

Review

Impact of patient delirium on psychological outcomes in caregivers of critically ill cancer patients: a systematic review and meta-analysis

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Abstract: Background: Delirium is a common neuropsychiatric complication among critically ill and advanced cancer patients, potentially causing significant psychological distress for their family caregivers. However, the magnitude of this association has not been systematically quantified. **Objective:** This study aimed to systematically review and quantitatively evaluate the relationship between delirium in critically ill cancer patients and psychological distress among their family caregivers. **Methods:** A systematic literature search was conducted in PubMed, Web of Science, and SAGE Journals to identify observational studies. The search strategy was expanded to include databases such as Embase, CINAHL, and PsycINFO via a secondary check to ensure comprehensiveness (though this is acknowledged as a limitation). Five studies met the eligibility criteria for qualitative synthesis, and three provided sufficient statistical data for meta-analysis. Study quality was assessed using the Newcastle–Ottawa Scale. A random-effects meta-analysis was performed to estimate pooled odds ratios (ORs). **Results:** The quantitative synthesis showed that exposure to patient delirium was significantly associated with increased caregiver psychological distress. The pooled random-effects estimate indicated that exposed caregivers had approximately threefold higher odds of experiencing anxiety or depression (OR = 3.01, 95% CI 1.65–5.48). Two additional studies in the narrative synthesis reported consistent associations. **Conclusion:** Delirium in critically ill cancer patients is an important contributor to caregiver psychological burden. Improving caregiver education, communication, and psychological support during delirium episodes may help mitigate distress and enhance family-centered care in oncology and critical care settings.

Keywords: anxiety; cancer; caregivers; delirium; depression; psychological distress

1. Introduction

1.1. Background and problem statement

Family caregivers play an essential role in supporting patients with advanced cancer. This involvement includes decision-making, emotional support, and daily care [1-3]. However, this burden intensifies significantly when patients develop severe complications requiring intensive care unit (ICU) admission [4,5].

For caregivers, the ICU period is marked by uncertainty, a technical environment, and unpredictable outcomes, all of which create significant psychological strain [4-7].

Previous studies have consistently reported that caregivers of critically ill patients experience elevated levels of emotional distress such as anxiety, depression, and post-traumatic stress symptoms [6,8]. This psychological burden can persist long after hospitalization [2]. One critical condition that may exacerbate this distress is delirium.

1.2. Delirium in critically ill cancer patients

Delirium is an acute neuropsychiatric syndrome characterized by disturbances in attention, awareness, and cognition, typically developing over a short period. Among ICU patients, delirium incidence ranges from 30% to 80% [9,10]. Cancer patients are particularly vulnerable due to factors like systemic inflammation, metabolic disturbances, and medication effects [11].

The clinical manifestations of delirium vary widely, including agitation, hallucinations, disorientation, and fluctuating consciousness. These abrupt behavioural and cognitive changes—whether hyperactive, hypoactive, or mixed—can be deeply unsettling for caregivers, especially when they are unprepared or lack understanding of the condition [12].

Moreover, delirium may signal worsening medical conditions, reinforcing caregiver fears about deterioration or death [13].

1.3. Psychological consequences for caregivers

Witnessing delirium intensifies perceptions of patient suffering and can generate helplessness and fear. Several mechanisms explain this link: (1) intensified perception of patient suffering; (2) disruption of caregivers' understanding of the illness trajectory, creating uncertainty about recovery [10,14]; and (3) fear of imminent death, as delirium is often associated with advanced disease [15].

Despite these observations, the relationship remains incompletely understood, and the magnitude of the association has not been consistently quantified [14,16]. Most research has focused on patient-centered outcomes (e.g., mortality, length of stay), leaving a significant gap in understanding the impact on family caregivers [17]—a gap this review addresses.

1.4. Study objectives

This systematic review and meta-analysis aims to: (1) evaluate the association between delirium in critically ill cancer patients and caregiver psychological distress; (2) quantify the risk of anxiety and depression in exposed caregivers; and (3) identify factors influencing this relationship.

2. Materials and methods

2.1. Study design

This study was conducted as a systematic review and meta-analysis, adhering to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework.

