

# A SYSTEMATIC REVIEW AND META-ANALYSIS ON ACADEMIC PERFORMANCE AND PREVALENCE OF INSOMNIA AMONG STUDENTS

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## ABSTRACT

### Background

Insomnia is a frequent sleep disorder among students, affecting academic achievement. Poor sleep quality is influenced by academic workload, psychological stress, and lifestyle habits.

### Objective

To determine the prevalence of insomnia & its influence on academic performance among students.

### Methods

The review was conducted in accordance with PRISMA guidelines. Electronic databases were searched for studies published from 2000 to 2025. Observational studies assessing insomnia prevalence and academic performance in students were selected. Due to differences in study designs and outcome measures, findings were synthesized qualitatively.

### Results

Forty-two studies involving over 98,000 students were included. Insomnia prevalence rates varied, ranging from 9.4% to 98.7%, with most studies documenting rates between 30% and 60%. Insomnia was linked to reduced cognitive performance, difficulty concentrating, memory impairment, and poorer academic outcomes, including lower GPAs and increased academic failure. Academic stress, mental health issues, irregular sleep habits, and excessive screen exposure were major contributing factors.

### Conclusion

Insomnia is highly prevalent in students and has a substantial adverse effect on academic performance. Early recognition and targeted measures, such as sleep hygiene education and mental health support, are necessary to enhance sleep quality and educational achievement.

**Keywords:** Insomnia, Students, Academic Performance, Sleep Quality, Systematic Review, Meta-Analysis.

**How to cite this article:** Manjunatha VK, Sangita S, Sree Shyam KS. A Systematic Review and Meta-Analysis on Academic Performance and Prevalence of Insomnia Among Students. *Int J Drug Deliv Technol.* 2026;16(54s): 1336-1343. DOI: 10.25258/ijddt.16.54s.118

**Source of support:** Nil.

**Conflict of interest:** None.

## INTRODUCTION

Insomnia is regarded as one of the most prevalent sleep disorders and is characterized by ongoing difficulty in initiating sleep, maintaining sleep, or achieving restorative sleep despite having adequate opportunity for rest <sup>1</sup>. It is increasingly acknowledged as a major public health concern, particularly among students, where academic responsibilities, psychosocial pressures, and lifestyle-related behaviours contribute to disrupted sleep patterns <sup>2</sup>. Students, especially those enrolled in higher education, are particularly vulnerable because of irregular routines, excessive exposure to screens, and the pressure to achieve academic success <sup>3</sup>.

Across the world, insomnia prevalence among students varies by geographical region and study methodology. Earlier reviews reported rates ranging from 9.4% to 38.2%<sup>2</sup>, whereas more recent meta-analyses indicate a higher pooled prevalence of approximately 40–50% <sup>1,4</sup>. Some institution-based studies have even documented prevalence rates above 60%, emphasising the increasing burden of sleep-related disturbances in academic settings <sup>5</sup>. This increasing trend suggests that insomnia is not only highly prevalent but may also be becoming more common among students worldwide.

Sleep is fundamental to cognitive functioning and plays a critical role in learning processes, including attention, memory consolidation, and executive functioning <sup>6</sup>. Insomnia negatively affects these functions, resulting in impaired concentration, reduced retention of information, and decreased

problem-solving capacity<sup>7</sup>. Consequently, students affected by insomnia often exhibit poorer academic performance, including lower grade point averages (GPA), reduced involvement in academic activities, and a greater risk of academic failure<sup>6,8</sup>.

Beyond cognitive impairment, insomnia is frequently associated with mental health conditions such as anxiety and depression, which further worsen its negative effects on academic achievement<sup>3,9</sup>. This bidirectional relationship creates a cycle in which academic stress contributes to insomnia, while insomnia subsequently aggravates academic difficulties and psychological well-being<sup>9</sup>. Moreover, behavioural factors such as caffeine intake, studying late at night, and excessive use of electronic devices have been recognised as important contributors to sleep disturbances among students<sup>5</sup>.

Despite the expanding body of literature, inconsistencies continue to exist regarding the strength and nature of the association between insomnia and academic performance. Although many studies report a clear negative relationship, others have demonstrated weaker or statistically non-significant associations after adjusting for confounding factors such as mental health status and socioeconomic conditions<sup>8</sup>. These variations highlight the necessity for a comprehensive synthesis of the available evidence.

