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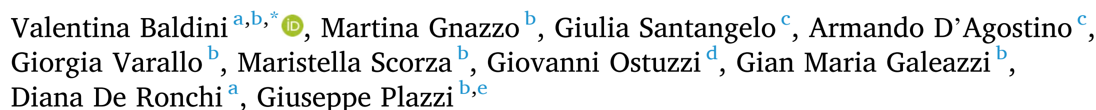
Are sleep disturbances a risk factor for suicidal behavior in the first episode of psychosis? Evidence from a systematic review



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A R T I C L E I N F O

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A B S T R A C T

Sleep disturbances are common in individuals with first-episode psychosis (FEP) and have been identified as potential contributors to an increased risk of suicidal behavior. This systematic review aims to synthesize the existing evidence on the association between sleep disturbances and suicidal behavior in individuals experiencing FEP, a critical period for early intervention.

In accordance with the guidelines established by PRISMA, this systematic review was duly registered in PROSPERO (CRD42024598203) prior to its initiation. A comprehensive search was conducted across databases including PubMed, Web of Science, EMBASE, and PsycINFO, encompassing studies from their inception through February 2025. The review specifically included observational studies that investigated the association between sleep disturbances and suicidal behaviors, which include suicidal ideation, attempts, or completed suicides, among individuals with FEP. The inclusion criteria required that all studies featured adult participants aged 18 years and older, employed validated measures for both sleep disturbances and suicidality, and concentrated on populations with FEP. Reviews, case reports, and studies not published in English were systematically excluded. The selection of studies, extraction of data, and assessment of quality were conducted independently by two reviewers.

Seven studies met the inclusion criteria, with sample sizes ranging from 118 to 688 participants. The findings indicate that sleep disturbances, especially insomnia, are significantly linked to an increased risk of suicidal ideation and behavior in individuals with FEP. The strength of these associations varied among the studies, with some reporting moderate to strong effect sizes. However, there was noted methodological heterogeneity, including variations in sleep assessment tools.

This systematic review highlights sleep disturbances as a key modifiable risk factor for suicidal behavior in individuals with FEP. Future research should prioritize longitudinal designs and standardized sleep assessments to better characterize this relationship and guide targeted interventions.

1. Introduction

Psychotic disorders are serious mental illnesses that typically emerge during late adolescence or early adulthood, often resulting in significant disability, burden, and substantial economic cost (Cloutier et al., 2016; Salomon et al., 2012).

The first episode of psychosis (FEP) is generally preceded by a prodromal period, typically characterized by features including reduced attention and motivation, feelings of depression, anxiety, social withdrawal, suspiciousness, and disturbed sleep (Yung et al., 1996; Clarke

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et al., 2020). FEP is associated with is heightened risk of suicide, which remains one of the leading causes of premature death in this population (Nordentoft et al., 2004; Simon et al., 2018).

Suicidal ideation and attempts (i.e., suicidality) stand as strong predictors of subsequent suicide mortality and are highly prevalent during the first years of FEP, with rates ranging from 15 to 40 % and 5 %–12 %, respectively (Chapman et al., 2015). Indeed, while suicide risk is reported to be highest in the first year following illness onset, studies indicate that this risk can fluctuate for many individuals throughout the course of the disorder (Nordentoft et al., 2013). A significant portion of patients may experience an increase in suicidality severity (e.g., from ideation to planning or attempting suicide) at the start of treatment, while others experience a decrease (e.g., from an attempt to passive ideation) in the long term (Fedyszyn et al., 2010; Madsen and Nordentoft, 2012). Understanding the contributing factors to suicide risk is crucial for improving intervention strategies during this vulnerable period. Among the various factors possibly implicated in suicide risk, sleep disturbances have garnered increasing attention, as they are robustly associated with increased suicidality across multiple clinical and non-clinical populations (Baldini et al., 2024, 2025; Geoffroy et al., 2014).

Sleep disturbances are common in individuals with psychosis, with studies showing high prevalence rates of insomnia, circadian rhythm disruptions, and poor sleep quality (Reeve et al., 2019; Zanini et al., 2013; Li et al., 2016). Overall, a 50 % prevalence of sleep disturbances appears consistent across different stages of psychosis (Bagautdinova et al., 2023). Suicidal behaviors and suicidal ideation are significant concerns in individuals with FEP. Prevalence estimates for suicidal ideation at baseline range from 15 % to 31.2 %, while suicide attempts during the untreated psychosis phase have been reported in about 14.1 % of cases (Bornheimer et al., 2018; Barrett et al., 2010). These variations underscore the importance of considering study methodologies, as some investigations specifically recruit individuals with a history of suicidality, while others evaluate broader FEP samples. For example, studies focusing on patients presenting to emergency departments may report higher rates of suicidal behaviors compared to community-based studies. Therefore, when interpreting these prevalence rates, it is essential to account for the recruitment methods and sample characteristics of each study.