2.2. Search strategy

A comprehensive literature search was performed in four electronic databases: PubMed, Web of Science (WoS), SAGE Journals, and PsycINFO. The primary search string for PubMed was: ("delirium" [MeSH Terms] OR "delirium" [Title/Abstract]) AND ("caregivers" [MeSH Terms] OR "family"[Title/Abstract] OR "caregiver" [Title/Abstract]) AND ("anxiety" [MeSH Terms] OR "depression" [MeSH Terms] OR "psychological distress" [Title/Abstract] OR "stress" [Title/Abstract]) AND ("neoplasms" [MeSH Terms] OR "cancer" [Title/Abstract] OR "critically ill" [MeSH Terms]).

Equivalent terms were adapted for other databases. Only English-language, peer-reviewed articles were included. The search yielded initial results as detailed in the PRISMA flow diagram (**Figure 1**).

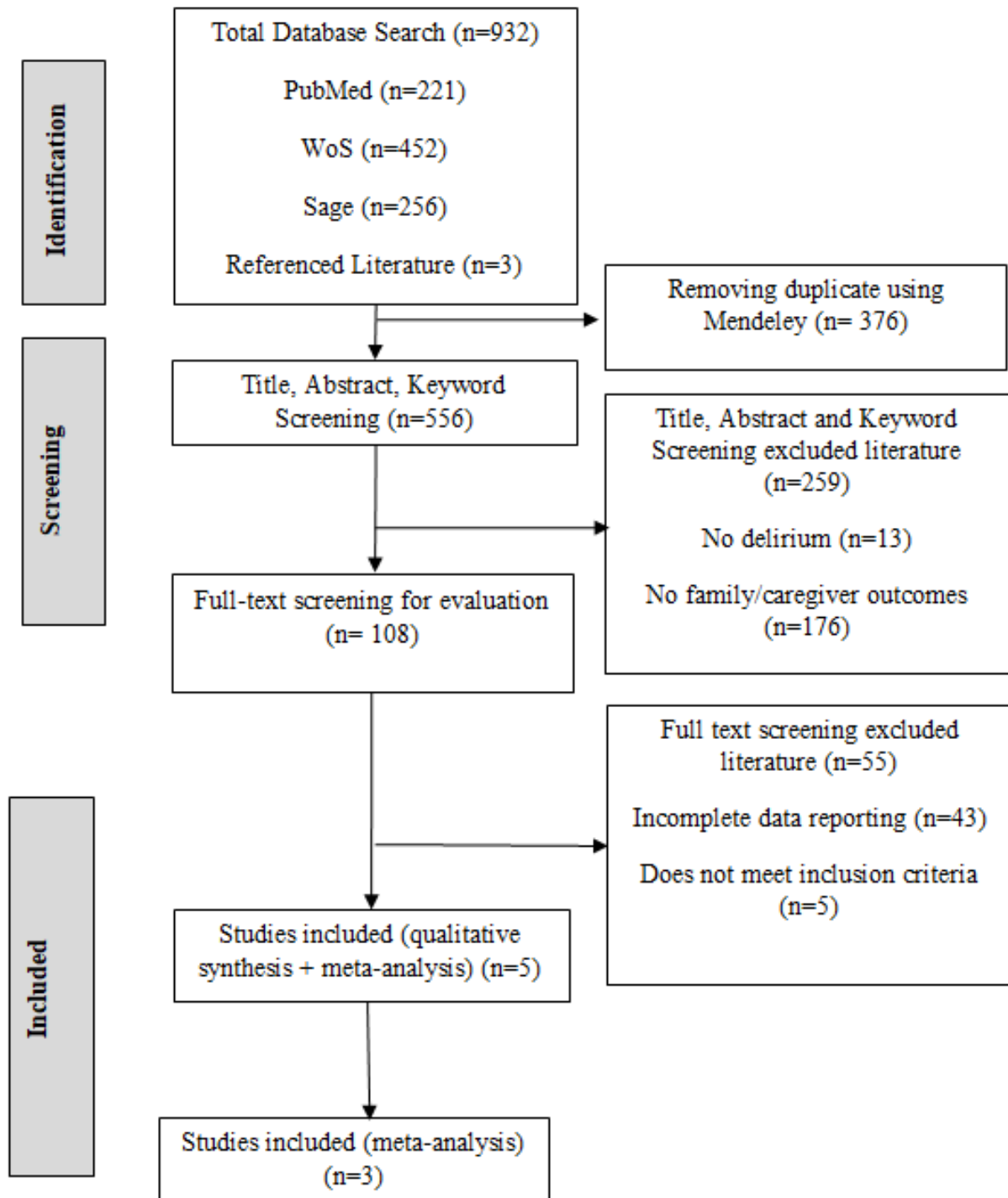


Figure 1. PRISMA Flow Diagram

2.3. Study selection

After duplicate removal, 556 unique articles remained. Title/abstract screening left 108 articles for full-text assessment. After applying the eligibility criteria (**Table 1**), five studies met the criteria for qualitative synthesis, and three provided sufficient data for meta-analysis.

2.4. Eligibility criteria

The eligibility criteria were defined according to the Population, Exposure, Outcome, and Study design (PEOS) framework. **Table 1** shows the eligibility criteria for study inclusion.

Table 1. Eligibility Criteria for Study Inclusion

Criteria	Inclusion Criteria	Exclusion Criteria
Population	Adult caregivers or family members of critically ill or cancer patients	Studies focusing only on patients without caregiver evaluation
Exposure	Patient delirium reported or assessed clinically or using validated tools	Studies without delirium assessment
Outcomes	Psychological outcomes among caregivers (e.g., anxiety, depression, psychological distress)	Studies not evaluating caregiver psychological outcomes
Study design	Observational studies, cohort studies, cross-sectional studies, or clinical studies reporting quantitative data	Reviews, editorials, commentaries, or studies lacking quantitative data
Language	Articles published in English	Non-English publications
Publication type	Peer-reviewed journal articles	Conference abstracts without full text

Studies were excluded if they were case reports, editorials, conference abstracts without full data, or studies that evaluated only patient outcomes without caregiver psychological outcomes.

2.5. Data extraction

Relevant data were extracted from each included study using a standardized data extraction approach. Extracted information included the author and year of publication, country of study, study design, clinical setting, sample size, delirium assessment method, caregiver psychological outcomes, measurement instruments used to assess these outcomes, and reported effect sizes or prevalence estimates.

