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SYSTEMATIC REVIEW

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Impact of sleep on educational outcome of Indigenous Australian children: A systematic review

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Abstract

Introduction: The association between quality sleep and improved cognition is well reported in literature. However, very few studies have been undertaken to evaluate the impact of poor sleep on educational outcomes in Indigenous Australian children.

Objectives: The objective of this review was to explore the association between sleep and educational outcomes of Indigenous children.

Methods: For this systematic review, a literature search covering research articles in academic databases and grey literature sources was conducted to retrieve studies published until March 2022. Eight online e-databases (PubMed, Ovid MEDLINE, CINAHL, SCOPUS, HealthinfoNet, PsycINFO, Cochrane and Google Scholar) were searched for data extraction and two appraisal tools (NIH and CREATE) were used for quality assessment. Studies that explored any aspect of sleep health in relation to educational/academic outcomes in school going Indigenous Australian children aged 5–18 were included in this study. All review articles and studies that focused on physical/ mental disabilities or parent perceptions of sleep and educational outcomes were excluded. A convergent integrated approach was used to collate and synthesize information.

Results: Only three studies (two cross-sectional and one longitudinal) met the eligibility criteria out of 574 articles. The sample size ranged from 21–50 of 6 to 13 year old children. A strong relationship was indicated between sleep quantity and educational outcomes, in two of the three studies. One study related the sleep fragmentation/shorter sleep schedules of short sleep class and early risers with poorer reading ($B = -30.81$ to -37.28, $p = 0.006$ to 0.023), grammar ($B = -39.79$ to -47.89, $p = 0.012$–0.013) and numeracy ($B = -37.93$ to -50.15, $p = 0.003$ to 0.022) skills compared with long sleep and normative sleep class whereas another reported no significant relation between sleep and educational outcomes.

Conclusion: The review highlights the need for more research to provide evidence of potentially modifiable factors such as sleep and the impact these may have on academic performance.

KEYWORDS

cognition, Indigenous Australian, sleep, sleep fragmentation, systematic

1 | INTRODUCTION

Sleep health is a key determinant of physical, social and emotional well-being of an individual. A sound sleep and healthy mind promotes positive health, and allows exploration of new ideas, improves complex problem-solving ability and stimulates engagement in challenges through enhanced metacognition.[1–3] Decline in slow-wave or deep sleep is negatively associated with declarative memory.[4,5] Inadequate sleep can also lead to poor health-related quality of life by triggering obesity, diabetes and cardiovascular disorders.[6,7]

There has been a growth in our understanding of the impact of sleep quality on paediatric health and cognition in the past two decades.[8–10] In children, sleep duration of 8–10 h has been associated with a positive impact on declarative memory and an enhanced ability to retrieve and apply practical knowledge.[4] Unfortunately, Quach et al.[11] have reported occurrence of mild sleep-related problems among 17%, and moderate-to-severe sleep issues in 5.7% of Australian children in the age group of 6–7 years. With age, interplay of various biological and sociocultural factors interferes with adequate sleep quality and durations. Puberty and physiological homeostasis are normative factors that develop over time and alter sleep–wake cycle in growing children.[12] Besides these normative factors, health (physical and/or mental challenges), social (overcrowding and associated disturbances) and environmental (noise) issues along with lifestyle habits (technology usage in the evening) formed during childhood can precipitate sustained sleep difficulties.[13,14] Persistence of poor sleep in children can result in adverse health and well-being outcomes,[15] and substandard learning and cognitive abilities,[7,16] leading to poor academic performance.[17,18]

Studies have also indicated the bidirectional link between adequate sleep, academic outcome and school workload. The Longitudinal Study of Australian Children (LSAC) annual statistical report stated that children aged 12–15 were more likely to get the required minimum hours of sleep on non-school nights compared to school nights. During early years of school, the bed-time use of technology is also highly associated with poor sleep patterns.[13,19] The LSAC report further indicated that sleep pattern become more disrupted during adolescence (age 16–17) and only 50% students get the required amount of sleep.[20] Besides workload, screen-time and electronic usage, other reasons for poor sleep in adolescents include competing health priorities, overcrowded houses, discomfort or simply lack of awareness regarding sleep health.[13,19]