Compared to the healthy control samples, reported abnormalities in the patient's sleep architecture include longer sleep onset time, increased wakefulness after sleep onset, more frequent arousals, higher amount of light sleep, lower sleep efficiency, and reduced rapid eye movement density. Additionally, sleep spindle (Manoach et al., 2014; Kaskie et al., 2019) and slow wave (Castelnovo et al., 2024) abnormalities have recently been confirmed in FEP.

These disturbances are not only considered symptoms of psychosis but may also act as independent risk factors for suicide. Disrupted sleep can impair emotional regulation, increase impulsivity, and exacerbate psychiatric symptoms, potentially contributing to suicidal ideation and behavior (Pigeon et al., 2012; Littlewood et al., 2016).

In a cohort of 334 patients with FEP, Salagre and colleagues found that insomnia predicted a trajectory of worsening suicidal ideation over a 2-year follow-up period (Salagre et al., 2021).

Although there is extensive literature examining sleep disturbances in individuals with a long-term diagnosis of schizophrenia, the role of sleep has received comparatively less attention during the early stages of the disorder. Research focusing on this population is essential for advancing our understanding of the causes of sleep disturbances in schizophrenia, especially when conducted with individuals who are either antipsychotic-naive or have had minimal exposure to such medications.

Such studies would provide valuable insights into the prevalence and impact of sleep difficulties throughout the course of schizophrenia and whether disrupted sleep contributes to the persistence of psychotic symptoms or the risk of relapse. Two reviews have proposed models for the relationship between sleep disturbances and the onset of psychosis (Bagautdinova et al., 2023; Zanini et al., 2013). However, these might suffer from selection bias, as they have incorporated data from genetic risk samples and long-term schizophrenia studies, while studies focusing on the early phases of psychosis were less represented.

The mechanisms underlying this relationship between sleep disturbances and FEP remain poorly understood. Several hypotheses have been proposed to explain how sleep disturbances might contribute to suicidality in this population. First, sleep disruptions may exacerbate emotional dysregulation, a well-established risk factor for suicidal behavior (Harris et al., 2020). Sleep deprivation has been linked to heightened emotional reactivity and impaired stress management, which may increase vulnerability to suicidal ideation. Second, poor sleep may intensify psychotic symptoms, such as hallucinations and paranoia, which have been strongly associated with suicidality (Wastler et al., 2025). Finally, sleep disturbances may impair executive function, leading to deficits in decision-making, impulse control, and problem-solving, all of which could increase the likelihood of suicidal behavior (Marin et al., 2023). Given these potential mechanisms, it is crucial to determine whether existing research on FEP supports these pathways. This review aims to assess the association between sleep disturbances and suicidality in FEP and examine whether studies provide evidence for these proposed mechanisms.

In order to fill this gap, this review examines explicitly data from samples of individuals who have recently experienced the onset of FEP and later received a diagnosis of schizophrenia, as well as those with a schizophrenia diagnosis who retrospectively report on their initial psychotic episode. Additionally, data from ultra-high-risk (UHR) and at-risk mental state (ARMS) samples were included. The term "early psychosis" will be used throughout this review to refer to individuals who have recently experienced or are at risk of undergoing their first psychotic episode. For clarity, UHR terminology will be employed to encompass both UHR and ARMS, given that these terms are frequently used interchangeably.

This systematic review aims to synthesize the current evidence on sleep disturbances and their association with suicide in individuals with FEP. By critically evaluating the available evidence, we seek to clarify whether sleep-related factors serve as significant contributors to suicide risk during this critical phase and highlight areas for future research.

Therefore, this review intends to investigate a principal research question: Is there an association between sleep disturbances and suicidal ideation and behaviors in individuals with FEP, and what mechanisms might explain this relationship?

2. Method

This systematic review of the literature was conducted and reported according to the preferred reporting items for systematic reviews and meta-analysis PRISMA guidelines (Page et al., 2021). The study protocol was registered in advance on PROSPERO (CRD42024598203).

2.1. Eligibility criteria

Studies were included if they were observational—specifically, prospective or retrospective cohort, case-control, or cross-sectional designs—reporting data on suicide behavior and/or non-suicidal self-injury in individuals with FEP, according to the Diagnostic and Statistical Manual of Mental Disorders (DSM) or International Classification of Diseases (ICD), in the context of sleep disturbances. Only observational studies were included, as we aimed to examine the natural association between sleep disturbances and suicidal behavior in FEP without the confounding effects of structured therapeutic interventions. We included studies of sex and ethnicity with individuals aged 18 years or older.

