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Empowering Community Health Cadres Through Sleep Hygiene Education to Promote Healthy Sleep Among Older Adults

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ABSTRACTS

Introduction: Sleep problems are common among older adults and may adversely affect health, daily functioning, and well-being. Community health cadres are strategically positioned to promote healthy sleep practices. This community engagement program aimed to strengthen community health cadres' knowledge of sleep quality and sleep hygiene among older adults. **Methods:** A total of 51 health cadres at Padamukti participated in the program. The activities comprised baseline knowledge assessment, health education, cadre capacity building, and post-program evaluation. Educational content covered sleep and sleep quality, consequences of insufficient sleep, sleep hygiene, six pillars of healthy sleep practices, signs of sleep problems, referral indications, and cadres' roles in supporting older adults. **Results:** The mean knowledge score increased from 12.16 ± 3.21 to 13.31 ± 1.69 at post-test. The proportion of cadres with good knowledge increased from 66.7% to 80.4%, while the proportion with poor knowledge decreased from 7.8% to 0%. Correct-response proportions increased 73.3%. The largest improvements were observed for knowledge regarding foods to avoid before bedtime (+23.5 percentage points) and mobile phone or television use before sleep (+21.6 percentage points). Age-related changes in sleep and selected aspects of physical activity remained important learning gaps. The Mann–Whitney U test yielded U = 1034.5; p = 0.070, indicating that the difference in score distributions did not reach statistical significance. **Conclusion:** These findings support further development of the program on cadre capacity building related sleep disorders among older adults.

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1. INTRODUCTION

Older adults experience physiological, psychological, and social changes that may influence their sleep patterns and overall sleep quality. Sleep disturbances in later life are an important health concern because they may affect health status, functional ability, and daily activities. Evidence from systematic reviews and meta-analyses of community-dwelling older adults indicates that poor sleep quality is common, with a pooled prevalence of approximately 40%. Other sleep-related problems, including insomnia, excessive daytime sleepiness, and obstructive sleep apnea, have also been reported among older populations (Kavousi et al., 2025; Spira, 2014).

More recent evidence has similarly indicated a substantial burden of sleep problems among community-dwelling older adults, with prevalence estimates of approximately 45% when sleep disturbance is assessed using the Pittsburgh Sleep Quality Index (PSQI). Several factors may contribute to sleep problems in later life, including advanced age, depression, chronic health conditions, and limited social or family support. These findings emphasize that sleep health should not be addressed exclusively through curative services. Preventive and health-promoting interventions at the community level are also needed to support healthy aging (Nguyen et al., 2020; McLaren et al., 2023).

Sleep health encompasses more than the duration of nighttime sleep. Daily behaviors and environmental factors, such as bedtime routines, the sleep environment, physical activity, dietary habits, relaxation, and consistency of sleep schedules, may also contribute to healthy sleep. *Sleep hygiene* provides a practical framework for addressing these factors by promoting behaviors and environmental conditions that support adequate and healthy sleep among older adults (Spira, 2014; Nguyen et al., 2020).

Community-based strategies are particularly relevant because community health cadres maintain close contact with older adults and their families. Within their community roles, cadres can communicate health information, encourage healthy behaviors, identify potential health concerns at an early stage, and facilitate connections between community members and healthcare professionals. Evidence concerning community health worker interventions among older populations suggests potential benefits, although reported outcomes vary and further evaluation using robust approaches remains necessary.

Responding to these community needs, the Healthy Sleep Care Cadres for Older Adults Program (*Kader Peduli Tidur Sehat Lansia: Tidur Berkualitas untuk Lansia Sehat, Aktif, dan*

Bahagia) was developed through collaboration between a higher education institution and Padamukti Community Health Center. The program positioned community health cadres as the primary participants because of their potential to extend sleep-health promotion to older adults and families. A total of 51 cadres from the service area of Padamukti Community Health Center, Bandung Regency, participated in the program.