In Australia, the disparities in quality sleep and education of Aboriginal and Torres Strait Islander (hereafter respectfully referred to as Indigenous) children as compared to non-Indigenous children is currently under research. Among the various barriers to quality sleep identified in Indigenous Australians, social barriers are regarded as the most significant. The Aboriginal and Torres Strait Islander people contribute to 3.3% of the total Australian population.[21] According to AIHW estimates, 17.6% of Indigenous populations reside in remote areas of Australia and represent 31.5% of the remote population. In contrast, 44.2% and 38.3% Indigenous populations reside in regional areas and major cities, but represent only 5.9% and 1.8% proportion of the total Australian population, respectively.[21] The data suggest that although Indigenous populations are gradually

What is already known about this subject

- Links have been established on how social lifestyles can contribute to inadequate or fragmented sleeping patterns and educational under-achievements in a population.
- The influence of quality sleep on improved cognition is also well reported.

What this study adds

- The present review highlights the scarcity of research on whether poor sleep significantly affects educational outcomes in Indigenous Australian population.
- Although much research has been carried out on the association of sleep and educational outcomes in Indigenous population, they lack conclusive data based on statistical and quality appraisal tools in most research studies.

moving to regional areas and major cities, they still account for almost one-third of overall remote population. Factors like overcrowding, which affects 48% of the population in remote areas, lead to inconsistent bedtimes and sleep fragmentation. This augments the challenges of quality sleep in Indigenous Australians.[22] Most often, the school-aged children fail to get the 9–11 h of sleep recommended by National Sleep Foundations.[23,24] The geographical remoteness also challenges availability of learning resources and are associated with low attendance rates and language barriers.[25] Altogether, it is understood that sleep problems and social barriers like inadequate learning resources is associated with lower levels of education attainment and have majorly influenced the under-achievements of Indigenous children.[25,26] It also raises serious concerns about the long-term consequences of the socio-economic disadvantages on sleep health, educational outcomes and overall well-being of Indigenous children.[26,27]

Sleep problems within Indigenous children is reported to be higher than non-Indigenous counterparts.[28,29] The factors associated with social determinants of health (employment, food security, educational resources and sanitary habits) provide plausible explanations for this disparity.[29] Despite the established evidence on the role of quality sleep in positive academic outcomes,[30] there remains significant gaps in our understanding of the impact of poor sleep on academic performance of Indigenous children. This is particularly concerning knowing that Indigenous children have disproportionately poor academic performance and are predisposed to socio-economical disadvantages and language barriers. Hence, the objective of this systematic review was to explore the association between sleep and educational outcomes of Indigenous children.

2 | METHODS

2.1 | Guiding framework

This is a mixed-methods systematic review[31] guided by strength-based approaches (positive attributes)[32] for analysis of quantitative data on the association between quality sleep and educational outcomes in Indigenous children. Strengths-based approaches have been identified as a way to move away from a 'deficit discourse' with Indigenous studies. They enable our focus on positive attributes of associations between any selected statistical variables of a study, which in turn supports a positive change while respecting community values and principles.[32] This review is also evaluated by, the expertise and experience of, a cultural mentor (MG) to ensure that the interpretation and reporting of study findings are culturally respectful and responsive to Indigenous populations. This review followed methodology described by Stern et al.[31] and involved four steps; data collection, data transformation, data integration and synthesis of evidence.

2.2 | Study design

A systematic search using relevant search terms was developed using the MeSh subject headings and adjusted to conduct a title and abstract pilot search in PubMed before searching Ovid MEDLINE, CINAHL, SCOPUS, HealthinfoNet, PsycINFO and Cochrane databases for relevant literature (Appendix S1) published until March 2022. Also, potentially relevant articles, reports of epidemiological studies and grey literature were searched on Google Scholar using subject headings. The search strategy was developed with support from a research librarian. A reference list was prepared with the assistance of co-authors and research librarian. The reference lists of included articles were manually checked for any potentially relevant studies by two reviewers (Author 1 and Author 2). All titles were extracted to Endnote and uploaded to Covidence. In Covidence, duplicates were removed and screening of titles, abstracts and full texts were completed by two reviewers (Author 1 and Author 2). This review is presented in accordance with Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines.[33]

2.3 | Inclusion and exclusion criteria

Inclusion criteria: The qualitative, quantitative and mixed method studies that explored any aspect of sleep health in relation to educational/academic outcomes in school going Indigenous Australian children aged 5–18 were searched in literature databases. Only original research articles and grey literature (conference abstracts) published in English language were included in this study.