Research studies were deemed eligible for inclusion if they investigated individuals with FEP, regardless of their recovery status, provided

that data regarding sleep disturbances and suicidal behaviors were available. Furthermore, studies that incorporated mixed samples were considered eligible for inclusion as long as they featured a distinctly identifiable FEP subsample with pertinent data.

We considered sleep disturbances were identified based on whether insomnia symptoms or other sleep problems were evaluated. Specifically, sleep disturbances were examined through specific questionnaires, if they were available. Suicide behaviors were classified as suicidal ideation, suicide attempt, and suicide death.

2.2. Search strategy

A systematic search was conducted in PubMed, Web of Science, EMBASE, and PsycINFO encompassing studies from their inception through February 2025 using the following search terms: ("first episode psychosis" OR "first-episode-psychosis" OR psychosis OR "ultra-high risk" OR "ultra-high-risk" OR "at-risk mental state" OR "at-risk-mental-state" OR "clinical high risk" OR "clinical-high-risk" OR "early psychosis" OR prodromal OR "psychotic disorder" OR "unspecified psychosis" OR "psychosis NOS" OR schizophrenia OR schizotypy OR "early intervention") AND (sleep OR insomnia OR circadian OR dream* OR polysomnograph* OR nightmares) AND (suicide OR suicidal behaviors OR suicidal ideation OR self-harm OR "non-suicidal self-injury").

2.3. Selection of the studies

During the screening phase, all relevant original research articles were identified based on their titles and abstracts. At this stage, articles without pertinent information on the subject, including those not in English, reviews, case reports/series, conference abstracts, editorials, and viewpoints, were excluded. Full texts of the articles derived from the screening phase were reviewed to determine whether they met the selection criteria. These full texts were also searched manually to identify additional studies The selection was conducted by two reviewers (VB and MG) in a double-blind process. No sex or age criteria were used for article eligibility.

2.4. Data extraction

MG and GS extracted data. VB checked the data extracted on the characteristics of the studies. The following were extracted: (a) Country, sample (number of participants, mean age, sex), type of publication (i.e., peer-review journal, grey literature, book), year, study design, and study goals; (b) Measures employed to assess FEP; (c) Potential other relevant concepts were detected, and research gaps were highlighted. We extracted data on suicidal behavior, defined as the prevalence or incidence of individuals who engage in any type of self-injury or report suicidal ideation, and examined its relationship with measures of sleep disturbances (e.g., insomnia, hypersomnia, or poor sleep quality). Two researchers independently performed data extraction on the following variables of the studies: year and place of publication, country of origin, study design, age and sex of participants, and validated instruments for evaluating the outcome and authors' interests.

2.5. Assessment of the quality of studies and risk of bias from the review

The included studies were evaluated utilizing the Newcastle-Ottawa Scale (NOS), which assesses the risk of bias in observational studies across three domains: selection, comparability, and exposure. This scale provides an overall score that ranges from 1 (indicating the highest risk of bias) to 9 (indicating the lowest risk of bias) (Hartling et al., 2013). The assessment of risk was conducted independently by two Researchers, VB and MG. Any disagreements that arose were subsequently discussed with a third researcher, GS.

2.6. Synthesis of results

Due to the methodological and statistical diversity present across the various studies—covering differences in study design, participant characteristics, and assessment tools—a formal meta-analysis was considered impractical. Instead, a narrative synthesis approach was used to gather the findings. The studies were classified based on the specific types of sleep disturbances examined, the methodologies used to assess suicidality, and the characteristics of the studied populations. Significant themes, patterns of association, and potential mechanisms linking sleep disturbances to suicidal behaviors were identified and thoroughly discussed. Any discrepancies or inconsistencies noted among the studies were acknowledged, and plausible explanations were explored in the discussion.

3. Results

3.1. Flow chart of included studies

Search results are summarized in the PRISMA flowchart (Fig. 1). A total of 2180 records were initially identified through the database search. After removing 102 duplicates, 2078 records remained for title and abstract screening. Of these, 2005 did not meet the inclusion criteria and were excluded. Following full-text assessment, seven studies were included in the final systematic review (Ayers et al., 2024; Carruthers et al., 2022; Cohen et al., 2024; Ketcham et al., 2024; Salagre et al., 2021; Salvatore et al., 2013; Salvatore et al., 2021).