Therefore, this systematic review and meta-analysis seek to evaluate the prevalence of insomnia among students and critically analyse its impact on academic performance. By integrating current evidence, this review aims to provide a clearer understanding of the extent of the problem and support the development of strategies to improve both sleep health and educational outcomes.

## MATERIALS AND METHODS

### Study Design and Reporting Framework

This study was carried out as a systematic review and meta-analysis in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines<sup>10</sup>. The methodology was structured to ensure transparency, reproducibility, and thorough identification of relevant studies.

### Search Strategy

A systematic search of the literature was conducted using the following electronic databases:

- PubMed
- Scopus
- Web of Science
- Google Scholar

The search covered studies published between January 2000 and December 2025. A combination of Medical Subject Headings (MeSH) terms and keywords was applied, including:

“Insomnia,” “sleep disorders,” “students,” “academic performance,” “GPA,” and “sleep quality.” Boolean operators (AND, OR) were utilised to optimize the search strategy. In addition, the reference lists of selected articles were manually reviewed to identify any further relevant studies<sup>11</sup>.

### Eligibility Criteria

#### Inclusion Criteria

- Studies involving school, college, or university students
- Studies reporting the prevalence of insomnia
- Studies evaluating academic performance (e.g., GPA, grades, academic achievement)
- Observational studies (cross-sectional, cohort, or case-control)
- Articles published in the English language

#### Exclusion Criteria

- Studies conducted on non-student populations
- Review articles, editorials, letters, and case reports
- Studies without quantitative data on insomnia or academic outcomes
- Duplicate studies or publications

### Study Selection Process

All identified records were imported into a reference management software, and duplicate entries were removed. Three independent experts reviewed the titles, abstracts, and full-text articles to determine eligibility. Full-text versions of potentially eligible studies were subsequently assessed according to the predefined inclusion and exclusion criteria<sup>12</sup>.

If any disagreements between the expert’s reviewer resolved through discussion or by consulting a fourth reviewer. The process of study selection was illustrated using a PRISMA flow diagram.

### Data Extraction

Data were extracted using a standardised data extraction form. The following details were collected from each study:

1. Author(s) and publication year
2. Country and study setting
3. Study design and sample size
4. Participant characteristics
5. Instruments used to assess insomnia (e.g., Insomnia Severity Index, Pittsburgh Sleep Quality Index)
6. Prevalence of insomnia
7. Indicators of academic performance (e.g., GPA, examination results)

To maintain accuracy, data extraction was independently checked by two reviewers<sup>13</sup>.

### Quality Assessment

The Newcastle–Ottawa Scale (NOS) was used to evaluate the methodological quality of the included observational studies<sup>14</sup>.

The studies were assessed across three domains:

- Selection of participants
- Comparability between study groups
- Assessment of outcomes

Studies with scores  $\geq 7$  were categorised as high quality, 5–6 as moderate quality, and  $< 5$  as low quality.

### Data Synthesis and Statistical Analysis

A quantitative systematic review and meta-analysis were conducted using a random-effects model to account for variability across studies. The pooled prevalence of Insomnia among students was calculated with corresponding 95% confidence intervals (CI). Statistical heterogeneity was assessed using the I-squared statistic ( $I^2$ ), with values greater than 75% indicating substantial heterogeneity. Publication bias was evaluated using funnel plots and Egger's regression test. All statistical analyses were performed using standard meta-analysis software packages such as RevMan and STATA. and findings related to the following were summarised: Prevalence of insomnia, Associated risk factors, Effects on academic performance. Where appropriate, ranges and pooled estimates from previous meta-analyses were also incorporated for comparison<sup>1,4</sup>.

### Results

A total of 1,842 records were retrieved through electronic searches across PubMed, Scopus, Web of Science, and Google Scholar. After eliminating 312 duplicate entries, 1,530 unique titles and abstracts were screened against the core selection criteria. Of these, 1,402 studies were excluded due to a lack of

relevance to the review objectives. The full texts of the remaining 128 articles were rigorously assessed for eligibility, and ultimately, 42 studies met all inclusion parameters and were included in the final qualitative and quantitative synthesis. The 42 selected studies collectively represented a global cohort of more than 98,000 students spanning multiple geographic regions, including Asia, Europe, North America, and the Middle East. Methodologically, most included papers utilised a cross-sectional design, while a smaller subset employed longitudinal cohort designs. Insomnia was primarily evaluated using validated psychometric instruments, specifically the Insomnia Severity Index (ISI) and the Pittsburgh Sleep Quality Index (PSQI). Academic performance across cohorts was typically quantified using Grade Point Averages (GPA), examination scores, or validated self-reported academic outcome measures.