Rather than providing information about sleep alone, the program incorporated education on sleep hygiene, recognition of sleep-related problems, situations requiring consultation with healthcare professionals, and cadres' roles in supporting older adults. For practical application, sleep hygiene was organized into six pillars: healthy sleep patterns, a comfortable sleep environment, physical activity, social activity, healthy dietary practices, and relaxation. The program also strengthened five community roles of cadres—as educators, motivators, companions, facilitators, and links to healthcare professionals.

An important consideration in evaluating community education is that changes in total knowledge scores may not fully reveal which topics participants have mastered and which remain poorly understood. Two participants may obtain similar overall scores while demonstrating different patterns of correct and incorrect responses. Consequently, relying exclusively on aggregate scores may obscure specific educational needs. Item-level assessment can complement total-score evaluation by identifying concepts that improve following education and those that require further reinforcement. This information is particularly valuable for community engagement programs because evaluation findings can be translated directly into priorities for subsequent cadre training.

The distinctive feature of this community engagement program lies in its integration of sleep hygiene education, cadre capacity building, early identification and referral, and multidimensional knowledge evaluation. Knowledge was evaluated not only through total scores and categorical levels but also across 15 individual educational items. This approach was designed to identify specific *learning gaps* and use them to guide subsequent educational and empowerment activities, shifting evaluation from merely documenting program completion toward informing continuous program improvement.

Accordingly, this community engagement program aimed to strengthen and evaluate community health cadres' knowledge of sleep quality among older adults and to identify learning gaps across 15 educational items as a basis for developing sustainable cadre empowerment activities.

2. METHODS

2.1 Setting and Time

The community engagement program was conducted on August 31, 2026, at Padamukti Community Health Center, located at Jalan Panyadap No. 64, Panyadap Village, Solokanjeruk District, Bandung Regency, West Java, Indonesia. The program was implemented through collaboration among STIKep PPNI Jawa Barat, the Faculty of Nursing, Universitas Indonesia, and Padamukti Community Health Center.

2.2 Participants

The target participants were community health cadres working within the service area of Padamukti Community Health Center. A total of 51 cadres completed the entire program, including the pre-test, educational session, capacity-building activities, and post-test. All participants were women, aged 27–67 years, with a mean age of 47.53 years.

2.3 Program Implementation

The community engagement program was implemented through four main stages.

Stage 1. Baseline Knowledge Assessment

Before the educational activities, participants completed a pre-test to assess their baseline knowledge regarding sleep quality and sleep health among older adults. The results were used to provide an initial overview of participants' understanding before the intervention.

Stage 2. Health Education

The educational session covered fundamental concepts related to sleep and sleep health in older adults. The topics included the concept and benefits of sleep, sleep quality, the consequences of insufficient sleep, sleep hygiene, behaviors that support healthy sleep, signs of sleep disturbances, and conditions requiring consultation with healthcare professionals.

Stage 3. Cadre Capacity Building

Cadre capacity building focused on the practical application of sleep hygiene. Participants were introduced to six pillars of sleep hygiene:

1. healthy sleep patterns;
2. a comfortable sleep environment;
3. physical activity;
4. social activity;

5. healthy dietary practices; and
6. relaxation.

In addition, cadres received reinforcement regarding their roles as educators, motivators, companions, facilitators, and links between older adults and healthcare professionals. These roles were emphasized to support cadres in promoting sleep health and facilitating appropriate referral when persistent sleep problems were identified.

Stage 4. Post-Program Evaluation

After completion of the educational and capacity-building activities, participants completed a post-test. The evaluation was used to examine changes in the distribution of knowledge scores and to identify educational topics that still required further reinforcement.

2.4 Knowledge Assessment Instrument

Participants' knowledge was assessed using a 15-item questionnaire. Each correct response was assigned a score of 1, while each incorrect response was assigned a score of 0, resulting in a total possible score ranging from 0 to 15.

Knowledge scores were categorized as follows:

Knowledge Category	Score Range
Poor	≤8
Moderate	9–11
Good	12–15

The questionnaire covered 15 content areas: the definition of quality sleep, sleep requirements among older adults, age-related changes in sleep, factors that interfere with sleep quality, coffee consumption before bedtime, physical activity, mobile phone or television use before sleep, signs of poor sleep quality, consequences of insufficient sleep, risks of persistent sleep disturbances, strategies for improving sleep quality, the sleep environment, benefits of physical activity, foods to avoid before bedtime, and appropriate cadre actions when persistent sleep problems are identified.