3.2. Ratings of study quality and risk of bias

According to our study's quality ratings using NOS, four studies were rated as good quality (scores 7–9), two as moderate quality (scores 5–6), and one as poor quality (score <5). The NOS evaluates studies across three domains—Selection, Comparability, and Outcome/Exposure—providing a maximum score of 9. While Table 1 in the main text summarizes the overall ratings, a detailed breakdown of individual domain scores for each study is available in the Supplementary Material (Supplementary Table 1a).

3.3. Characteristics of the included studies

The studies include three cohort studies, four cross-sectional designs, and one retrospective study. The ages of individuals with FEP vary significantly from younger populations such as Cohen, with 18.2 years, to older populations like Carruthers, with 39.0 years. Additionally, the proportion of female participants ranges from 28.7 % to 46.3 %, indicating a male predominance in most studies. The primary outcome for the majority of the identified studies focused on the prevalence of suicide attempts or suicide ideation. The characteristics of the included studies are shown in Table 1.

3.4. Relationship between sleep disturbances and suicidal behavior in FEP

Table 2 details the instruments used to assess sleep disturbances and psychopathology in various studies. Methods for assessing suicidal behavior or ideation varied across the included studies. Some studies utilized standardized instruments such as the Calgary Depression Scale for Schizophrenia (CDSS), which includes a suicidality item (e.g., Ayers et al., 2024; Cohen et al., 2024), while others relied on clinical interviews or self-reported suicidal ideation (e.g., Salagre et al., 2021; Ketcham et al., 2024). One study (Salvatore et al., 2013) reported both ideation and attempts based on retrospective clinical assessment and the Athens Insomnia Scale (AIS) framework. These differences in measurement approach may have contributed to variability in the reported prevalence of suicidality.

Most studies on sleep disturbances concentrated on insomnia, with

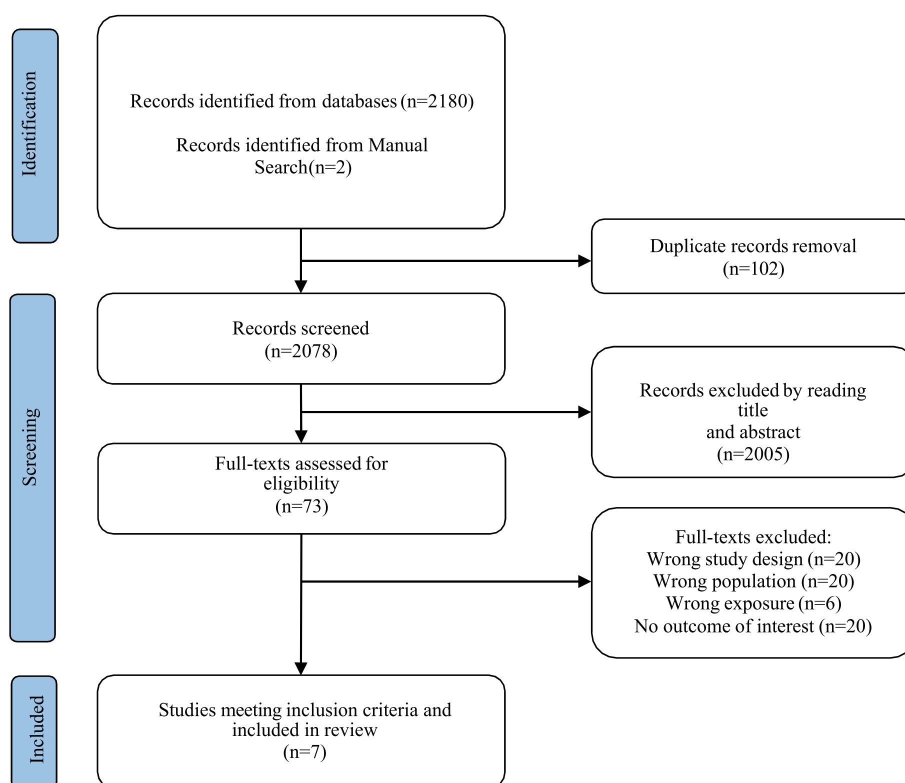

Fig. 1. Flow-chart describing the study selection process.

Table 1
Characteristics of the included studies.

