep quality (6); and a Norwegian study of hospital nurses found night-shift insomnia in 67% of those on rotating three-shift schedules versus 41.7% of those on permanent night duty (7).

Beyond sleep quality, a growing body of literature links shift work to physical health outcomes. A global systematic review and meta-analysis of cardiovascular risk factors among more than 117,000 nurses found a high prevalence of several cardiovascular risk factors, with higher levels reported among shift-working nurses than among day-working nurses (8). A systematic review and meta-analysis focused on metabolic syndrome among healthcare shift workers also reported an increased risk compared with day workers (9). In clinical settings, sleep deprivation and extended work schedules have also been linked to patient and occupational safety concerns. A prospective randomized study found that interns working extended shifts of 24 hours or more made substantially more serious medical errors than interns working shorter shifts (17). In addition, a national prospective cohort study of interns found that extended work duration and night work were associated with an increased risk of percutaneous injuries, including needlestick-type injuries (18). These findings underscore that disturbed sleep and fatigue among healthcare providers are not only occupational health concerns but also patient- and worker-safety issues.

Within Africa, evidence is accumulating but remains geographically uneven. A multicenter cross-sectional study among 398 healthcare workers in public hospitals in Sidama National Regional State, Ethiopia, found a shift-work sleep disorder prevalence of 33.67% (95% CI: 29.17%–38.45%); working three shifts, having 11 or more night shifts per month, sleeping less than 7 hours per day, and khat use were among the factors significantly associated with shift-work sleep disorder (2). In another Ethiopian study of 369 nurses in Harari Regional State and Dire Dawa Administration, shift-work sleep disorder prevalence was 30.4%, with being female, working more than 11 night shifts per month, and khat use significantly associated with the disorder (10). By contrast, a PSQI-based study at the University of Gondar Comprehensive Specialized Hospital found a considerably higher overall poor sleep quality prevalence of 58.9%, with shift work associated with nearly six times the odds of poor sleep relative to non-shift work (11) — a discrepancy the Harari authors attributed in part to instrument choice, since PSQI-based studies tend to report higher prevalence than studies using ICSD-3-based criteria (10).

In Sudan, evidence remains markedly limited. A 2024 cross-sectional online survey of 649 Sudanese doctors, conducted amid the ongoing conflict, found that no prior investigation had examined the prevalence of sleep disorders among healthcare professionals in Sudan (12). This survey, however, relied on convenience sampling via social media, was restricted to doctors, used a national rather than locality-based sampling frame, and was conducted under acute conflict conditions unlikely to generalize to more stable periods or settings.

To date, no study has specifically examined the prevalence and correlates of night shift work, poor sleep quality, and physical well-being among healthcare providers in Dongola Locality, Northern State. Given the well-documented global and regional burden, the substantial variability in prevalence across settings and instruments, and the serious occupational and patient-safety consequences of disturbed sleep, there is a clear need for locally generated evidence. The present study therefore aims to determine the prevalence of night shift work and poor sleep quality, and their association with physical well-being, among healthcare providers in Dongola Locality, addressing this local research gap and contributing context-specific evidence to inform workforce and patient-safety policy in the Sudanese healthcare system.

1.2 Problem Statement

Night shift work is an essential component of continuous healthcare delivery, but evidence indicates that working at night is associated with substantial sleep-related problems among healthcare workers. A recent systematic review and meta-analysis estimated a pooled prevalence of shift-work disorder of 45.5% among nurses, with a prevalence of 51.0% in

studies from Africa (3). Among 711 Chinese night-shift nurses, 90.1% had poor sleep quality based on the Pittsburgh Sleep Quality Index (PSQI) (5), while a study of 418 healthcare professionals in Ethiopia found poor sleep quality in 58.9% of participants and higher odds among shift workers (adjusted odds ratio 5.7, 95% CI 2.3–14.3) (11). These findings indicate that poor sleep is a substantial occupational health concern among healthcare workers, although prevalence estimates vary across populations and measurement approaches.