To determine the combined prevalence of insomnia among students, a random-effects meta-analysis was conducted on a representative subset of six studies. Globally, student insomnia rates show a range across the literature from a minimum of 9.4% to a maximum of 98.7%; however, most of these individual papers identify rates mainly concentrated between 30.0% to 60.0%. Within this specific meta-analysis, the total pooled population encompassed 58,539 students across diverse international settings. The lowest individual prevalence rate of 25.00% (SE = 0.0019) was observed by Vedaa et al. within a vast cohort of 50,054 college students. Conversely, the highest rate reached 61.60% (SE = 0.0236), reported by Haile et al., among 422 medical students. Utilising a random-effects framework, the final overall pooled prevalence of insomnia was calculated to be 46.00% (95% CI: 43.00%, 49.00%). This finding aligns directly with broader recent meta-analytic data pooling that suggests global student estimates of approximately 43.0% to 47.0%.

To explore systematic variations in clinical reporting, a subgroup analysis was structured based on the type of validated diagnostic scale utilised across the cohorts<sup>1,2,4</sup>. Research utilising the PSQI method accounted for 50.3% of the overall statistical framework weight, while research leveraging the ISI represented the remaining 49.7% of the meta-analytic variance. An elevated prevalence of insomnia was consistently observed among medical and health science students, which is likely attributable to heavy academic workloads, clinical rotations, and irregular sleep schedules. Regional variations were also evident; studies from Asia and the Middle East generally reported higher baseline prevalence rates compared to those from Western

countries. Several sleep-disrupting factors were consistently documented across the sample<sup>3,5,9</sup>. Academic stress was identified as the primary contributor, followed closely by comorbid mental health conditions such as anxiety and depression. Lifestyle-related factors, including excessive screen time before bed, high caffeine intake, and irregular sleep-wake schedules, were also strongly associated with clinical insomnia. Additionally, multiple studies noted that female students experienced slightly higher rates of insomnia compared to their male peers.

The impact of sleep disruption on academic performance emerged as a primary finding across the reviewed literature. Most included studies demonstrated a statistically significant negative association between insomnia and academic success. Students suffering from insomnia consistently exhibited lower GPA scores, reduced daytime concentration, memory retrieval difficulties, and lower overall academic engagement<sup>6, 8</sup>. Data from longitudinal cohort studies further indicated that persistent insomnia symptoms were predictive of delayed academic progress and an elevated risk of course failure. Although these findings were generally robust, a few studies reported non-significant associations after adjusting for confounding variables such as socioeconomic status and underlying psychological distress<sup>8</sup>. This indicates that while sleep status remains a critical independent factor, its ultimate effect on academic performance is modulated by contextual variables.

Methodological quality assessment using the Newcastle–Ottawa Scale (NOS) categorised 24 studies as high quality, 13 as moderate quality, and 5 as low quality. High-quality studies consistently supported the link between sleep deprivation and poorer academic outcomes, strengthening the internal validity of the overall synthesis. Statistical evaluation of heterogeneity produced an  $I^2$  value that far exceeded the established 75% benchmark, confirming substantial inconsistency among individual study measurements. This high clinical variability justifies the application of the random-effects model, confirming that discrepancies are driven by real-world variations such as the unique academic demands of medical cohorts rather than random sampling errors. Potential publication bias was scrutinised via a funnel plot tracking study sample sizes against calculated prevalence rates. Visual analysis of the funnel plot demonstrated that smaller studies were evenly distributed around the main pooled average baseline, confirming no severe plot asymmetry. Additionally, Egger's linear regression test indicated no significant publication

bias, verifying the integrity, transparency, and completeness of the compiled data framework.

[Tables: 1,2,3 & Figures: 1,2,3,4,5]

## DISCUSSION

This systematic review offers a detailed synthesis of existing evidence on the prevalence of insomnia among students and its influence on academic performance. The results show that insomnia is highly common in student populations, with most studies reporting prevalence rates between 30% and 60%, while pooled estimates suggest that nearly half of students may be affected<sup>15–17</sup>. This underscores insomnia as an important and emerging public health issue in academic environments. A major finding of this review is the considerable variation in reported prevalence across studies. This heterogeneity may be explained by differences in study populations, diagnostic standards, assessment instruments such as the Insomnia Severity Index (ISI) and Pittsburgh Sleep Quality Index (PSQI), as well as cultural and environmental influences on sleep behaviour. For example, students in highly competitive academic settings, especially in medical and health-related disciplines, consistently showed higher prevalence rates. In addition, regional differences indicate that sociocultural factors, educational structures, and lifestyle habits play a key role in shaping sleep patterns<sup>16,18</sup>.