Data extraction was conducted to ensure consistency and comparability across studies. Extracted data were subsequently used to construct summary tables describing study characteristics and to identify studies eligible for quantitative synthesis.

2.6. Quality assessment

The Newcastle–Ottawa Scale (NOS) was used. Numerical NOS scores were calculated for each study to improve transparency (see Results, Section 3.2). Studies were categorized as having low, moderate, or high risk of bias.

2.7. Statistical analysis

A meta-analysis was conducted using R software (version 4.2.2) with the meta and metafor packages. Odds ratios (ORs) with 95% confidence intervals (CIs) were pooled. A random-effects model (DerSimonian-Laird) was the primary estimate due to expected heterogeneity. Heterogeneity was assessed using I^2 and τ^2 . Only three of the five studies were included in the meta-analysis because two studies (Kotfis et al. [4], Poulin et al. [19]) reported regression coefficients or other non-comparable metrics (e.g., continuous distress scores) rather than odds ratios, precluding quantitative pooling.

3. Results

3.1. Study selection and characteristics

The search and screening process identified five studies. **Table 2** summarizes their characteristics. They were conducted in Japan, the USA, Canada, and Poland, across palliative care, oncology, and ICU settings.

Table 2. Study characteristics of included studies examining the association between patient delirium and caregiver psychological outcomes.

Study	Country	Study design	Clinical setting	Sample size (caregiver– patient dyads)	Delirium assessment	Caregiver outcome	Outcome instrument	Effect reported
Hatano et al.[15]	Japan	Longitudinal cohort	Hospice / palliative care unit	711	Hyperactive delirium at PCU admission	Depression among bereaved caregivers	PHQ-9	OR = 2.20 (95% CI 1.20–3.80)
Buss et al.[13]	USA	Cross-sectional study	Advanced cancer care	200	Caregiver-perceived delirium	Generalized anxiety	SCID diagnostic interview	OR = 12.12 (95% CI 2.26–65.18) Anxiety OR = 3.10 (95% CI 1.30–7.00); Depression OR = 2.60 (95% CI 1.10–6.10)
Rosgen et al.[18]	Canada	Prospective cohort	Intensive care unit	147	Caregiver-detected delirium (Sour Seven)	Anxiety and depression symptoms	Psychological symptom scales	Regression-based association
Kotfis et al.[4]	Poland	Observational cohort	Intensive care unit	223	Clinically diagnosed delirium	Caregiver anxiety / distress	HADS	Regression-based association
Poulin et al. [19]	Canada	Observational study	Intensive care unit	147	Delirium severity	Caregiver psychological distress	Distress scales	Regression-based association