First author, year	Country	Study design	Individuals with FEP	Age (M ±SD)	Male sex (%)	Setting and recruitment method	Quality rating
Ayers et al., 2024	USA	Cohort	403	23.7 ± 4.9	69.3 %	National Institute of Mental Health Data Archive; clinical registry	Good
Carruthers et al. (2022)	Australia	Cross-sectional	118	39.0 ± 10.0	56.8 %	Outpatient service; consecutive referrals, self-referred or voluntary participants	Low
Cohen et al., 2024	USA	Cross-sectional	688	18.2 ± 4.1	54.1 %	North American Prodrome Longitudinal Studies; multi-site registry	Good
Ketcham et al., 2024	USA	Cohort	305	38.2 ± 11.8	71.3 %	Outpatient service; consecutive referrals	Good
Salagre et al., 2021	Spain	Cross-sectional	334	23.1 ± 9.1	67.4 %	Outpatient service; consecutive referrals	Good
Salvatore et al., 2013	Italy	Cross-sectional	516	31.5 ± 13.6	55.2 %	Psychiatric ward; clinical records	Moderate
Salvatore et al., 2021	Italy	Retrospective	216	24.1 ± 8.1	53.7 %	Psychiatric ward; clinical records	Moderate

only one (Salvatore et al., 2013) addressing a wider range of sleep-related issues. Sleep assessments varied among studies; some depended on self-reported measures, while others used standardized tools like the Pittsburgh Sleep Quality Index (PSQI) and the Athens Insomnia Scale (AIS).

3.5. Prevalence of sleep disturbances in FEP and suicidal behavior

All included studies identified a significant association between sleep disturbances and an increased risk of suicidal behavior in individuals with FEP. However, the prevalence of suicidal ideation and suicide attempts varied widely across the studies. For example, the research by Cohen and Salvatore (Cohen et al., 2024; Salvatore et al., 2013) reported high rates of suicidal ideation (218 and 196 individuals, respectively), whereas Ayers and Ketcham (Ayers et al., 2024; Ketcham et al., 2024) documented lower figures. A notable outlier was the study conducted by Salvatore, which reported 100 suicide attempts (Salvatore et al., 2013). This discrepancy may be due to differences in sample characteristics or the broader definition of sleep disturbances utilized in that study.

3.6. Nature of sleep disturbances and their association with suicidal behavior

Among the included studies, insomnia was the primary—and in most cases, the only—sleep disturbance investigated in relation to suicidal behavior. Very few studies examined other types of sleep problems, such as nightmares, hypersomnia, or circadian rhythm disruption. Therefore, conclusions about which specific sleep disturbances are most strongly associated with suicidality in FEP remain limited.

Several studies indicated that individuals experiencing severe sleep difficulties exhibited a higher likelihood of suicidal ideation and attempts. For example, Ayers and colleagues (Ayers et al., 2024) found that participants with moderate to severe insomnia had a 2.5-fold increased risk of suicidal ideation compared to those without sleep

Table 2
Clinical characteristics of the included studies.

First author, year	Psychiatric instruments	Type of Sleep Disturbances	Sleep evaluation	Suicidality assessment method	Suicidal ideation (n, %)	Suicide attempt (n, %)	Key findings
Ayers et al., 2024	CDSS (includes suicidality), PANSS	Insomnia	Self-reported during the month before	CDSS item + self-report	45 (40)	NA	Sleep problems are highly prevalent and associated with suicidal ideation and greater psychopathology in FEP. Over a 2-year period, the prevalence of sleep problems ranged from 40 % to 57 %, and the prevalence of suicidal ideation ranged from 5 % to 15 %.
Carruthers et al. (2022)	PANSS, MADRS, CDSS	Insomnia	Self-reported during the month before	Self-report	20 (23)	NA	Reduced sleep was subsequently found to be related to increased suicidal ideation through greater positive symptoms and hopelessness. More time spent awake at night also enables greater engagement with active positive symptoms to occur, potentially leading to increased thoughts about suicide.
Cohen et al., 2024	SOPS, CDSS (includes suicidality), SIPS	Insomnia	PSQI, SOPS item 1	CDSS item	218 (31)	NA	Sleep problems are prevalent and associated with suicidal ideation and more severe psychosis-risk symptoms in FEP individuals. Interventions to promote healthy sleep may improve symptom severity and suicidality in the FEP population, as well as patients with schizophrenia.
Ketcham et al., 2024	BPRS	Insomnia	Self-reported during the month before	Self-report	59 (22)	NA	Insomnia was associated with BPRS total and factor scores at several time points throughout the trial, including baseline and 3 months. Insomnia appears to be an important phenomenon in FEP that may be associated with increased suicidal ideation and behavior, and symptom severity.
Salagre et al., 2021	PANSS, MADRS	Insomnia	Clinical interview	Clinical interview	23 (8)	NA	Higher baseline scores in MADRS reduced sleep is associated with worsening suicidal ideation trajectory. Insomnia has been widely related to the acute emergence and persistence of suicidal thoughts. early identification and treatment of even mild sleep disruptions might provide a meaningful benefit for patients with FEP presenting with fluctuating suicidal ideation.
Salvatore et al., 2013	PANSS, BSABS	Any type of sleep disturbances	AIS	Clinical interview	196 (37)	100 (19)	Psychotic disorders have a substantially increased risk of suicide, especially early in the illness-course. The additional correlated or risk factors were as expected from previous studies of factors associated with suicidal risk, including prior suicide attempts and aggressive assaults, the presence of sleep disturbances, impulsivity, affective instability and decreased vital drive.
Salvatore et al., 2021	SAPS, HDRS	Insomnia	Clinical interview	Clinical interview	NA	23 (7)	The significantly higher prevalence of perceptual sleep disturbances and suicidal behavior during prodromes among patients with a later definitive diagnosis of schizophrenia suggests that the trajectory to fully expressed, syndromal, psychotic phenomenology may arise from anomalies of perception and awareness of reality, as has been proposed previously for schizophrenia-like psychotic disorders.