Exclusion criteria: All review articles and studies that focused on disabilities or parent perceptions of sleep and educational outcomes were excluded. The studies on sleep and educational outcomes in children with developmental and cognitive disabilities or medical conditions were also excluded.

2.4 | Quality appraisal

Two appraisal tools were selected to assess the quality of the selected studies for risk of bias and Indigenous

perspectives (Appendix S2). The 14 item measure NIH quality assessment tool for observational cohort and cross-sectional studies (represented in Table S1) was used to assess risk of bias and internal validity for the included final studies.[34] The Aboriginal and Torres Strait Islander Quality Appraisal Tool consisting of 14 items (represented in Table S2), designed by The **C**entre of Research Excellence in Aboriginal Chronic Disease Knowledge Translation and Exchange (CREATE), was used to assess the degree to which each paper complied with the quality guidelines developed for research that included Aboriginal and Torres Strait Islander people/communities.[35]

2.5 | Data extraction

The data from each study were evaluated in the following categories: (i) author's name, year of publication (ii) study sample (method and age group) (iii) study design and recruitment (iv) study tools (v) outcome measures and (vi) findings (Table 1).

3 | RESULTS

3.1 | Characteristics of studies

A total of 574 studies, published until 21 March 2022, were imported for screening out of which, 46 full-text articles were assessed for eligibility (Figure 1). Among these articles, three studies met the eligibility criteria and were included for review (Table 1). Two of these articles reported cross-sectional studies and one described longitudinal analysis of sleep health among Indigenous children. Since no qualitative or mixed methods studies met the inclusion criteria in this review, the same extraction tool was appropriately used throughout the study. In the community-based studies,[36,37] the total sample size ranged from 21–50 of 6- to 13-year-old children. The study samples were recruited from metropolitan and remote Indigenous communities.

The quantitative data were assembled qualitatively to optimally interpret descriptive information obtained from extracted literature.[37] A convergent integrated approach was used to collate and synthesize information. The data were then catalogued and grouped into themes to consolidate findings and examine the association between sleep and educational outcome in Indigenous children. Sleep quality and quantity was assessed by self/parent reports or sleep wearable devices.[22,36,37] The educational outcomes was assessed using the Wechsler Individual Achievement Test (WIAT),[37] parent-reported questionnaire about their child's school performance[36] and The National Assessment Program – Literacy and Numeracy (NAPLAN)[22] data.

3.2 | Quality assessment

The results from the NIH quality assessment tool and Aboriginal and Torres Strait Islander Quality Appraisal (CREATE) Tool are reported in Tables S1 and S2 respectively. Two studies carried out sampling from similar populations;[36,37] hence, the possibility of non-random sampling affecting the accuracy of results cannot be ignored. Two studies were rated as moderate risk of bias (achieving >50% response of 'Yes').[36,37] The longitudinal study was rated as low risk.[22] Two studies measured the exposure (sleep) more than once, improving result validity.[36,37] None of the outcome assessors for any of the studies was blinded to the exposure status of participants. The evaluation of Indigenous involvement, leadership and engagement in the studies based on the evaluation tool CREATE found that Indigenous participation was either under reported or not comprehensively included.[34]