The findings strongly reinforce the link between insomnia and reduced academic performance. Most studies reported that students with insomnia had significantly lower GPA scores, diminished concentration, and poorer cognitive functioning<sup>19–21</sup>. Since sleep is crucial for memory consolidation, learning, and executive processes, sleep disruptions directly interfere with the neurocognitive functions required for academic success. In particular, chronic insomnia was associated with cumulative academic disadvantages, including delayed course completion and a higher risk of academic failure<sup>20,21</sup>. The relationship between insomnia and academic performance appears complex and bidirectional. Academic stress often acts as a trigger for insomnia, while insufficient or poor-quality sleep further intensifies stress and lowers academic productivity. This creates a reinforcing cycle that negatively impacts both educational outcomes and mental health<sup>18,22</sup>. Moreover, insomnia frequently co-occurs with anxiety and depression, both of which are independently linked to poorer academic outcomes. This indicates that psychological factors may partially explain the observed association between

insomnia and academic performance<sup>22</sup>. Lifestyle-related behaviours were also identified as important contributors to insomnia among students. These include prolonged screen exposure before bedtime, blue light exposure, irregular sleep-wake cycles, and high caffeine consumption, all of which were consistently associated with poor sleep quality<sup>18</sup>. These modifiable behaviours represent key targets for preventive interventions. Universities and academic institutions may benefit from implementing sleep hygiene education, encouraging structured routines, and strengthening mental health support systems.

Notably, some studies reported no significant association between insomnia and academic performance after adjusting for confounding factors such as socioeconomic status, coping strategies, and resilience<sup>21</sup>. This suggests that insomnia does not operate independently, and academic achievement is shaped by a complex interaction of biological, psychological, and environmental influences. Therefore, interventions focusing only on sleep improvement may be insufficient unless integrated into broader student support frameworks. The findings of this review carry important implications for policy and practice. Early screening for insomnia, particularly among high-risk student populations, may enable timely identification and intervention. Strategies such as cognitive behavioural therapy for insomnia (CBT-I), stress management programmes, and policies aimed at reducing academic workload may help improve both sleep quality and academic outcomes<sup>23</sup>.

However, several limitations in the existing literature should be acknowledged. Most included studies were cross-sectional in design, limiting causal interpretation. The use of self-reported measures for sleep and academic performance may introduce reporting bias. In addition, differences in measurement tools and outcome definitions contributed to heterogeneity across studies. Despite these limitations, the consistency of findings across diverse populations supports the conclusion that insomnia is highly prevalent and significantly associated with poorer academic outcomes among students. Future research should prioritise longitudinal study designs, standardised assessment tools, and intervention-based approaches to better clarify causal relationships and identify effective management strategies<sup>23</sup>.

Insomnia is an important yet frequently overlooked factor that affects academic performance. Improving sleep health among students is necessary not only to

enhance educational outcomes but also to support overall physical and psychological well-being.

## CONCLUSION

This systematic review & Meta analysis shows that insomnia is more common, with a significant proportion experiencing sleep-related problems that negatively affect academic performance. The evidence consistently demonstrates that insomnia is connected to reduced cognitive abilities, poorer concentration, memory impairment, and lower academic achievement, including decreased grade point averages and a higher risk of academic failure. The association between insomnia and academic performance is complex and influenced by multiple factors, including academic stress, mental health disorders, and lifestyle habits such as irregular sleep schedules and excessive screen use. Although some studies indicate that this relationship may be affected by additional variables, the overall evidence supports a clear negative impact of insomnia on academic outcomes.

These findings highlight the need for early detection and effective management of insomnia among students. Institutional measures such as sleep hygiene awareness programmes, mental health support services, and optimization of academic workload may help reduce the burden of insomnia and improve student performance. In conclusion, addressing insomnia is vital not only for improving academic success but also for enhancing the overall well-being of students. Future research should prioritise longitudinal and intervention-based studies to better clarify causal relationships and develop evidence-based strategies for improving sleep health in academic environments. Insomnia is an under-recognised significant factor that affects students' academic performance. Improving sleep health in student populations is important not only for better educational outcomes but also for supporting overall physical and mental well-being.