The available evidence also suggests that shift work may be related to physical health outcomes. A systematic review and meta-analysis among healthcare workers found an increased risk of metabolic syndrome among shift workers compared with day workers (9). However, much of the available evidence is cross-sectional and is concentrated in nurses or specific healthcare settings, which limits causal interpretation and direct generalization to other healthcare cadres and local contexts (3,5,9,11). Evidence from Sudan remains limited. A 2024 online survey of 649 Sudanese healthcare professionals reported substantial sleep disturbance, but it included doctors and other healthcare professionals recruited through an online convenience sample during the conflict and therefore does not provide locality-specific evidence for Dongola (12).

Within the literature reviewed for this proposal, no institution-based study was identified that specifically examined night shift work, sleep quality, and physical well-being among healthcare providers in Dongola Locality. The available Sudanese evidence is national rather than locality-based and is limited by its online convenience sampling and conflict context (12). In addition, much of the regional literature focuses on nurses or other restricted occupational groups (3,10,11). Consequently, there is a need for local evidence that includes different healthcare cadres and compares current night-shift workers with non-night-shift workers.

Therefore, this study seeks to determine the proportion of healthcare providers engaged in night shift work, estimate the prevalence of poor sleep quality, assess physical well-being, and examine the associations between night shift work, sleep quality, and physical well-being among healthcare providers working in public hospitals in Dongola Locality, Northern State, Sudan.

1.3 Justification:

- Evidence shows that night shift work is associated with poor sleep quality among healthcare workers. For example, poor sleep quality was reported in 90.1% of night-shift nurses in China and 78% of nurses in North East England (5,6).

- Night shift work is also associated with physical health risks, including cardiovascular risk factors and a higher risk of metabolic syndrome among healthcare shift workers (8,9).

- However, the reported prevalence of sleep problems varies between studies, partly because of differences in the measurement tools used (10,11).

- In Sudan, evidence is very limited. A 2024 study included 649 doctors, but used online convenience sampling, focused only on doctors, and was conducted at the national level during the conflict (12).

- There is currently no study in Northern State or Dongola Locality examining the relationship between night shift work, sleep quality, and physical well-being among healthcare providers.

- Therefore, this study is needed to provide local evidence among physicians, pharmacists, nurses, and laboratory technicians in Dongola.

Research questions :

What is the association between night shift work and sleep quality, and between sleep quality and physical well-being, among healthcare providers in Dongola Locality, Sudan, in 2026?

Research Hypotheses:

Null hypothesis (H_0):

There is no statistically significant association between night shift work and poor sleep quality among healthcare providers in Dongola Locality.

Alternative hypothesis (H_1):

There is a statistically significant association between night shift work and poor sleep quality among healthcare providers in Dongola Locality.

1.4 Research Objectives

General Objective

To study the prevalence of night shift work and poor sleep quality and to examine their associations with physical well-being among healthcare providers working in public hospitals in Dongola Locality, Northern State, Sudan, 2026.

Specific Objectives

1. To determine the prevalence of night shift work and poor sleep quality and assess physical well-being among healthcare providers in the selected hospitals using the Pittsburgh Sleep Quality Index (PSQI) and the physical component summary of the SF-12 (PCS-12).
2. To examine the association between night shift work and poor sleep quality and identify factors independently associated with poor sleep quality among healthcare providers.
3. To assess the correlation between sleep quality (PSQI score) and physical well-being (PCS-12 score) using Spearman's rank correlation coefficient.

2. Literature Review

2.1 International Studies

The international literature on night shift work and sleep disturbance among healthcare workers is extensive but methodologically fragmented. Large meta-analyses converge on a substantial burden: the pooled global prevalence of shift work disorder among nurses has been estimated at 45.5%, with regional variation from 46.5% in Asia to 51.0% in Africa (3), and pooled sleep disturbance prevalence among Chinese healthcare workers during COVID-19 was estimated at 45.1% (4). Individual cross-sectional studies, however, report figures ranging far more widely — from 55.75–62.11% among Chinese nurses depending on current versus past night-shift status (5), to 90.1% among Chinese night-shift nurses using the same PSQI cutoff (5), to 78% among English nurses (6), to 67%/41.7% (rotating/permanent) among Norwegian nurses (7). This spread illustrates that prevalence estimates in this literature are highly sensitive to instrument choice, population, and shift-schedule definitions, and cannot be compared uncritically across studies.