3.3 | Sleep and educational outcomes

The studies included in this review explored a direct relationship between sleep and academic performance in Indigenous children. One study reported that on average, Indigenous children slept for 8.78 h (SD ± 49.6 min).[37] Based on sleep schedules, participants were categorized as early risers (15%), long sleep (12.3%), normative sleep (49.7%), variable bedtimes (11.7%) and short sleep (10.9%).[22] A strong relationship was indicated between sleep quantity and educational outcomes, in two of the three studies.[22,37] One study reported the correlation between sleep schedules and academic performance in terms of βeta co-efficient (β). The sleep fragmentation/shorter sleep schedules of short sleep class and early risers were significantly related to poorer reading ($\beta = -30.81$ to -37.28, $p = 0.006$ to 0.023), grammar ($\beta = -39.79$ to -47.89, $p = 0.012$–0.013) and numeracy ($\beta = -37.93$ to -50.15, $p = 0.003$ to 0.022) skills compared with long sleep and normative sleep class.[22] More movement during sleep ($r = 0.52$; $p < 0.05$) was linked to poorer reading skills.[37] Independent of geographical location, one study presented evidence of low numeracy skills ($r = 297.45$–311.98; $p < 0.01$) in early risers, short sleep class and variable bedtimes, as compared to normative and long sleepers ($r = 329.05$–366.05; $p < 0.05$) during school nights.[22] In contrast, Blunden and Chervin[36] reported no significant relation between sleep and educational outcomes.

TABLE 1 Characteristics of three studies included in the review.

Author (year)	Study sample	Age group (in years)	Study design and recruitment	Study tools (data collection)	Outcome measures	Findings
Blunden & Chervin (2010)[36]	Matched sample of 50 school-aged children including 50% Indigenous and 54% males from metropolitan and urban areas. Original survey sample size was 135	Indigenous children: 7–12 Non- Indigenous children: 7–11	Cross-sectional Exploratory Schools invited: 26 Schools attended sessions: 8 and 5 continued with the study A total of $n = 135$ questionnaires received Information of 50 children extracted (25 Indigenous and 25 non Indigenous) The information on the number of students who completed the data set from the sample n is unavailable. Participants were matched based on age, gender, locality and parental education. Response rate: 30.6%	Self-reported data provided by primary caregiver	Sleep Disturbance Scale for Children (SDSC): Behavioural sleep problems, sleep-disordered breathing problems, arousal disorders, sleep wake transition problems, excessive daytime sleepiness, hyperhidrosis, total sleep problem score Child Behaviour Checklist (CBCL): Academic problems, remedial teaching/learning assistance, school performance, anxiety, withdrawn, somatic, social and thought behaviours, attention, rule breaking, aggression, internalized behaviour, externalized behaviour, total problem behaviours	Indigenous participants (in comparison with non-Indigenous indicated in brackets): 32% (40%) reported behavioural sleep problems 12% (28%) reported sleep-disordered breathing and arousal problems, 20% (16%) reported sleep wake transition and excessive daytime sleepiness Total combined sleep problems: 56% (school performance and total behaviour problems) The link between sleep and behaviour is correlational and not causal

TABLE 1 (Continued)

Author (year)	Study sample	Age group (in years)	Study design and recruitment	Study tools (data collection)	Outcome measures	Findings
Cooper et al. (2012)[37]	21 Indigenous children (71% males) from a remote Indigenous community	6–13	Cross-sectional, purposive community sample from a school in the remote Indigenous community in the Northern Territory. Response rate: 42%	Actigraphy data collected through a wearable watch (on the non-dominant hand) and psychometric assessment	Sleep duration, efficiency and latency in Indigenous children and their association with academic performance (Wechsler Individual Achievement Test (WIAT-II) and executive function -auditory and visual attention (NEuroloPSYcological Assessment (NEPSY) and NEPSY-II)	Actigraphy data indicated a total sleep time of 8.78 h (SD ± 49.6 min) in children. Greater sleep efficiency was significantly associated with increased word-reading ability, greater movement time during sleep was significantly associated with reduced word-reading ability and sleep fragmentation was significantly linked with reduced reading and numeracy skills Limitations relate to (1) small sample size and assessment tool not normed for the population and (2) unaccounted confounding factors (parent education, school attendance, socio-economic status, hearing problems). Therefore, the study lacks the ability to argue casualty

(Continues)

TABLE 1 (Continued)

