

ORIGINAL ARTICLE

Prevalence of Sleep Disturbance and the Impact of Psychologist-Delivered Cognitive Behavioural Therapy in Newly Diagnosed Cancer Patients: A Prospective Single-Centre Study from Saudi Arabia

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Abstract

Background. Sleep disturbance is among the most prevalent and undertreated symptoms in patients with cancer, yet data from Middle Eastern oncology settings are scarce. Cognitive behavioural therapy for insomnia (CBT-I) is the guideline-endorsed first-line treatment but is rarely operationalised as a routine psychologist-delivered service in the region.

Objective. To determine the prevalence of clinically significant sleep disturbance among newly diagnosed cancer patients at a single tertiary centre and to evaluate the short-term impact of a psychologist-delivered CBT/CBT-I intervention on sleep outcomes.

Methods. Prospective single-centre observational study of 99 consecutive newly diagnosed cancer patients treated at the Armed Forces Hospital, Southern Region, Saudi Arabia, between December 2023 and June 2024. Patients were screened for sleep disturbance at each treatment cycle; those screening positive underwent structured clinical and psychological assessment, and confirmed cases received manualised, psychologist-delivered CBT/CBT-I. Outcomes were graded as complete resolution, moderate improvement, or no improvement. Proportions are reported with 95% Wilson confidence intervals (CI).

Results. Sleep disturbance was screen-positive in 27/99 patients (27.3%; 95% CI 19.5–36.8) and confirmed in 20 (20.2% of the cohort; 95% CI 13.5–29.2). Emotional instability was the most frequently identified contributor (9/20; 45.0%), followed by pain (4/20; 20.0%). Anxiety or depressed mood was reported by 44.4% of affected patients. Following CBT, any degree of sleep improvement occurred in 13/20 patients (65.0%; 95% CI 43.3–81.9), comprising complete resolution in 3 (15.0%; 95% CI 5.2–36.0) and moderate improvement in 10 (50.0%); 7 (35.0%) showed no improvement. The proportion achieving any improvement significantly exceeded the pre-specified 10% quality-improvement target (exact binomial $p < 0.001$).

Conclusions. Clinically significant sleep disturbance affected approximately one in five newly diagnosed cancer patients and was strongly linked to psychological distress. A psychologist-delivered CBT service produced improvement in roughly two-thirds of treated patients, supporting the feasibility and value of embedding evidence-based behavioural sleep care within routine oncology practice. The single-arm design and small sample warrant confirmation in controlled studies using validated instruments.

Keywords: cancer; insomnia; sleep disturbance; cognitive behavioural therapy; psycho-oncology; supportive care.

1. Introduction

Cancer remains one of the leading causes of morbidity and mortality worldwide. According to GLOBOCAN 2022, an estimated 20 million new cancer cases and 9.7 million cancer-related deaths occurred globally, and approximately one in five people develop cancer during their lifetime.^{1,2}

In Saudi Arabia, cancer represents a growing public-health and economic challenge. National registry data document a substantial and sustained rise in incidence over the past two decades, with breast cancer the most frequently diagnosed malignancy among Saudi women, and modelling projects a continued increase in annual case volume and associated cost toward 2030.^{3,4,5} Against this backdrop, the supportive-care needs of newly diagnosed patients—including the management of treatment-related and disease-related symptoms—have assumed increasing importance.

Sleep disturbance is among the most common yet least addressed symptoms in oncology. Depending on the population and assessment method, 30–60% of patients with cancer report insomnia symptoms, and a substantial proportion meet formal diagnostic criteria for an insomnia syndrome—rates roughly two to three times those of the general population.^{6,7,8} In a landmark study of women with breast cancer, insomnia onset followed the cancer diagnosis in one-third of cases, and the majority attributed their sleep difficulties to the illness or its treatment.⁹ Insomnia in this setting is frequently chronic and persists into long-term survivorship.^{10,11} Sleep disruption is closely intertwined with fatigue, pain, anxiety, and depressed mood, and is associated with impaired quality of life and, potentially, poorer treatment tolerance.^{6,12}