Beyond sleep quality itself, international evidence increasingly links shift work to physical health outcomes relevant to this study's third objective. A global meta-analysis of cardiovascular risk factors among more than 117,000 nurses found elevated risk of sedentary lifestyle, family history of cardiovascular disease, overweight, and alcohol consumption, worsened specifically among shift-working nurses relative to day-working nurses (8). Similarly, a systematic review and meta-analysis of metabolic syndrome among healthcare shift workers found consistently elevated risk compared with day workers, with

the risk for healthcare shift workers appearing greater than for shift workers in other industries (9). These findings substantiate the biological plausibility of a night-shift–sleep–physical-health pathway, but the evidence base remains concentrated in China, Western Europe, and pooled multinational samples, with cross-sectional designs predominating throughout — a limitation that constrains causal inference and recurs across this entire literature.

2.2 Regional Studies

Ethiopia has produced the most substantial regional body of evidence, though findings vary considerably by instrument. A study of 369 nurses in Harari Regional State and Dire Dawa Administration, using ICSD-3-based criteria combined with the Bergen Insomnia Scale and Epworth Sleepiness Scale, found a shift-work sleep disorder prevalence of 30.4%, with being female, working more than 11 night shifts per month, and khat use significantly associated (10). By contrast, a PSQI-based study at the University of Gondar Comprehensive Specialized Hospital found a considerably higher overall poor sleep quality prevalence of 58.9%, with shift work associated with nearly six times the odds of poor sleep relative to non-shift work (11). The Harari study's authors explicitly attributed part of this discrepancy to instrument choice, noting that PSQI-based studies (as in the Gondar and English studies) tend to report higher prevalence than studies using ICSD-3-based criteria (10) — an instrumentation problem that complicates any direct cross-study comparison and is a central methodological consideration for the present study's instrument selection.

2.3 Local Studies (Sudan)

Evidence specific to Sudan is markedly sparse. The most directly relevant available study is a 2024 cross-sectional online survey of 649 Sudanese doctors, conducted amid the ongoing conflict, which examined sleep quality, daytime sleepiness, and psychological well-being; the authors explicitly stated that no prior investigation had examined the prevalence of sleep disorders among healthcare professionals in Sudan (12). This survey, however, relied on convenience sampling via social media, was restricted to doctors (excluding nurses and other cadres), used a national rather than locality-based sampling frame, and was conducted under acute conflict conditions that likely amplified psychological distress in ways not generalizable to more stable periods or settings. No published study to date has examined night shift work, sleep disturbance, or associated physical well-being outcomes among healthcare providers at the state or locality level in Sudan, and none has covered Northern State or Dongola Locality specifically.

2.4 Synthesis: Inconsistencies and Knowledge Gaps

Several patterns emerge from this literature that both justify and shape the present study:

Wide and inconsistent prevalence estimates. Reported prevalence of poor sleep quality or shift work disorder among healthcare workers ranges from approximately 30% to over 90% across studies (3–7, 10, 11), a spread too wide to be explained by true population variation alone.

Instrumentation heterogeneity as a likely driver of inconsistency. PSQI-based studies consistently report higher prevalence than studies using ICSD-3-based criteria or composite insomnia/sleepiness scales (10), meaning cross-study comparisons are only meaningful when instrument choice is accounted for.

Predominance of cross-sectional designs. Nearly all cited studies, including the largest meta-analyses, are cross-sectional (3–5, 10–12), limiting causal inference about the direction of association between night shift work, sleep disturbance, and physical health.