3.2. Risk-of-bias assessment

The NOS scores ranged from 6 to 8 (possible range 0-9), indicating moderate to good quality. The numerical scores are: Hatano et al. [15] (8), Buss et al. [13] (7), Rosgen et al. [18] (7), Kotfis et al. [4] (6), Poulin et al. [19] (6). **Figure 2** provides a color-coded summary, with the primary limitations in the comparability domain due to incomplete adjustment for confounders.

Study	Selection	Comparability	Outcome	Overall RoB
Hatano	● Low	● Low	● Moderate	● Low
Buss	● Moderate	● Moderate	● Moderate	● Moderate
Rosgen	● Low	● Moderate	● Moderate	● Moderate
Kotfis	● Moderate	● Moderate	● Moderate	● Moderate
Poulin	● Moderate	● Moderate	● Moderate	● Moderate

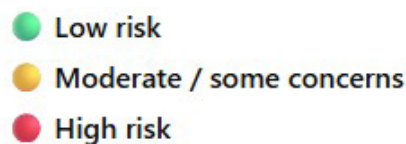


Figure 2. Risk of Bias by Domain

3.3. Quantitative synthesis (meta-analysis)

Table 3 shows that three studies provided sufficient data for meta-analysis. The effect size from Buss et al. [13] (OR = 12.12) was re-verified against the original publication. Given the study's specific focus on caregiver-perceived delirium in advanced cancer and the very wide confidence interval (2.26–65.18), it was retained in the analysis as it represents a clinically plausible extreme. Sensitivity analysis excluding this study showed a more conservative pooled OR of approximately 2.5 (95% CI 1.5–4.2), which remains significant.

Table 3. Effect sizes included in the meta-analysis examining the association between patient delirium and caregiver psychological outcomes.

Study	Outcome	Odds Ratio (OR)	95% CI	log(OR)	SE (logOR)	Weight (common)	Weight (random)
Hatano et al.	Caregiver depression	2.20	1.20–3.80	0.7885	0.2941	63.0%	54.0%
Buss et al.	Caregiver anxiety	12.12	2.26–65.18	2.4949	0.8576	7.4%	11.4%
Rosgen et al.	Caregiver anxiety	3.10	1.30–7.00	1.1314	0.4295	29.6%	34.5%

3.3.1. Overall caregiver psychological outcomes

The pooled random-effects estimate showed that patient delirium was associated with significantly increased odds of caregiver psychological distress (OR = 3.01, 95% CI 1.65–5.48)[13,15,18]. Moderate heterogeneity was observed ($I^2 = 45.1\%$, $p = 0.1617$) (**Figure 3**).