Non-pharmacological therapy is recommended as the first-line treatment for chronic insomnia. Cognitive behavioural therapy for insomnia (CBT-I)—a multicomponent intervention combining stimulus control, sleep restriction, cognitive restructuring, and sleep-hygiene education—is endorsed as the preferred initial treatment by the American College of Physicians and the American Academy of Sleep Medicine,^{13,14} and is specifically recommended for cancer-related insomnia by the European Society for Medical Oncology and pan-Canadian guidance.^{15,16} The Insomnia Severity Index (ISI) and the Pittsburgh Sleep Quality Index (PSQI) are the validated instruments most commonly used to screen for and quantify insomnia in this population.^{17,18}

The efficacy of CBT-I in oncology is well established. Randomised controlled trials have demonstrated durable improvements in sleep and psychological outcomes among cancer patients,^{19,20,21} and meta-analyses report large effects on insomnia severity (standardised mean difference ≈ 0.77 – 0.78) that persist to six months.^{22,23,24} Importantly, CBT-I can be delivered effectively by trained non-specialist clinicians, including oncology nurses,²⁰ and structured sleep-hygiene-based educational approaches have shown benefit as a lower-intensity adjunct or alternative for non-specialist delivery.²⁵ Behavioural approaches to insomnia more broadly have also demonstrated durable superiority over pharmacotherapy in randomised comparisons, supporting a non-pharmacological first-line

approach even where specialist therapist availability is limited.²⁶ Increasingly, CBT-I is also delivered through digital platforms, which may mitigate the limited availability of specialist therapists.^{27,28} Nonetheless, real-world data on psychologist-delivered behavioural sleep interventions from Middle Eastern oncology services remain scarce, and the extent to which international recommendations are operationalised in routine regional practice is largely unknown.

We therefore conducted a prospective single-centre study with two aims: (i) to determine the prevalence and clinical correlates of sleep disturbance among newly diagnosed cancer patients at a tertiary centre in the Southern Region of Saudi Arabia; and (ii) to evaluate the short-term impact of a psychologist-delivered CBT/CBT-I intervention on sleep outcomes, against a pre-specified quality-improvement target of at least a 10% absolute improvement over six months.

2. Materials and Methods

2.1 Study design and setting

This was a prospective, single-centre observational study with an embedded quality-improvement intervention, conducted in the Clinical Oncology service of the Armed Forces Hospital, Southern Region, Khams Mushait, Saudi Arabia. Consecutive adults with a new histopathologically confirmed diagnosis of cancer who commenced systemic anticancer therapy between December 2023 and June 2024 were eligible. The study is reported in accordance with the STROBE statement for observational studies; given the embedded quality-improvement component, relevant elements of the SQUIRE 2.0 guideline for quality-improvement reporting were also followed.

2.2 Participants and screening

A total of 99 newly diagnosed cancer patients were enrolled. At each treatment cycle, patients were screened for sleep disturbance through structured clinical enquiry addressing sleep-onset latency, sleep maintenance, early awakening, and daytime consequences. Patients screening positive underwent a detailed clinical and psychological assessment—including a structured mental status examination and evaluation of emotional stability—to confirm the presence, degree, and probable contributors of sleep disturbance and to exclude transient sleep complaints. Family and social support were documented. Detailed mental status examination (Table 3) was undertaken in the subgroup of patients for whom the treating clinical psychologist identified greater psychological complexity, diagnostic uncertainty, or clinician-flagged risk warranting more comprehensive assessment beyond the standard structured evaluation performed in all screen-positive patients.