Author (year)	Study sample	Age group (in years)	Study design and recruitment	Study tools (data collection)	Outcome measures	Findings
Blunden et al., (2018)[22]	Participants (~50% males) of the Waves 5 and 8 of the Longitudinal Study of Indigenous children (LSIC) cohort Wave 5: $n = 1258$	Wave 5–7.5–9 Wave 8–10.5–12	Longitudinal, Cluster sampling covering 11 remote, regional and urban locations in Australia Retention rate: Wave 4 and 5: 85.5% Waves 1 and 5: −71.8%	Self-reported data provided by primary caregiver	Sleep duration classification – Early risers, Long, Short and Normative sleep, Variable bedtimes, Maternal education, Family type, Household size, Geographic remoteness, National Assessment Program–Literacy and Numeracy (NAPLAN) data	Five distinct groups of children, based on their sleep schedules, were identified as Early Risers (15%), Long Sleep (12.3%), Normative Sleep (49.7%), Variable Bedtimes (11.7%) and Short Sleep (10.9%). Short sleep had significantly poor literacy (spelling, grammar and writing) and numeracy compared with Long Sleep class Limitations relate to (1) self-reported nature of data collection (no objective measure like actigraphy) and (2) paternal sleep patterns, subsequent difficulty in estimating sleep duration. Therefore, the study lacks the ability to argue casualty

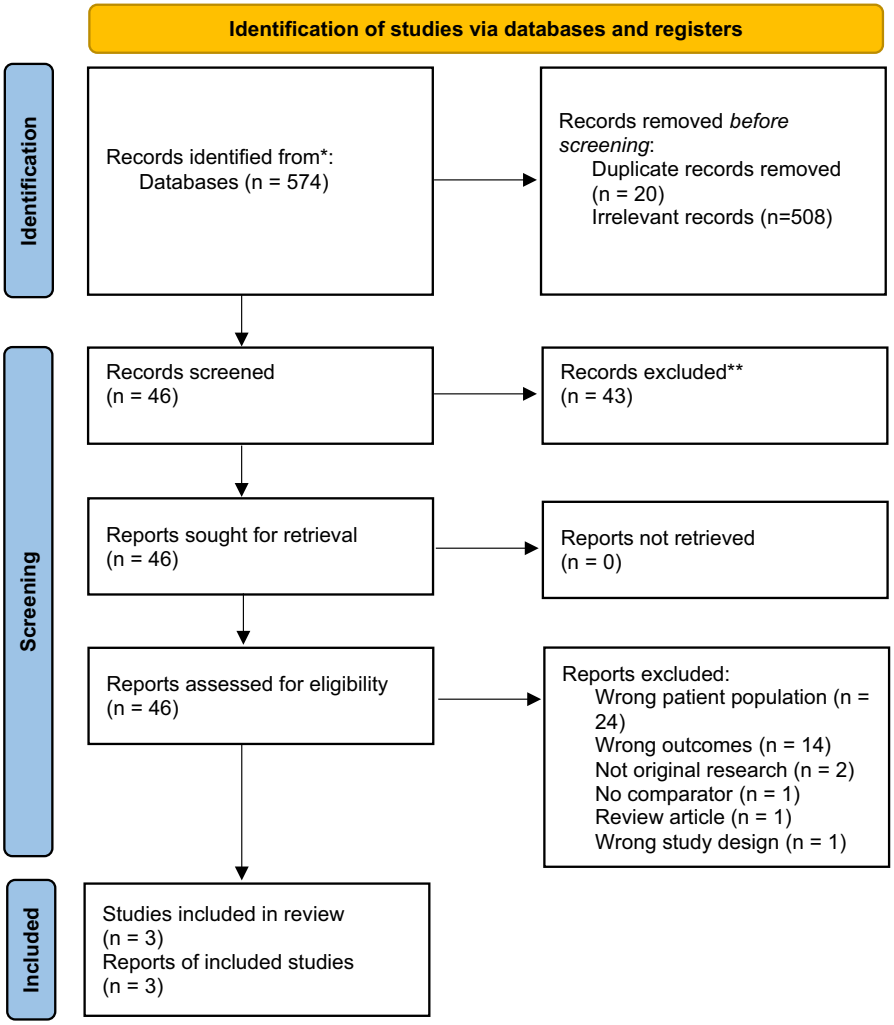

FIGURE 1 Quality scores of studies screened and assessed in this review.