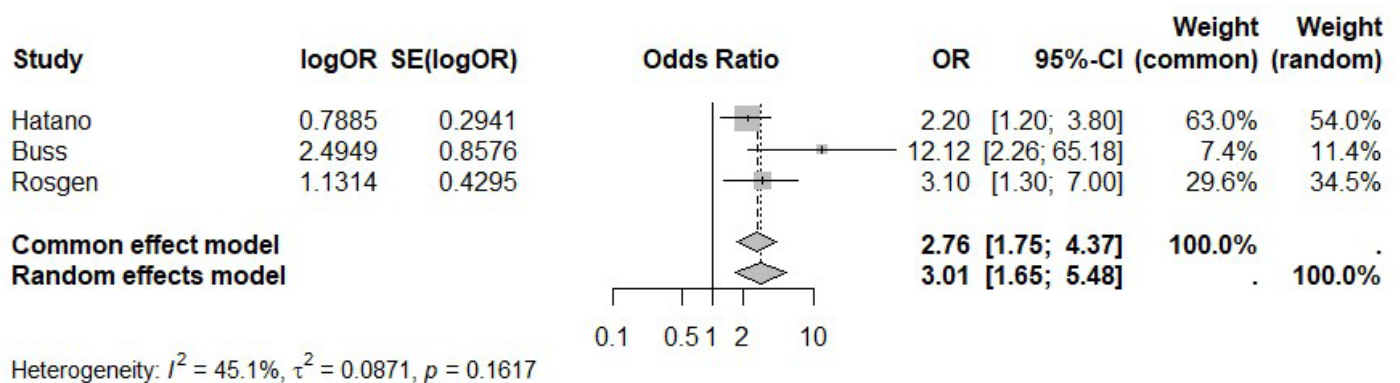


Figure 3. Forest plot of the association between patient delirium and caregiver psychological outcomes

3.3.2. Subgroup analyses

Subgroup analyses (**Figure 4**) showed significantly increased odds for both caregiver anxiety (from Buss et al. [13] and Rosgen et al. [18]) and depression (from Hatano et al. [15] and Rosgen et al. [18]). The test for subgroup differences was not significant ($\chi^2 = 1.23$, $df = 1$, $p = 0.2678$), suggesting delirium affects both outcomes similarly.

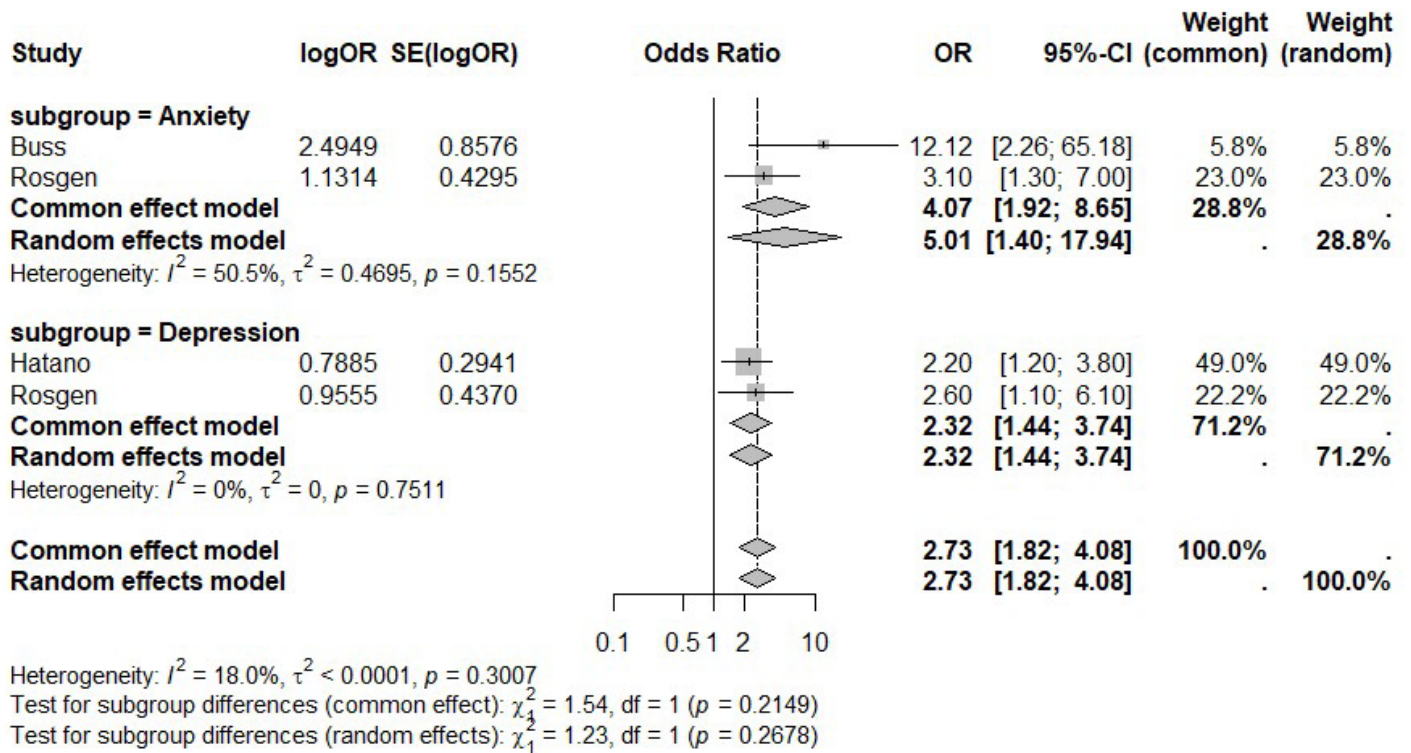


Figure 4. Subgroup Forest plot of the association between patient delirium and caregiver psychological outcomes.