2.3 Intervention

Patients with confirmed sleep disturbance received a manualised, psychologist-delivered cognitive behavioural intervention for insomnia (CBT/CBT-I) as the standard of care, in keeping with international recommendations that behavioural therapy precede, and may be combined with, pharmacotherapy.^{13,14,15} Core components comprised stimulus control, sleep restriction/consolidation, cognitive restructuring of maladaptive sleep-related beliefs, relaxation training, and sleep-hygiene education, adapted to the patient's treatment schedule and psychological state. Sessions were delivered by clinical psychologists and reinforced at subsequent treatment cycles. Sessions were delivered in individual format, comprising approximately 3-5 sessions of approximately 30 minutes each, typically over 2 months.

2.4 Outcomes

The primary outcome was the clinician-graded change in sleep disturbance following the intervention, categorised as complete resolution, moderate improvement, or no improvement. Outcome grading was operationalised as follows: complete resolution denoted full resolution of subjective sleep complaints with no residual clinician-identified insomnia symptoms at final assessment; moderate improvement denoted a clinician-assessed reduction in sleep-onset latency, nocturnal awakenings, and/or daytime consequences without full resolution; no improvement denoted no discernible clinician-assessed change relative to baseline. The pre-specified quality-improvement benchmark was achievement of at least a 10% absolute improvement in the treated cohort within the six-month study window. Secondary descriptors included the prevalence of confirmed sleep disturbance, its identified contributors, baseline emotional stability, the spectrum of emotional responses to diagnosis, and mental status examination findings.

2.5 Statistical analysis

Categorical variables are summarised as frequencies and percentages with 95% confidence intervals (CI) calculated by the Wilson score method; exact Clopper–Pearson intervals were used as a sensitivity check. Clopper–Pearson intervals did not differ meaningfully from the Wilson score estimates reported here (e.g., confirmed prevalence 20.2%: Wilson 13.5–29.2 vs. Clopper–Pearson 12.8–29.5; any improvement 65.0%: Wilson 43.3–81.9 vs. Clopper–Pearson 40.8–84.6), confirming that the reported proportions are robust to the choice of interval method. The observed proportion achieving improvement was compared with the 10% quality-improvement target using a one-sample exact binomial test. A within-patient pre/post comparison of the dichotomous insomnia outcome was additionally examined using an exact McNemar test. Given the single-arm design and modest sample size, analyses are considered descriptive and hypothesis-generating; no adjustment for multiplicity was applied. Analyses were performed in Python 3 (SciPy, statsmodels); two-sided $p < 0.05$ was considered statistically significant unless otherwise stated.

2.6 Ethical considerations

The study was conducted in accordance with the Declaration of Helsinki. Approval was obtained from the Institutional Research Ethics Committee of the Armed Forces Hospital, Southern Region, and all participants provided informed consent for assessment, intervention, and use of anonymised data.

3. Results

3.1 Prevalence of sleep disturbance

Of 99 newly diagnosed cancer patients screened, 27 (27.3%; 95% CI 19.5–36.8) reported sleep disturbance on initial screening. Structured assessment confirmed clinically significant sleep disturbance of varying degrees in 20 of these 27 patients (74.1%; 95% CI 55.3–86.8), corresponding to a confirmed prevalence of 20.2% (95% CI 13.5–29.2) in the enrolled cohort (Figure 1; Table 1).

3.2 Emotional status and contributors

Among the 27 patients with sleep complaints, baseline emotional stability was graded as moderate in 19 (70.4%; 95% CI 51.5–84.1), stable in 6 (22.2%), and unstable in 2 (7.4%) (Figure 2). A previous psychiatric history was present in 3 patients (11.1%). The emotional response to diagnosis was heterogeneous: anxiety, low mood, or mood instability predominated (12/27; 44.4%; 95% CI 27.6–62.7), followed by loss of appetite (8/27; 29.6%), a desire

for total social isolation (3/27; 11.1%), denial of the diagnosis (2/27; 7.4%), and an essentially unchanged baseline emotional state (2/27; 7.4%) (Table 2).