NA=Not Applicable; FEP=First episode of psychosis; PANSS=Positive and Negative Syndrome Scale; CDSS=Calgary Depression Scale for Schizophrenia; MADRS= Montgomery-Åsberg Depression Rating Scale; SOPS=Scale of Prodromal Symptoms; SIPS=Structured Interview for Psychosis-Risk Syndromes; BPRS= Brief Psychiatric Rating Scale; ISI=Insomnia Severity Index; AIS=Athens Insomnia Scale; BSABS=Bonn Scale for the Assessment of Basic Symptoms; SAPS=Scale for the Assessment of Positive Symptoms; HDRS=Hamilton Depression Rating Scale.

disturbances. Similarly, Cohen reported that poor sleep quality, as measured by the PSQI, was significantly correlated with suicidal ideation, independent of depressive symptom severity (Cohen et al., 2024).

In contrast, Salvatore explored a broader range of sleep disturbances, including fragmented sleep and hypersomnia (Salvatore et al., 2013). This study found that fragmented sleep patterns were more strongly associated with suicide attempts than insomnia alone.

3.7. Potential mechanisms underlying the sleep-suicide association in FEP

Some studies suggest that sleep disturbances worsen affective dysregulation and cognitive impairments, which, in turn, increase vulnerability to suicidal behavior. For example, Ketcham and colleagues (Ketcham et al., 2024) proposed that disrupted sleep contributes to executive dysfunction, impairing problem-solving abilities and heightening feelings of hopelessness—both well-established risk factors for suicide. Additionally, the study of Salagre (Salagre et al., 2021) indicated that sleep disturbances may mediate the relationship between the severity of psychotic symptoms and suicidality, suggesting that interventions aimed at improving sleep could lower suicide risk in this population.

4. Discussion

This systematic review included seven observational studies examining the relationship between sleep disturbances and suicidal behavior

in individuals with FEP. Most studies utilized cross-sectional or cohort designs and mainly focused on insomnia or general sleep quality. Across all studies, sleep disturbances were consistently linked to increased suicidal ideation and in some instances, suicide attempts. However, there was considerable variation in the tools employed to assess both sleep and suicidality and other forms of sleep disturbances—such as nightmares or circadian rhythm disruptions—were seldom studied. These findings indicate a strong connection between sleep issues and suicidality in early psychosis while also highlighting significant gaps in the existing literature.

These results are consistent with prior studies conducted on chronic schizophrenia populations, which have also shown strong associations between sleep disturbances—especially insomnia—and an increased risk of suicidal thoughts and attempts (Rogers et al., 2023; Li et al., 2016). Our findings suggest that this relationship emerges early in the illness, reinforcing the hypothesis that sleep disturbances may act as a transdiagnostic and stage-independent factor contributing to suicide risk in psychotic disorders.

A consistent predominance of male subjects was observed across the included studies, aligning with the higher prevalence of FEP in males (Barlow et al., 2016). However, none of these studies directly investigated whether males face an elevated suicide risk compared to females. While males were overrepresented within the analyzed samples, this review does not provide direct evidence that male gender independently increases suicide risk in FEP. This trend is further corroborated by findings from a cohort study that demonstrated a more substantial association between sleep disturbances and suicide risk in males relative to females, suggesting the existence of potential gender differences in vulnerability (Gonzalez et al., 2018).

As mentioned in the introductory section, three primary mechanisms have been hypothesized to elucidate the relationship between sleep disturbances that may contribute to suicidality in FEP: emotional dysregulation, exacerbation of psychotic symptoms, and compromised executive function. Our review evaluated whether the current literature substantiates these mechanisms; however, the evidence remains limited.