4 | DISCUSSION

The aim of this review was to understand the impact of sleep and its association with educational outcomes in Indigenous children. Quality sleep has an important impact on a person's health and well-being. Despite a plethora of evidence supporting the association of improved sleep with better health and educational outcomes in non-Indigenous children,[16,38,39] this review identified only three published studies that have explored a direct relationship between sleep and educational outcomes in Indigenous Australian children.[22,36,37] Indigenous peoples experience considerable inequities in their health and educational outcomes. Understanding opportunities for improvements in health and educational outcomes is an imperative, and sleep provides one such opportunity.[29]

The main findings of this review indicate a moderate association between quality sleep and educational outcomes in Indigenous Australian children based on the observations of three review articles that met the eligibility criteria for this study. However, the scarcity of research in this area limits confidence with these findings and was not supported by one study[35]; thus highlighting the need for more research. The reported prevalence of sleep disorders in Indigenous Australian children in the studies reviewed is widely supported in the broader literature.[19,29,40–43] In this review, two studies associated sleep times of less than 9–10 h with daytime tiredness, poor reading, grammar, writing and numerical ability resulting in poor academic performance.[22,37] These studies did/did not differentiate between age groups and it is likely there would be some variation with age.[29] Although greater sleep quality was positively associated with increased word reading ability, there was no compelling evidence to establish a significant relation between sleep quantity and academic performance. Given the evidence supporting the association between sleep quantity and academic performance in non-Indigenous populations, the insignificant relation reported by Blunden and Chervin[36] may be a consequence of either small sample size or self-reported unintentional data bias in a cross sectional study design. Since sleep plays a significant role in a child's overall development, this study also analysed sleep problems and its implications

on a child behaviour including anxiety, withdrawn, somatic, social and thought behaviours, rule breaking, aggression and total behaviour problems impacting educational outcomes. It indicated positive correlation of sleep problems with withdrawn (58.2%) and externalized behaviour (57.1%) in Indigenous children.[36] Previous findings have suggested that these behaviours in children are likely mediated by sleep; therefore, improved sleep may benefit both individual behaviours and academic outcomes in Indigenous children.[44]

The reviewed studies highlight the association of sleep problems with academic under-achievement, display of externalized and withdrawn behaviour in Indigenous children. These findings are consistent with current evidence of sleep and educational outcomes in children. In Australia, it is well established that the level of academic achievement in Indigenous children remains below that of their non-Indigenous peers.[28,45] To overcome social barriers, government programs practise targeted interventions keeping in mind sensitivity of Indigenous cultures and traditions. It has been hypothesized that other factors such as low attendance rates are likely to be associated with sleep issues.[25,42] Findings of 10% lower attendance rate of Indigenous children, which further widens to 17% during the secondary school years, and twice the likelihood of them remaining absent at least 26 days or more in a school year supports the hypothesis.[25,28,42] Moreover, the low academic performance resulting from low attendance rates are influenced by the same set of factors that are defined to affect quality sleep. These factors include social lifestyle, low socio-demographics, life stress events, overcrowding, limited access to resources and support services.[25,46]

Sleep is one of a number of factors that potentially influences health and education outcomes for Indigenous children. From our understanding, it is possible that there is little or no awareness regarding the impact of sleep deprivation or less duration of quality sleep among Indigenous populations. Coupled with previously defined social factors, this may create a challenge for Indigenous children to perceive and appreciate their right to quality sleep.