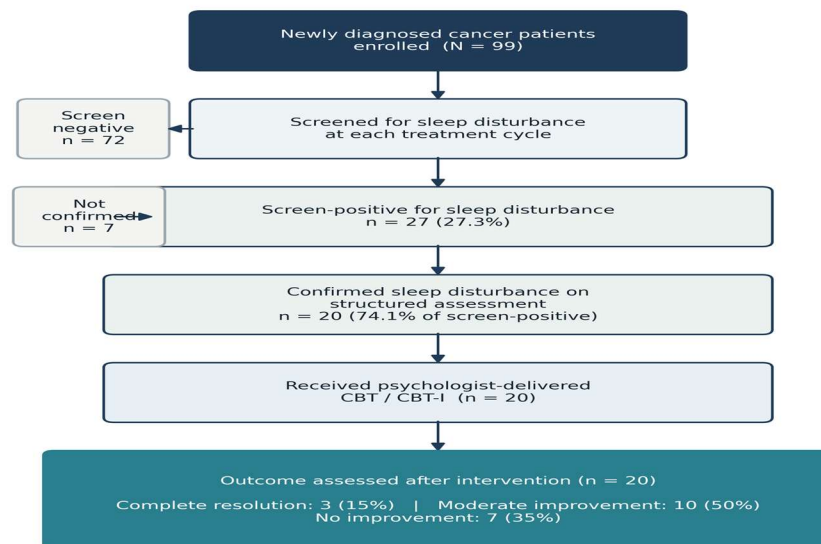


Figure 1. Study flow (STROBE-style) from enrolment through screening, confirmation, intervention, and outcome assessment.

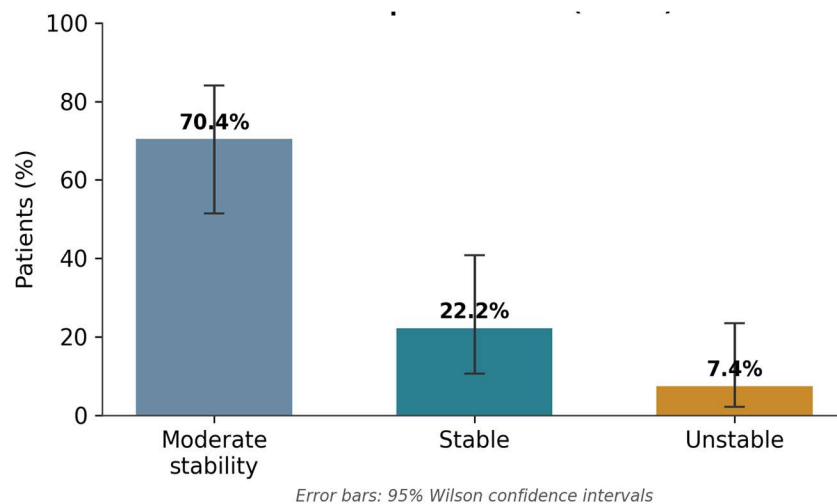


Figure 2. Baseline emotional stability among patients with sleep disturbance (n = 27). Bars show percentages; error bars are 95% Wilson confidence intervals.

Among the 20 patients with confirmed sleep disturbance, the most frequently identified contributor was emotional instability (9/20; 45.0%; 95% CI 25.8–65.8), followed by pain related to surgery or treatment (4/20; 20.0%); an additional 4/20 (20.0%) had other or multifactorial contributors, and 3/20 (15.0%) had no identifiable cause. All affected patients had documented family support (Table 2).

Table 1. Study population and prevalence of sleep disturbance (N = 99)

Stage	n	% (95% CI)
Newly diagnosed cancer patients enrolled	99	—
Screen-positive for sleep disturbance	27	27.3 (19.5–36.8)
Confirmed sleep disturbance (of enrolled cohort)	20	20.2 (13.5–29.2)
Confirmed among screen-positive	20	74.1 (55.3–86.8)

Percentages for confirmed sleep disturbance are expressed relative to the enrolled cohort (n = 99); the final row expresses confirmation relative to screen-positive patients (n = 27). CI, confidence interval (Wilson score method).