The first hypothesis is that sleep disturbances exacerbate emotional dysregulation, which is closely linked to suicidality. Sleep is crucial for emotional regulation, and inadequate sleep is associated with heightened emotional reactivity and poor stress management. Individuals with FEP, who frequently experience mood instability, insomnia, and other sleep disruptions, may find it even more challenging to regulate negative emotions, leading to an increase in the intensity and frequency of suicidal thoughts (Freeman et al., 2020). This represents a critical gap in the literature, as individuals with FEP frequently experience mood instability, which could increase the intensity and frequency of suicidal thoughts in the presence of sleep disruptions.

The second hypothesis is that sleep disturbances exacerbate core psychotic symptoms, such as hallucinations and delusions, which may, in turn, contribute to suicidal behavior. Disrupted sleep has been shown to increase paranoia, intensify auditory hallucinations, and worsen delusional thinking in individuals with psychosis (Wulff et al., 2010). These symptoms may heighten feelings of distress, persecution, and hopelessness, which are strong drivers of suicidal ideation. In fact, paranoia itself has been associated with an increased risk of suicide, and sleep disturbances may act as a trigger for worsening paranoia in FEP (Koyanagi et al., 2015). Additionally, impaired sleep may reduce individuals' resilience to these experiences, making it harder to cope with the mental strain of psychotic episodes, further escalating the risk of suicide. A third interesting hypothesis is that sleep deprivation impairs executive functioning, including decision-making, impulse control, and problem-solving abilities. For individuals with FEP, who often already experience cognitive deficits, sleep disturbances may further impair their cognitive abilities, potentially leading to increased impulsivity and reduced capacity to inhibit harmful behaviors, such as suicide attempts (Kahn-Greene et al., 2007). While none of the reviewed studies directly examined executive function impairments as a mediator between sleep and suicidality in FEP, indirect evidence from studies in chronic psychosis suggests that sleep disturbances may contribute to cognitive dysfunction, which in turn could increase suicide risk (McGowan et al., 2020).

At the neurobiological level, sleep disturbances may contribute to suicidality through dysregulation of neurotransmitter systems, such as the serotonergic and dopaminergic systems, which play crucial roles in mood regulation and impulse control (McGowan et al., 2020). Sleep is essential for the maintenance of healthy serotonin levels, and disruptions in serotonin pathways have been linked to both insomnia and suicidal behavior (Van Heeringen and Mann, 2014). Additionally, sleep deprivation alters dopamine signaling, which could impair reward processing and increase anhedonia, a factor closely associated with suicidal ideation (Zhai et al., 2015). Neuroinflammation, which has been linked to both psychosis and poor sleep quality, may also contribute to suicidal behavior by affecting neural circuits involved in mood regulation (Ben Simon and Walker, 2018).

These hypotheses underscore the importance of considering sleep disturbances not only as a symptom of psychosis but as a key contributor to suicidal behavior. The mechanisms linking sleep to suicidality in FEP appear multifaceted, involving emotional, cognitive, and neurobiological pathways. Future research should aim to elucidate these pathways further, using both longitudinal studies and neuroimaging techniques to investigate how sleep disturbances impact brain function and behavior in individuals with psychosis.

While sleep disturbances are a plausible target for intervention in psychosis due to their established links with suicidality (Waite et al., 2020; McGorry et al., 2008), direct evidence that treating sleep reduces suicide risk is currently lacking. No intervention studies reviewed explicitly tested whether improving sleep led to reductions in suicidal behaviors or ideation. Future randomized controlled trials should evaluate whether interventions targeting sleep, such as cognitive-behavioral therapy for insomnia (CBT-I), can mitigate suicidality in FEP.

This review has several limitations. First, the limited number of included studies may restrict the generalizability of the findings. Furthermore, it is imperative to address the issues of publication bias and the limitations associated with small sample sizes. Publication bias represents a potential concern, as studies yielding significant results may have a higher likelihood of publication, resulting in an over-representation of positive findings. In addition, the small sample sizes of numerous included studies give rise to apprehensions regarding statistical power and the reliability of the observed associations. Smaller studies tend to be more vulnerable to variability in findings and may fail to detect true effects or conversely, might produce exaggerated effect sizes due to insufficient statistical power. Future research should aspire to include larger sample sizes and pre-registered study protocols to alleviate these issues.