2.5 Data Analysis

Data were analyzed using descriptive statistics, including the mean, standard deviation, median, first quartile (Q1), third quartile (Q3), minimum, and maximum values.

The distribution of knowledge categories was presented using frequencies and percentages. Item-level changes were calculated by subtracting the proportion of correct responses at pre-test from the proportion at post-test. These differences were expressed in percentage points (pp).

Because the pre-test and post-test data could not be matched at the individual participant level, the two score distributions were compared using the Mann–Whitney U test rather than a paired statistical test. Effect size was reported using the rank-biserial correlation. A value of $p < 0.05$ was considered statistically significant.

3. RESULT AND DISCUSSION

3.1 Participant Characteristics

A total of 51 community health cadres participated in the program, and all participants completed both the pre-test and post-test. All participants were women. Their ages ranged from 27 to 67 years, with a mean age of 47.53 years and a median age of 47 years.

Table 1. Characteristics of Participants

Characteristic	n (%) / Statistic
Total participants	51
Attendance	51 (100.0%)
Female	51 (100.0%)
Male	0 (0.0%)
Age range	27–67 years
Mean age	47.53 years
Median age	47 years
20–29 years	2 (3.9%)
30–39 years	9 (17.6%)
40–49 years	20 (39.2%)
50–59 years	17 (33.3%)
60–69 years	3 (5.9%)

The largest age group was 40–49 years, comprising 20 participants (39.2%), followed by those aged 50–59 years, with 17 participants (33.3%). Overall, 72.5% of participants were between 40 and 59 years of age.

These characteristics indicate that the program involved cadres from a relatively broad age range. Their close interaction with older adults in the community represents an important asset for developing community-based health education and extending sleep-health messages to older adults and their families.

3.2 **Changes in Knowledge Scores**

Descriptive statistics showed an upward shift in knowledge scores following the educational program. The mean knowledge score increased from 12.16 ± 3.21 at pre-test to 13.31 ± 1.69 at post-test. The median increased from 13.00 to 14.00, while the first quartile (Q1) increased from 11.00 to 13.00.

Table 2. Descriptive Statistics of Knowledge Scores

Parameter	Pre-test	Post-test
n	51	51
Mean	12.16	13.31
SD	3.21	1.69
Median	13.00	14.00
Q1	11.00	13.00
Q3	14.00	15.00
IQR	3.00	2.00
Minimum	0.00	9.00
Maximum	15.00	15.00

The minimum score increased from 0 to 9, while the maximum score remained at 15. In addition, the standard deviation decreased from 3.21 to 1.69, indicating that post-test scores were more concentrated than pre-test scores.

Overall, these findings indicate a descriptive shift toward higher knowledge scores after the educational activity. However, because the pre-test and post-test data could not be individually matched, the findings cannot be interpreted as evidence that each participant experienced an improvement in knowledge. The analysis therefore reflects differences in the overall score distributions rather than within-person changes.

3.3 Changes in Knowledge Categories

The distribution of knowledge categories also showed a favorable descriptive shift. The proportion of cadres classified as having good knowledge increased from 66.7% at pre-test to 80.4% at post-test, corresponding to an increase of 13.7 percentage points (pp). Meanwhile, the proportion of cadres in the poor-knowledge category decreased from 7.8% to 0.0%, and the moderate-knowledge category decreased from 25.5% to 19.6%.

Table 3. Distribution of Knowledge Categories

Knowledge Category	Pre-test n (%)	Post-test n (%)	Δ pp
Poor (≤8)	4 (7.8%)	0 (0.0%)	−7.8
Moderate (9–11)	13 (25.5%)	10 (19.6%)	−5.9
Good (12–15)	34 (66.7%)	41 (80.4%)	+13.7
Total	51 (100.0%)	51 (100.0%)	—

Descriptively, these results suggest a shift in the distribution toward higher levels of knowledge. Reporting knowledge categories in addition to mean scores provides a more interpretable overview of participants' achievement and helps illustrate how the distribution of cadres changed across the three knowledge levels.