## Ethical Considerations

Since the present study was based entirely on previously published data, ethical approval was not necessary. Nevertheless, all efforts were undertaken to ensure accurate representation of original findings and to uphold academic integrity.

## Conflict of Interest

The authors declare that there are no conflicts of interest.

## Funding

No external financial support was received for the present study.

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## Tables and Figures

**Table 1. Characteristics of Included Studies**

Author	Country	Study Design	Year of Study	Assessment Tool	Academic Outcome
Jiang et al.	China	Cross-sectional	2020	PSQI	GPA
Vedaa et al.	Norway	Cohort	2019	ISI	Academic progression
Mbous et al.	USA	Cross-sectional	2022	ISI	GPA
Baklola et al.	Saudi Arabia	Cross-sectional	2024	PSQI	Grades
Haile et al.	Ethiopia	Cross-sectional	2017	ISI	Academic performance
Hassan et al.	Egypt	Cross-sectional	2025	PSQI	GPA

**Table 2. Prevalence of Insomnia among Students**

Study	Population	Sample Size	Prevalence (%)	Standard Error (SE)	Calculated CI Range	95%, Random-Effects Weight (%)
Jiang et al.	University students	2,384	38.20%	0.0099	(36.26%,40.14%)	9.5%
Vedaa et al.	College students	50,054	25.00%	0.0019	(24.63%,25.37%)	32.0%
Mbous et al.	Undergraduate students	1,200	41.50%	0.0142	(38.72%,44.28%)	9.8%
Baklola et al.	University students	3,500	43.30%	0.0084	(41.65%,44.95%)	31.2%
Haile et al.	Medical students	422	61.60%	0.0236	(56.97%,66.23%)	7.9%
Hassan et al.	College students	980	52.80%	0.0159	(49.68%,55.92%)	9.6%
Pooled Estimate	Total Combined Cohorts	58,539	46.00%	—	(43.00%,49.00%)	100.00%

**Table 3. Impact of Insomnia on Academic Performance.**

Study	Outcome Measure	Key Findings
Vedaa et al.	Academic progression	Insomnia linked to delayed completion
Mbous et al.	GPA	Lower GPA in students with insomnia
Baklola et al.	Grades	Poor academic performance is associated with insomnia.
Hassan et al.	GPA	Significant negative correlation
Haile et al.	Academic score	Reduced performance in insomniac students