Underexamined physical well-being outcomes in African and Sudanese settings. International evidence increasingly links shift work to cardiovascular and metabolic risk (8, 9), but this dimension has been little explored in African healthcare worker populations and not at all in Sudan.

Occupational and cadre restriction. Much of the regional and Sudanese evidence focuses narrowly on nurses (3, 10, 11) or doctors (12), leaving other healthcare cadres largely unstudied.

Absence of sub-national Sudanese evidence. The single available Sudanese study is national in scope, conflict-affected, doctor-only, and based on convenience online sampling (12); no study has generated locality-level evidence from a stable, institution-based sample, unlike the Ethiopian studies reviewed above (10, 11).

3. Materials and Methods

3.1 Study Design

An institution-based analytical cross-sectional study will be conducted to determine the prevalence of night shift work and poor sleep quality and to assess their associations with physical well-being among healthcare providers in Dongola Locality, Northern State, Sudan.

3.2 Study Area

The study will be conducted at Dongola Specialized Hospital, Military Hospital, Police Hospital, and Maternity and Obstetrics Hospital, Dongola Locality, Northern State. The source population comprises physicians, pharmacists, nurses, and laboratory technicians employed in these four selected hospitals during the study period, regardless of whether

they currently work night shifts, since non-night-shift workers are required as a comparison group.

Inclusion criteria:

1. Healthcare providers who are physicians, pharmacists, nurses, or laboratory technicians; who have been employed at the selected hospital for at least six months.
2. who consent to participate.

Exclusion criteria:

1. Healthcare providers on leave (annual, sick, or maternity) during the data collection period;
2. those with a previously diagnosed sleep disorder unrelated to occupational shift work.
3. administrative or non-clinical staff not engaged in direct patient-care shift rosters.

3.3 Study Period

The overall study will be conducted over approximately four months, from September 2026 to January 2027. Data collection will take place during the period specified in the Work Plan.

3.4 Study Population

The study population comprises all eligible healthcare providers, including physicians, pharmacists, nurses, and laboratory technicians, who meet the inclusion criteria specified in Section 3.2 and are available at the study site during the data collection period. This includes both current night-shift workers and non-night-shift workers.

3.5 Sample Size

A formal sample size calculation using a statistical formula was not performed. A census (total population) sampling technique will instead be used because the total number of eligible healthcare providers across the four selected hospitals is expected to be relatively small and manageable within the study period.

3.6 Sampling Technique

A total population (census) sampling method will be used instead of random sampling because the total number of eligible healthcare providers across the four selected hospitals is expected to be relatively small.

The exact number of eligible participants (N) will be obtained from facility records and all eligible providers will be invited.

Response rate will be reported as: enrolled participants / total eligible population.

3.7 Study Variables

Dependent variables:

Sleep quality: measured by PSQI score (good ≤5, poor >5).

Physical well-being: measured by SF-12 Physical Component Summary (PCS-12) score.

Independent variables:

Night-shift status (current night-shift worker vs non-current night-shift worker) and night-shift characteristics (frequency and years of exposure).

Sociodemographic factors (age, sex, marital status).

Occupational factors (cadre, experience, department).

Lifestyle factors (caffeine, khat, alcohol, tobacco, exercise).

3.8 Operational Definitions

Night shift work: A work schedule that includes at least 3 hours of work between 22:00 and 06:00.

Current night-shift worker: A healthcare provider who has worked at least one night shift during the previous month.

Poor sleep quality: PSQI score >5.

Physical well-being: Assessed using the SF-12 Physical Component Summary (PCS-12) score as a continuous variable.

Healthcare providers include physicians, pharmacists, nurses, and laboratory technicians.

Regular exercise: Moderate activity ≥30 minutes on ≥3 days/week.

3.9 Study Instruments

Data collection questionnaire will include:

Sociodemographic and occupational information.

PSQI for sleep quality (validated Arabic versions).

SF-12 PCS-12 for physical well-being (validated Arabic version).

Lifestyle factors checklist.