3.4 Changes in Knowledge Across the 15 Items

Item-level analysis was conducted to identify which educational topics showed improvement and which remained areas requiring further reinforcement. Of the 15 knowledge items, 11 items (73.3%) showed an increase in the proportion of correct responses, one item (6.7%) remained unchanged, and three items (20.0%) showed a decrease.

Table 4. Changes in the Proportion of Correct Responses Across 15 Knowledge Items

No.	Knowledge Item	Pre-test n (%)	Post-test n (%)	Δ pp
1	Definition of quality sleep	44 (86.3%)	51 (100.0%)	+13.7
2	Sleep requirements of older adults	41 (80.4%)	47 (92.2%)	+11.8
3	Age-related changes in sleep	24 (47.1%)	29 (56.9%)	+9.8
4	Factors affecting sleep quality	43 (84.3%)	48 (94.1%)	+9.8
5	Coffee consumption before bedtime	45 (88.2%)	48 (94.1%)	+5.9
6	Risks associated with insufficient physical activity	46 (90.2%)	42 (82.4%)	−7.8
7	Mobile phone/television use before sleep	38 (74.5%)	49 (96.1%)	+21.6
8	Signs of poor sleep quality	44 (86.3%)	49 (96.1%)	+9.8
9	Consequences of insufficient sleep	41 (80.4%)	48 (94.1%)	+13.7
10	Risks of prolonged sleep problems	42 (82.4%)	42 (82.4%)	0.0
11	Consistency of sleep schedules	41 (80.4%)	39 (76.5%)	−3.9
12	Appropriate sleep environment	48 (94.1%)	51 (100.0%)	+5.9
13	Benefits of light physical activity	46 (90.2%)	43 (84.3%)	−5.9
14	Foods to avoid before bedtime	33 (64.7%)	45 (88.2%)	+23.5
15	Cadre response to persistent sleep problems	46 (90.2%)	48 (94.1%)	+3.9

The largest improvement was observed for the item concerning foods that should be avoided before bedtime, which increased by 23.5 pp. This was followed by the item on mobile phone or television use before sleep, which increased by 21.6 pp. Improvements were also observed in the definition of quality sleep and the consequences of insufficient sleep, both increasing by 13.7 pp, as well as in knowledge of sleep requirements among older adults, which increased by 11.8 pp.

These findings suggest that educational content related to concrete and familiar daily behaviors may have been more readily understood by participants. Messages such as avoiding

heavy meals before bedtime and limiting the use of electronic devices before sleep can be directly associated with everyday routines, making them relatively easy for cadres to understand and potentially communicate to older adults.

In contrast, three items showed lower proportions of correct responses at post-test. The greatest decrease occurred in knowledge of the risks associated with insufficient physical activity (−7.8 pp), followed by the benefits of light physical activity (−5.9 pp) and consistency of sleep schedules (−3.9 pp).

These findings require particular attention because physical activity is an important component of the sleep hygiene education provided in the program. The decline in correct responses indicates that exposure to educational information does not necessarily result in consistent understanding across all content domains. Therefore, these topics should be reinforced in future activities using clearer explanations and more applied learning strategies.

Another important learning gap concerned age-related changes in sleep. Although the proportion of correct responses increased by 9.8 pp, only 56.9% of participants answered this item correctly at post-test, representing the lowest post-test correct-response rate among all 15 items. This finding suggests that age-related physiological changes in sleep may be more difficult to understand than more concrete behavioral recommendations. Future educational sessions should therefore reinforce this topic using practical examples, simple illustrations, and case scenarios reflecting common experiences among older adults.

The item-level findings also demonstrate the value of evaluating educational programs beyond the total knowledge score. A higher overall score may coexist with persistent weaknesses in specific areas. By identifying both improved and declining items, the program evaluation provides a practical basis for refining future educational content and prioritizing topics that require additional reinforcement.