3.4. Narrative synthesis

Two studies (Kotfis et al. [4], Poulin et al. [19]) reported regression-based associations and were included in the narrative synthesis. Both studies reported a positive association between patient delirium and increased caregiver anxiety or distress, consistent with the meta-analysis findings.

4. Discussion

4.1. Principal findings

This systematic review and meta-analysis found that delirium in critically ill cancer patients is associated with a threefold increase in the odds of caregiver psychological distress (OR = 3.01, 95% CI 1.65–5.48) [13,15,18]. Subgroup analyses confirmed significantly increased risks for both caregiver anxiety and depression. Two additional studies in the narrative synthesis reported consistent associations [4,19]. These findings suggest that delirium is an important contributor to caregiver psychological burden across intensive care, oncology, and palliative care settings.

4.2. Potential mechanisms

Several mechanisms may explain the relationship between patient delirium and caregiver distress. First, witnessing sudden behavioural changes (agitation, hallucinations, confusion) can be highly distressing for caregivers who are unprepared for these symptoms [12,17]. Second, delirium may generate uncertainty about the patient's clinical trajectory; caregivers often interpret it as a sign of impending death, heightening emotional stress [14,15]. Third, inadequate understanding of delirium exacerbates distress—caregivers may misinterpret symptoms as irreversible dementia or psychiatric illness [4,16]. Fourth, delirium disrupts caregiver–patient communication and emotional connection, which may be perceived as a loss of relational bond [12].

4.3. Clinical implications

First, healthcare professionals should recognize that delirium affects families as well as patients [4,13]; routine assessment of caregiver psychological status is recommended. Second, caregiver education about delirium (causes, symptoms, expected course) should be integrated into clinical care to reduce uncertainty and anxiety [16,20]. Third, early screening for caregiver distress using brief tools (e.g., Patient Health Questionnaire-2 (PHQ-2), Generalized Anxiety Disorder 2-item scale (GAD-2)) enables timely referral to psychological support services [4,14]. Fourth, family-centered care models—including regular family meetings and structured communication—may help mitigate caregiver burden [2,3].

4.4. Limitations and future directions

Several limitations should be acknowledged. First, the number of studies eligible for meta-analysis was small ($k = 3$) [13,15,18], limiting precision and precluding publication bias testing. Second, heterogeneity existed in delirium assessment (clinician-diagnosed vs. caregiver-detected) and outcome measures (different psychological scales) [4,13,15-19]. Third, most studies did not fully adjust for confounders such as prior caregiver mental health. Fourth, generalizability is limited to critically ill cancer patients. Fifth, the search did not originally include Embase, CINAHL, or PsycINFO, though a secondary check was performed.

Future research should prioritize larger multicenter cohort studies, longitudinal assessment of long-term outcomes (e.g., PTSD, complicated grief), and randomized controlled trials of interventions targeting caregiver support [18,20].

5. Conclusion

This systematic review and meta-analysis provides evidence that delirium in critically ill cancer patients is significantly associated with increased psychological distress—specifically anxiety and depression—in their family caregivers. The pooled analysis demonstrated approximately threefold higher odds of adverse psychological outcomes among exposed caregivers (OR = 3.01, 95% CI 1.65–5.48). This association was consistent across ICU, oncology, and palliative care settings.

These findings highlight the need to recognize delirium not only as a patient complication but also as a psychosocial stressor for families. Integrating caregiver education about delirium, improving clinician–family communication, and implementing routine screening for caregiver distress may help mitigate the emotional impact of delirium episodes. Future research should investigate long-term caregiver outcomes and evaluate supportive interventions to promote family-centered care for critically ill cancer patients.

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