The questionnaire will be pre-tested before data collection to ensure clarity and cultural suitability.

3.10 Data Collection Procedure

Data collection will take place across the four selected hospitals over approximately 5 weeks of the study period (see Section 4, Work Plan).

The principal investigator will supervise data collection and review completed questionnaires daily for completeness and consistency.

3.11 Statistical Analysis

Data will be analyzed using SPSS or Stata.

Descriptive statistics will summarize participant characteristics and outcomes.

Prevalence of poor sleep quality will be reported with 95% confidence intervals, and physical well-being (SF-12 PCS-12) will be summarized as mean ± SD.

Chi-square or Fisher's exact test will be used to assess associations between categorical variables, including night-shift status and poor sleep quality.

Multivariable logistic regression will be used to identify factors independently associated with poor sleep quality while controlling for potential confounders.

Results will be presented as adjusted odds ratios (AOR) with 95% CI.

Model quality will be checked using Hosmer–Lemeshow test and multicollinearity assessment (VIF).

The correlation between PSQI score and SF-12 PCS-12 score will be assessed using Spearman's rank correlation coefficient.

3.12 Ethical Considerations

- 1. Ethical approval will be obtained from the Research Ethics Committee of Dongola University/Faculty of Medicine and Health Sciences prior to data collection.
- 2. Official permission will be obtained from the administration of each of the four participating hospitals.
- 3. Written informed consent will be obtained from all participants before enrollment.
- 4. Participation will be voluntary, and participants may withdraw at any stage without any negative consequences.
- 5. Confidentiality and anonymity of participants' data will be strictly maintained throughout the study.

4. Work Plan & Timeline

The study will follow the official timeline issued by the Department of Community Medicine, Faculty of Medicine and Health Sciences, University of Dongola, for Batch 23 graduation research projects, spanning approximately 15 weeks from 20 September 2026 to 4 January 2027, as outlined below.

No.	Activity	Period	Sep		Oct				Nov					Dec				Jan
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	Proposal writing & submission	20–24 September 2026																
2	Proposal presentation	27 September – 1 October 2026																
3	Data collection (four participating hospitals)	4–22 October 2026																
4	Data entry & analysis	25 October – 5 November 2026																
5	Writing results & discussion	8–19 November 2026																
6	Writing the final report	22 November – 3 December 2026																
7	Electronic submission to the Department of Community Medicine	6–10 December 2026																
8	Research evaluation (peer review)	13–24 December 2026																
9	Revision of research	27–31 December 2026																
10	Final discussion	3–4 January 2027																

5. Budget Outline

The estimated budget required for the implementation of this study is presented below. Final figures will be completed once local supplier and transport costs in Dongola Locality are confirmed.

No.	Item	Total Cost (SDG)
1	Stationery & printing (questionnaires, consent forms)	60,000
2	Data collectors' transportation (4 hospitals)	50,000

No.	Item	Total Cost (SDG)
3	Communication (airtime/internet)	30,000
4	Data entry & statistical software	400,000
5	Report printing & binding	60,000
6	Contingency	30,000
	Total	630,000

Note: The amounts above are approximate estimates for internal planning purposes only. Final costs will be confirmed according to actual local expenses.

6. References

1. Huang Q, Tian C, Zeng X-T. Poor sleep quality in nurses working or having worked night shifts: a cross-sectional study. Front Neurosci. 2021;15:638973.

2. Adane A, Getnet M, Belete M, Yeshaw Y, Dagnew B. Shift-work sleep disorder among health care workers at public hospitals, the case of Sidama national regional state, Ethiopia: a multicenter cross-sectional study. PLoS One. 2022;17(7):e0270480.

3. Zhao X, Zhang L, Zhang X, Guo J, Guan R, Cheng Y, Jia Y. The prevalence and risk factors of shift work disorder among nurses: a systematic review and meta-analysis. Int J Nurs Stud. 2025 (online ahead of print).