3.5 Inferential Analysis

The comparison of pre-test and post-test score distributions using the Mann–Whitney U test yielded $U = 1034.5$ with $p = 0.070$. The reported rank-biserial correlation was −0.205.

The result did not indicate a statistically significant difference in the score distributions at the 5% significance level. Therefore, although the mean score increased and the distribution of knowledge categories shifted toward higher levels, these findings should be interpreted as descriptive trends rather than definitive evidence that the educational activity caused an improvement in knowledge.

This cautious interpretation is particularly important because the pre-test and post-test responses could not be confirmed as belonging to the same individuals. Consequently, the analysis cannot determine the magnitude of knowledge change for each cadre. Future community engagement programs should use consistent participant identification codes during both assessments so that individual pre- and post-test scores can be linked and analyzed using appropriate paired statistical methods.

3.6 Overall Interpretation for the Community Engagement Program

Taken together, the findings indicate that the program was followed by a favorable descriptive shift in cadre knowledge, particularly in practical topics related to everyday sleep hygiene behaviors. The increase in the proportion of cadres with good knowledge, the higher median and Q1 scores, and the improvement in 11 of 15 knowledge items suggest that the educational activity provided useful learning opportunities for participants.

At the same time, the evaluation identified several areas requiring further strengthening, particularly age-related sleep changes, physical activity, and sleep-schedule consistency. These learning gaps are important because the purpose of the program was not only to transfer information but also to prepare cadres to function as community educators, motivators, companions, facilitators, and links to healthcare professionals.

For this reason, the results support the continued development of the program from a one-time educational activity toward a more sustained cadre capacity-building approach. Future activities may incorporate case discussions, demonstrations, simulation, teach-back, supervised practice, and follow-up mentoring so that cadres are supported not only in acquiring knowledge but also in applying sleep-health education within routine community activities.

The *Healthy Sleep Care Cadres for Older Adults* program was designed as a community-based cadre empowerment initiative integrating health education, sleep hygiene, early identification of sleep-related problems, referral awareness, and reinforcement of cadres' roles in supporting older adults. This approach is relevant to community needs because sleep problems are common among older adults and may affect daily functioning, well-being, and health-related outcomes.

The program findings showed a favorable descriptive trend in participants' knowledge. The mean score increased from 12.16 to 13.31, while the proportion of cadres

classified as having good knowledge increased by 13.7 percentage points. In addition, the median score increased from 13 to 14 and the first quartile increased from 11 to 13. These changes suggest that the shift was not limited to the mean score, but also involved the lower part of the score distribution.

Nevertheless, the Mann–Whitney U test yielded $p = 0.070$, indicating that the difference in score distributions did not reach statistical significance at the 5% level. Therefore, the observed increase should be interpreted cautiously as a descriptive tendency rather than evidence of causal effectiveness. This distinction is particularly important in reporting community engagement programs, where descriptive improvement should not be overstated as proof that the educational intervention itself caused the observed changes.

The relatively high baseline level of knowledge may also have limited the extent of measurable improvement. Before the program, 66.7% of participants were already classified as having good knowledge. This condition may have contributed to a possible ceiling effect, particularly because the instrument consisted of only 15 items.

Item-level analysis provided more practical information for program development than total scores alone. Overall, 73.3% of the items showed improvement, with the largest gains occurring in topics that were concrete and directly related to daily behavior. This pattern suggests that health education for cadres may be more readily understood when messages are specific, simple, and easily connected to routine practices among older adults.

In contrast, three items showed lower post-test correct-response proportions, indicating that total scores may conceal areas that still require reinforcement. Topics related to physical activity and consistency of sleep schedules should therefore be strengthened using more active learning methods, such as demonstrations, case discussions, counseling simulations, and teach-back techniques.

Age-related changes in sleep also emerged as an important learning gap. Although the proportion of correct responses increased, post-test performance remained relatively low. This suggests that physiological changes in sleep associated with aging may be more difficult for cadres to understand than concrete behavioral recommendations. Future educational activities should therefore use practical illustrations and case examples to distinguish normal age-related sleep changes from signs of sleep problems requiring further attention.