Moreover, the heterogeneity in study designs, sample characteristics, and methods used to assess sleep disturbances and suicidal behavior across the included studies complicates direct comparisons and limits the ability to draw robust conclusions. The predominance of cross-sectional studies restricts our capacity to determine the directionality of the relationship between sleep disturbances and suicidal behavior. While we discuss sleep disturbances as a potential contributor to suicidality, it is also plausible that early psychotic symptoms and the associated distress contribute to the onset or worsening of sleep problems. Longitudinal and experimental studies are necessary to better understand whether improving sleep reduces suicide risk or if managing psychiatric distress and suicidality could lead to improvements in sleep disturbances.

Another limitation is the exclusion of self-harm, which is closely linked to suicide risk and shares many underlying mechanisms. Since self-harm occurs more frequently than suicide attempts, studies concentrating on self-harm may possess greater statistical power to identify connections with sleep disturbances. However, it is

methodologically challenging to distinguish self-harm from suicide attempts, as numerous studies fail to clearly differentiate between them. Future research should investigate whether sleep disturbances also contribute to self-harm risk and whether the mechanisms connecting sleep to suicidality similarly apply to self-harm.

Furthermore, we did not conduct a meta-analysis of the findings, which could have provided additional insights. The varied methodologies across studies, such as differences in sample size, study type, and instruments used, jeopardize the feasibility of performing a meta-analysis. Further research is necessary to strengthen our findings and provide more definitive conclusions about the mechanisms by which sleep disturbances contribute to suicidal behavior in FEP and to establish whether interventions specifically targeting sleep can lead to a sustained reduction in suicide risk. This includes conducting more extensive clinical follow-up studies, utilizing larger and more representative patient samples, as well as incorporating randomized controlled trials. Longitudinal studies that evaluate both objective (e.g., actigraphy, polysomnography) and subjective sleep measures, as well as studies investigating the neurobiological underpinnings of sleep and suicidality, are needed to refine our understanding of this association. Indeed, all reviewed studies relied on self-reported measures to assess sleep. Although prevalent in usage, these measures are susceptible to recall bias and may not accurately represent objective sleep disturbances. The notable absence of actigraphy or polysomnography in the studies reviewed is significant, as these instruments offer more precise and reliable evaluations of sleep patterns. Only a limited number of studies have utilized objective measures like actigraphy in individuals with schizophrenia (Mayeli et al., 2023) and in FEP/ARMS (Lunsford-Avery et al., 2015). Future research should incorporate objective sleep measures to better characterize sleep disturbances in FEP and their association with suicidal behaviors. Combining this data with the assessment of symptoms and suicidality at specific points in time would offer valuable insight into the relationship between sleep, symptoms, and suicidal behaviors.

In addition to the mechanisms explored in the reviewed studies, it is worth noting that nightmares have been shown to predict suicidal ideation and behavior in individuals with schizophrenia and other psychiatric conditions (Littlewood et al., 2016; Pigeon et al., 2012). None of the studies included in this review investigated nightmares specifically in relation to FEP. Given their established association with emotional dysregulation and suicide risk, the potential role of nightmares in early psychosis warrants closer attention in future research.

5. Conclusion

The findings of this systematic review highlight a significant association between sleep disturbances and suicidal behavior in individuals living with FEP. Sleep disturbances, including insomnia and sleep fragmentation, emerged as potential risk factors for suicidal ideation and suicide attempts, underscoring the importance of early identification and intervention. Given the vulnerability of this population, addressing sleep-related issues could be an important component of suicide prevention strategies. However, the heterogeneity of the studies reviewed and the limitations in methodology suggest that further research is needed to clarify the causal mechanisms and evaluate the efficacy of targeted interventions. Addressing this gap through longitudinal, neurobiological, and interventional studies will be critical in determining whether sleep interventions can be leveraged to reduce suicide risk in this population. Clinicians should consider routine assessment of sleep-in patients with psychosis, integrating sleep management into the broader treatment approach to mitigate the risk of suicidal behavior.

CRediT authorship contribution statement

Valentina Baldini: Writing – review & editing, Writing – original draft, Resources, Methodology, Investigation, Data curation, Conceptualization. **Martina Gnazzo:** Writing – original draft, Methodology, Investigation, Data curation. **Giulia Santangelo:** Writing – review & editing, Writing – original draft, Methodology, Investigation. **Armando D'Agostino:** Writing – review & editing, Validation, Methodology, Investigation. **Giorgia Varallo:** Writing – original draft, Investigation. **Maristella Scorza:** Writing – original draft, Validation. **Giovanni Ostuzzi:** Writing – review & editing, Validation. **Gian Maria Galeazzi:** Writing – review & editing, Supervision. **Diana De Ronchi:** Writing – review & editing, Supervision. **Giuseppe Plazzi:** Writing – review & editing, Writing – original draft, Supervision, Investigation, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jpsychires.2025.03.053.

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