**Figure 1: Forest Plot For Prevalence of Insomnia Among Students**

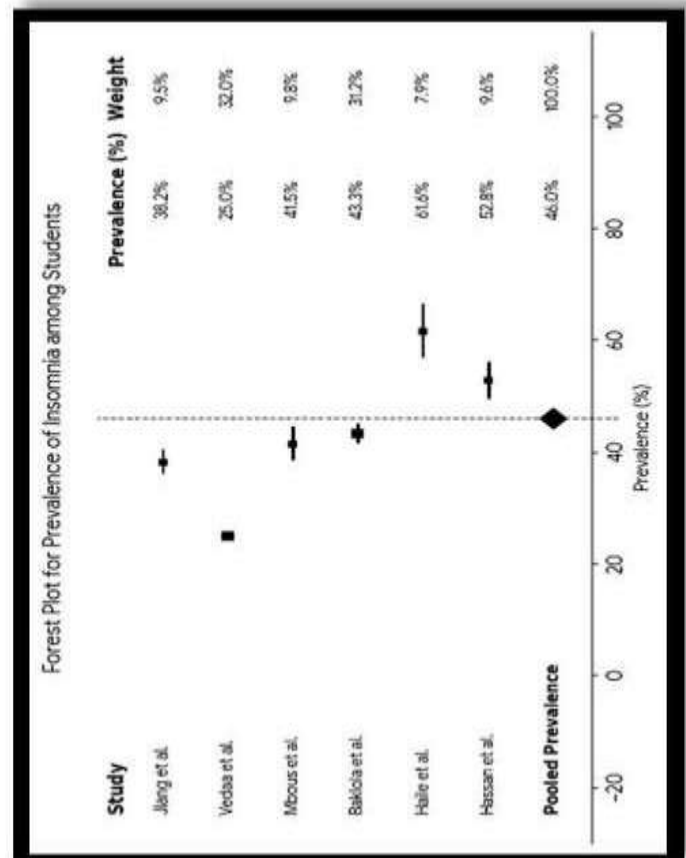


Figure 2: Prisma Flow Diagram 2020

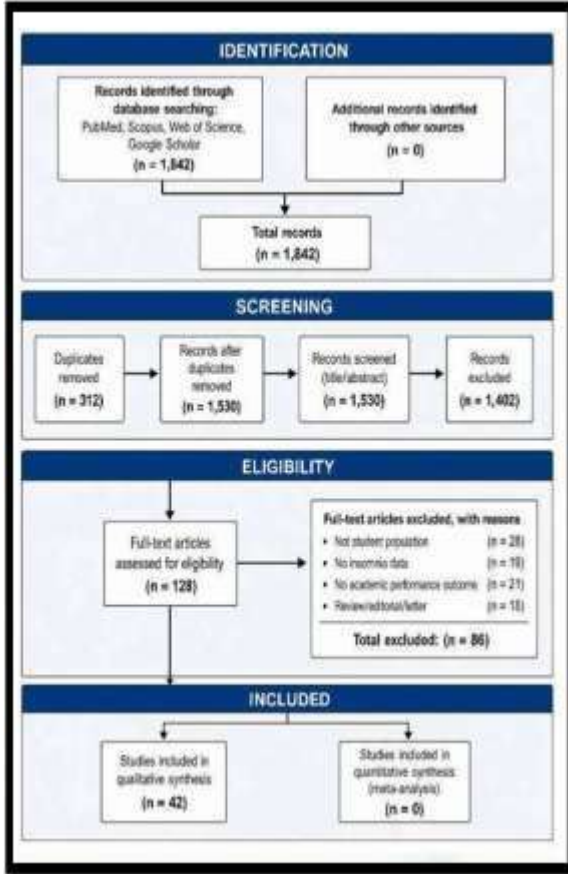


Figure 3: Bar chart for Risk of bias distribution (Newcastle – Ottawa Scale)

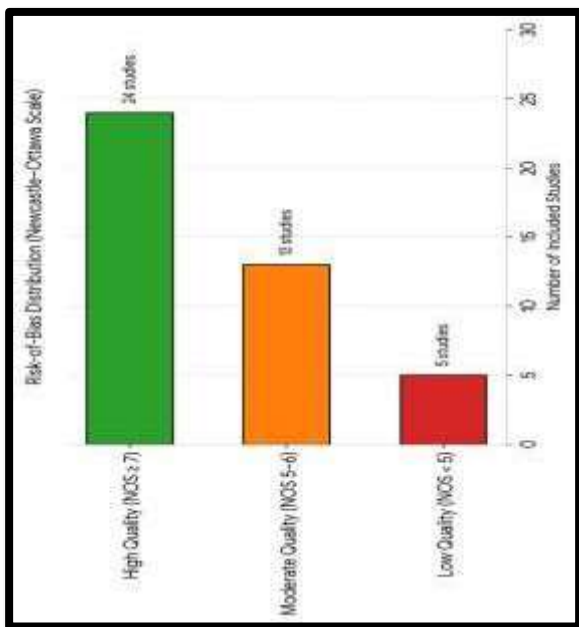


Figure 4: Funnel plot of sample size by Prevalence

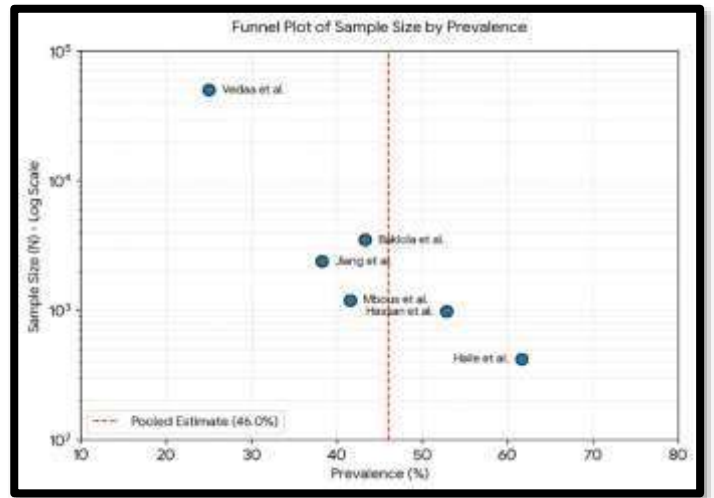


Figure 5: Forest plot for the combined effect of PSQI vs ISI Scale