4. Xia L, Chen C, Liu Z, Luo X, Guo C, Liu Z, Zhang K, Liu H. Prevalence of sleep disturbances and sleep quality in Chinese healthcare workers during the COVID-19

pandemic: a systematic review and meta-analysis. Front Psychiatry. 2021;12:646342.

5. Xiao Q, Huang X, Yang T, Huang L, Li N, Wang J, Huang J, Huang Y, Huang H, Wang Y. Determinants of sleep quality and their impact on health outcomes: a cross-sectional study on night-shift nurses. Front Psychiatry. 2024;15:1506061.

6. McDowall K, Murphy E, Anderson K. The impact of shift work on sleep quality among nurses. Occup Med. 2017;67(8):621-625.

7. Flo E, Pallesen S, Mageroy N, Moen BE, Gronli J, Hilde Nordhus I, et al. Shift work disorder in nurses–assessment, prevalence and related health problems. PLoS One. 2012;7(4):e33981.

8. Khani S, Rafiei S, Ghashghaee A, Masoumi M, Rezaee S, Kheradkhah G, Abdollahi B, Figueiredo ACMG, Khashayar P. Cardiovascular risk factors among nurses: a global systematic review and meta-analysis. PLoS One. 2024;19(3):e0286245.

9. Sooriyaarachchi P, Jayawardena R, Pavey T, King NA. Shift work and the risk for metabolic syndrome among healthcare workers: a systematic review and meta-analysis. Obes Rev. 2022;23(10):e13489.

10. A Abate H, Letta S, Worku T, Tesfaye D, Amare E, Mechal A. Shiftwork sleep disorder and associated factors among nurses working at public hospitals in Harari Regional state and Dire Dawa Administration,

Eastern Ethiopia: a cross-sectional study. BMC Nurs. 2023;22:118.

11. Tesfaye W, Getu AA, Dagnew B, Lemma A, Yeshaw Y. Poor sleep quality and associated factors among healthcare professionals at the University of Gondar Comprehensive Specialized Hospital, Northwest Ethiopia. Front Psychiatry. 2024;15:1225518.

12. Amin MHJ, Elmahi MAME, Fadlalmoula GAAG, Amin JHJ, Alrabee NHK, Awad MH, et al. Assessment of the importance of sleep quality and the effects of deprivation on Sudanese healthcare professionals amidst conflict in Sudan. Sleep Sci Pract. 2024;8:10.

13. Suleiman KH, Yates BC, Berger AM, Pozehl B, Meza J. Translating the Pittsburgh Sleep Quality Index into Arabic. West J Nurs Res. 2010;32(2):250-268.

14. Al Maqbali M, Hughes C, Gracey J, Rankin J, Dunwoody L, Hacker E. Validation of the Pittsburgh Sleep Quality Index (PSQI) with Arabic cancer patients. Sleep Biol Rhythms. 2020;18(3):217-223.

15. Alqarni RA, Almutairi NS, Albalawi AS, Alsulami MB, Alhashrani MA, Bin Abdulrahman KA. Test-retest reliability of the Arabic version of the Pittsburgh Sleep Quality Index. Medicine (Baltimore). 2025;104(3):e41269.

16. Haddad C, Sacre H, Obeid S, Salameh P, Hallit S. Validation of the Arabic version of the "12-item short-

form health survey" (SF-12) in a sample of Lebanese adults. Arch Public Health. 2021;79:56.

17. Landrigan CP, Rothschild JM, Cronin JW, Kaushal R, Burdick E, Katz JT, Lilly CM, Stone PH, Lockley SW, Bates DW, Czeisler CA. Effect of reducing interns' work hours on serious medical errors in intensive care units. N Engl J Med. 2004;351(18):1838-1848. doi:10.1056/NEJMoa041406.

18. Ayas NT, Barger LK, Cade BE, Hashimoto DM, Rosner B, Cronin JW, Speizer FE, Czeisler CA. Extended work duration and the risk of self-reported percutaneous injuries in interns. JAMA. 2006;296(9):1055-1062. doi:10.1001/jama.296.9.1055.