Table 2. Psychological status, emotional responses to diagnosis, and contributors to sleep disturbance

Variable	n / N	% (95% CI)
Baseline emotional stability (screen-positive, N = 27)		
Moderate stability	19/27	70.4 (51.5–84.1)
Stable	6/27	22.2 (10.6–40.8)
Unstable	2/27	7.4 (2.1–23.4)
Emotional response to diagnosis (N = 27)		
Anxiety / low or unstable mood	12/27	44.4 (27.6–62.7)
Loss of appetite	8/27	29.6 (15.9–48.5)
Desire for total isolation	3/27	11.1 (3.9–28.1)
Denial of diagnosis	2/27	7.4 (2.1–23.4)
Unchanged baseline emotional state	2/27	7.4 (2.1–23.4)
Previous psychiatric history	3/27	11.1 (3.9–28.1)
Identified contributor to sleep disturbance (confirmed cases, N = 20)		
Emotional instability	9/20	45.0 (25.8–65.8)
Pain (surgical or treatment-related)	4/20	20.0 (8.1–41.6)
Other / multifactorial	4/20	20.0 (8.1–41.6)
No identifiable cause	3/20	15.0 (5.2–36.0)

Denominators differ by variable, as indicated. Emotional-response categories were mutually exclusive (each patient was assigned to a single predominant emotional response). CI, confidence interval (Wilson score method).

3.3 Mental status examination

A structured mental status examination performed in the subgroup undergoing detailed psychological evaluation is summarised in Table 3. Findings were predominantly within normal limits for level of consciousness, thought content, and speech, with a minority exhibiting anxiety, obsessive or fearful thought content, impaired concentration, or reduced insight; isolated self-harm ideation was recorded in one patient, prompting escalation per local safeguarding protocols.

3.4 Response to intervention

All 20 patients with confirmed sleep disturbance received psychologist-delivered CBT. Any degree of improvement was observed in 13 patients (65.0%; 95% CI 43.3–81.9), comprising complete resolution in 3 (15.0%; 95% CI 5.2–36.0) and moderate improvement in 10 (50.0%; 95% CI 29.9–70.1); 7 patients (35.0%; 95% CI 18.1–56.7) reported no improvement (Figure 3; Table 4). The proportion achieving any improvement significantly exceeded the pre-specified 10% quality-improvement target (one-sample exact binomial $p < 0.001$). Complete resolution alone (15.0%) numerically exceeded the target but was not statistically distinguishable from it given the small sample (one-sided exact binomial $p = 0.32$; exact McNemar one-sided $p = 0.125$), underscoring the need for cautious interpretation.

Table 3. Structured mental status examination in the subgroup undergoing detailed psychological evaluation (n = 5)

Domain	Category (n)	Category (n)	Category (n)
General / body habitus	Cachectic (1)	Moderate (4)	—
Psychomotor activity	Decreased (2)	Increased (1)	Appropriate (2)
Irritability	Present (2)	Reduced (3)	—
Eye contact	Poor (1)	—	Appropriate (4)
Speech rate	Slow (1)	Rapid (1)	Normal (3)
Speech volume/amount	Reduced (0)	Increased (3)	Normal (2)
Articulation	Clear (4)	Stuttering (1)	—
Level of consciousness	Reduced (1)	—	Alert (4)
Mood	Anxious (1)	Unstable (2)	Euthymic (2)
Affect / feeling	Restricted (1)	Labile (2)	Appropriate (1)
Depersonalisation	Present (1)	Absent (4)	—
Thought form	Disorganised (2)	Clear (2)	—
Thought flow	Accelerated (2)	Retarded (1)	—
Thought content	Obsessive (2)	Fearful (2)	Self-harm (1)
Concentration / attention	Normal (2)	Impaired (1)	Inattentive (2)

Counts reflect findings in the subgroup that underwent detailed mental status examination; totals per domain vary owing to missing data. Categories were mapped from the original clinical assessment schema to standard descriptors. One patient exhibited self-harm ideation and was managed per local safeguarding protocols. Selection of this subgroup for detailed evaluation is described in Methods §2.2; given the small subgroup size ($n = 5$), these findings should be interpreted as descriptive and not generalised to the wider screen-positive cohort.