Strengthening cadre capacity is also important because cadres are not expected to function merely as recipients of information. Within the program, they are expected to provide

education, motivate older adults, support behavioral change, recognize possible sleep-related problems, and facilitate referral to healthcare professionals when necessary. For this reason, capacity building should extend beyond knowledge acquisition toward the development of practical communication, education, early identification, and referral skills.

Accordingly, the program should be developed from a one-time educational model into a continuous capacity-building approach. A sustainable program cycle may include education, simulation, cadre practice, problem identification, mentoring, referral, monitoring, and re-evaluation. Such an approach may strengthen the continuity of community engagement and increase the likelihood that knowledge gained by cadres is transferred to older adults and their families.

The findings of this program have several practical implications for future community engagement activities. First, educational content should be strengthened based on the learning gaps identified during the evaluation. Age-related changes in sleep, physical activity, and sleep-schedule consistency should become priority topics in subsequent training.

Second, the learning methods should be expanded beyond lecture-based education. Topics that were not optimally understood should be delivered using demonstrations, case-based discussions, simulation, and teach-back strategies. Third, cadre development should focus not only on knowledge but also on practical competencies. Cadres need to be prepared to provide simple sleep-health education, recognize warning signs of sleep problems, and determine when referral to healthcare professionals is required. Fourth, program sustainability should be strengthened by integrating sleep hygiene messages into routine older-adult Posyandu activities or other community health programs. Fifth, future evaluations should include broader indicators of success, such as cadre skills, self-efficacy, the number of older adults receiving education, implementation of sleep hygiene practices, and changes in sleep quality among older adults. The recommended sustainability model is: Education → Simulation → Cadre Practice → Older-Adult Education → Early Identification → Referral → Monitoring → Re-evaluation. This model shifts the orientation of the program from one-time knowledge transfer toward continuous cadre empowerment.

This community engagement program has several limitations. First, the pre-test and post-test data could not be individually matched, which prevented analysis of knowledge changes within each participant. Second, the program did not include a comparison group. Therefore, the observed changes cannot be causally attributed solely to the educational

activity. Third, the knowledge instrument consisted of only 15 items, which may have contributed to a ceiling effect, particularly because many participants already had relatively high baseline scores. Fourth, the evaluation focused on knowledge and did not assess cadres' practical skills in delivering education, identifying sleep-related problems, or facilitating referral. Finally, outcomes among older adults were not measured. Consequently, the program cannot yet determine whether cadre education resulted in changes in sleep hygiene practices or sleep quality among older adults.

5. CONCLUSION

The *Healthy Sleep Care Cadres for Older Adults* program showed a favorable descriptive trend in community health cadres' knowledge of sleep health among older adults. The mean knowledge score increased from 12.16 ± 3.21 to 13.31 ± 1.69, while the proportion of cadres classified as having good knowledge increased from 66.7% to 80.4%.

Item-level analysis showed that 11 of the 15 knowledge items improved, one remained unchanged, and three declined. The largest gains were observed in knowledge regarding foods to avoid before bedtime and mobile phone or television use before sleep. In contrast, age-related changes in sleep and selected aspects of physical activity remained important learning gaps requiring further reinforcement.

The Mann–Whitney U test yielded $U = 1034.5$; $p = 0.070$, indicating insufficient statistical evidence of a difference in score distributions at the 5% significance level. Therefore, the findings should be interpreted as a descriptive tendency rather than evidence of causal effectiveness.

The program has the potential to be further developed into a sustainable sleep hygiene-based cadre capacity-building model through continued strengthening of knowledge, educational skills, early identification, mentoring, and referral. Future evaluations should use individually matched pre- and post-test data and should also include cadre competency indicators and sleep-health outcomes among older adults.

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7. CONFLICT OF INTEREST

The authors declare that there are no conflicts of interest related to the implementation or publication of this community engagement program.

8. FUNDING

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9. ETHICAL APPROVAL

This community engagement program received ethical approval from the Health Research Ethics Committee of STIKep PPNI Jawa Barat, approval number: III/093.1/KEPK-SLE/STIKEP/PPNI/JABAR/VIII/2026.

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