4.1 | Limitations of the selected studies

All the three studies included in this review suffer from selection bias. Of the three Australian studies,[22,36,37] both cross-sectional studies by Blunden and Chervin,[36] and Cooper et al.[37] have a limitation of small study sample and response rate of less than 50% (30.6% and 42% respectively). Even though the sleep measure was based on different methodologies in the two studies, there is paucity of evidence available to further establish a strong relationship between sleep and well-being of children to their academic outcome and relate that to a larger population. Additionally, the longitudinal study holds the limitations of proxy data collection leading to recall bias as well as limited generalizability of findings.[22]

The active interest of children in wearing the non-invasive monitors and complying with the guidelines is a non-standardized procedure. This increases the possibility of manual errors in the study by Cooper et al.[47] Thirty-seven issues like technical errors in the sensors and inability to detect wakefulness within sleep periods in subjects further raise questions about the validity of data produced by this method. Moreover, auditory impairment and sleep disorders in subjects, and other confounding factors which affect sleep, were not taken into consideration to assess sleep, introducing a potential bias in data collection.[37]

In our understanding, to date, Blunden et al.[22] are the only longitudinal study that have evaluated sleep schedules and educational outcomes of Indigenous children. Analysis of longitudinal data with evaluated measures helps disambiguate the impact of sleep in Indigenous Australian children and also reduce the potential risk of subjective bias in the educational outcome. However, a more standardized tool like the Pittsburgh Sleep Quality Index (PSQI) to assess sleep quality, duration and efficiency can be used in different settings to get more consistent and reliable results in measuring sleep.[48]

The introduction of latent class analysis of sleep data, with variable bedtimes and sleep schedules, can also help us draw a number of interesting conclusions about quality of sleep and school performance in Indigenous children. For instance, sleep quantity is directly proportional to academic performance.[22,37] Variable sleep classes exist in Indigenous children and on an average, an Indigenous child sleeps for approximately 9 h per school night.[22] However, when this average sleep time is compared to the largest sleep class of children ($n = 225$) who sleep for 10 hours at school nights, there is a significant sleep debt over a period of time in a child who either has poor or variable sleep timings.[22] A small adjustment or extension in sleep time for the children who get less sleep can have positive effects on neurobehavioural functioning, improving their concentration, ability to focus and stay motivated in classrooms.[49]

Based on findings of Aboriginal and Torres Strait Islander Quality Appraisal (CREATE) Tool assessment, the principles of Indigenous data sovereignty were not recognized in the framework of selected studies. It is the right of Indigenous populations to own, control, access and steward the data relevant to their communities. The Indigenous leadership and engagement in the selected studies were not

adequately done and these findings are also supported by other research in this field.[29] This has implications for establishing community engagement and collaborative partnership to design interventions to address this issue. There was no evidence of the use of a two-way learning approach in the studies reviewed. Two-way learning involves collaboration between two cultures (in this case between Indigenous and non-Indigenous) to understand each other's world views and better address underlying social and political issues that face Indigenous peoples. The knowledge exchange between two cultures, and comparison of outcomes in studies involving two cultures, achieve more conclusive learning opportunities due to improved responsiveness.[50] Lack of this approach detects ambiguity as to what learning needs to be addressed in this particular question. To our knowledge, CREATE is probably the only tool that addresses Indigenous Australian involvement and leadership in research studies. Therefore, it is imperative that the authors include all the information, relevant to Indigenous involvement listed in this tool, in the original papers for a thorough quality appraisal by other researchers.

5 | CONCLUSION

The influence of quality sleep on improved cognition and links between fragmented sleep and educational underachievements have been well established. Despite this fact, the present review highlights the scarcity of conclusive research data on sleep health of Indigenous Australian populations. This scenario stipulates lack of understanding, cognizance and/or appreciation of the impact of sleep on educational outcomes in Indigenous children. In Australia, the Indigenous populations remain predisposed to socio-economical disadvantages and show poor academic performance compared to non-Indigenous peers. Hence, research on potentially modifiable factors such as sleep and the impact these may have on academic performance of Indigenous students may help close the educational gap.

AUTHOR CONTRIBUTIONS

Khadija Fatima: Writing – review and editing; resources; conceptualization; methodology; investigation; writing – original draft. **Sharon Varela:** Writing – review and editing. **Yaqoot Fatima:** Conceptualization; supervision; writing – review and editing. **Daniel Lindsay:** Writing – review and editing; supervision. **Malama Gray:** Writing – review and editing. **Alice Cairns:** Writing – review and editing; methodology; supervision.

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CONFLICT OF INTEREST STATEMENT

Authors declare no conflict of interest.

DISCLOSURE

The contents of this research study have not been previously published in part or in full elsewhere.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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