Table 4. Sleep outcome after psychologist-delivered CBT (n = 20)

Outcome	n	% (95% CI)
Complete resolution	3	15.0 (5.2–36.0)
Moderate improvement	10	50.0 (29.9–70.1)
No improvement	7	35.0 (18.1–56.7)
Any improvement (complete + moderate)	13	65.0 (43.3–81.9)

The proportion achieving any improvement significantly exceeded the pre-specified 10% quality-improvement target (one-sample exact binomial $p < 0.001$). Complete resolution alone was not statistically distinguishable from the 10% target (one-sided exact binomial $p = 0.32$). CI, confidence interval (Wilson score method).

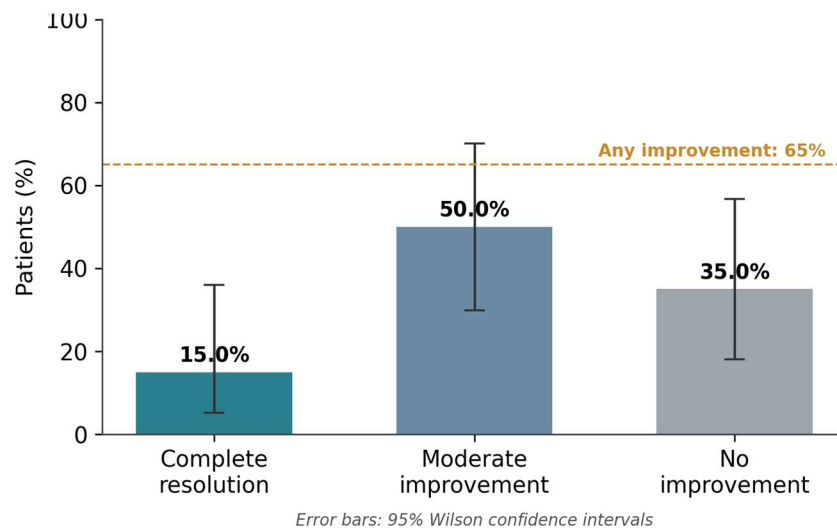


Figure 3. Sleep outcome after psychologist-delivered cognitive behavioural therapy (n = 20). Any improvement (dashed line) was observed in 65% of treated patients. Error bars are 95% Wilson confidence intervals.

4. Discussion

In this prospective single-centre study of newly diagnosed cancer patients in the Southern Region of Saudi Arabia, clinically significant sleep disturbance affected approximately one in five patients, and a psychologist-delivered CBT intervention was associated with improvement in roughly two-thirds of those treated. To our knowledge, this is among the first reports to describe the operationalisation of an evidence-based, psychologist-delivered behavioural sleep service within routine oncology practice in this setting.

The confirmed prevalence of 20.2% (screen-positive 27.3%) is consistent with, though at the lower end of, the 30–60% range reported internationally.^{6,8,10,11} The comparatively lower figure likely reflects our conservative, clinician-confirmed case definition and the absence of a validated self-report screening instrument, which tends to under-ascertain milder or subclinical insomnia relative to threshold-based tools such as the ISI.¹⁷ The strong association we observed between sleep disturbance and psychological distress—emotional instability was the single most common contributor, and anxiety or depressed mood was reported by nearly half of affected patients—accords with the well-described bidirectional relationship between insomnia and mood in cancer populations,^{6,9} and reinforces the rationale for a psychological, rather than purely pharmacological, first-line approach.

Our outcome data are broadly congruent with the established efficacy of CBT-I in oncology. Randomised trials by Savard and colleagues and by Espie and colleagues demonstrated durable improvements in sleep and mood,^{19,20} and meta-analyses report large, sustained effects on insomnia severity.^{22,23,24} The two-thirds improvement rate observed here is clinically meaningful and comfortably surpassed our quality-improvement benchmark; however, the complete-resolution rate was modest and, given the sample size, statistically indistinguishable from the target. This pattern is itself informative: it is consistent with meta-analytic observations that a meaningful minority of patients do not reach clinically important response thresholds, and that partial response is common.^{22,23} The demonstration by Espie and colleagues that CBT-I delivered by trained non-sleep-specialist clinicians retains efficacy²⁰ supports the feasibility of the psychologist-delivered model evaluated here and its potential for scalable implementation, including via digital adjuncts where therapist access is constrained.^{27,28}

These findings carry practical implications for regional cancer care. As the cancer burden in Saudi Arabia continues to grow,^{3,4} systematic screening for sleep disturbance—ideally using a validated instrument such as the ISI with an established cut-off—and structured referral to behavioural therapy could be integrated into routine oncology workflows at relatively low cost. Embedding a psychologist within the oncology service, as in the present model, offers a pragmatic mechanism to deliver guideline-concordant care.^{15,16}

4.1 Limitations

Several limitations temper these conclusions. First, the single-arm, uncontrolled design precludes causal attribution; improvement may partly reflect natural symptom fluctuation, concurrent supportive care, or regression to the mean. Second, sleep disturbance was ascertained and graded clinically rather than with validated patient-reported instruments (ISI/PSQI), limiting comparability and reproducibility; future work should incorporate standardised metrics and objective measures such as actigraphy. Third, the sample was small and drawn from a single centre, reducing statistical power—as reflected in the wide confidence intervals—and external validity. Fourth, cancer type, stage, treatment modality, and concomitant pharmacotherapy were not analysed as covariates, and outcomes were assessed over a short horizon without long-term follow-up. Finally, the intervention was pragmatically delivered and not manual-audited, so fidelity to formal CBT-I protocols cannot be fully verified. Additionally, the subgroup undergoing detailed mental status examination ($n = 5$; Table 3) was small and selected on clinical grounds rather than systematically, so those findings should not be generalised to the wider cohort. These constraints define a clear agenda for a subsequent adequately powered, instrument-based, and ideally controlled study.

5. Conclusion

Clinically significant sleep disturbance affected approximately one in five newly diagnosed cancer patients at a tertiary centre in Saudi Arabia and was closely linked to psychological distress, particularly anxiety and mood instability. A psychologist-delivered CBT intervention was associated with improvement in about two-thirds of treated patients, exceeding the pre-specified quality-improvement target and supporting the feasibility of embedding evidence-based behavioural sleep care within routine oncology practice. Given the uncontrolled design and modest sample, these results should be regarded as hypothesis-generating and confirmed in larger, controlled studies using validated instruments and longer follow-up.

Declarations

Ethics approval and consent to participate: Obtained from the Institutional Research Ethics Committee of the Armed Forces Hospital, Southern Region; all participants provided informed consent.

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Competing interests: The authors declare no competing interests.

Data availability: The anonymised data supporting the findings are available from the corresponding author on reasonable request.

Use of artificial intelligence: Used for rephrasing and improving visuals. No generative Ai was used

Authors' Contributions:

- **Yousra Suliman:** Conceptualization; Methodology; Data curation; Funding acquisition; Writing – review & editing
- **Ahmed Mostafa:** Conceptualization; Methodology; Writing – original draft; Writing – review & editing; Supervision
- **Mohamed Shubaili:** Methodology; Formal analysis; Data curation; Visualization
- **Mohamed Al Qahtani:** Investigation; Writing – review & editing; project administration
- **Lobna Saleem:** Formal analysis; Investigation; Writing – review & editing
- **Haneen Abud:** Psychological intervention delivery
- **Nora Saad Al Qahtani:** Psychological intervention delivery
- **Mona Abasher:** Methodology; Formal analysis; Data curation; Visualization
- **Shaza Abdelsadig Ahmed:** Methodology; Formal analysis; Data curation; Visualization

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