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The Impact of Snakes and Ladders on Motor and Cognitive Development in Children: A Systematic Literature Review

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ABSTRACT

Introduction: Educational games are instrumental in supporting early childhood development, particularly in enhancing motor and cognitive abilities. Snakes and Ladders is a commonly used game that promotes strategic thinking, coordination, and social interaction.
Objective: This study aims to systematically analyze and synthesize research findings related to the impact of Snakes and Ladders on children's motor and cognitive development. Specifically, it evaluates outcomes in number comprehension, memory retention, strategic thinking, fine motor skills, and hand-eye coordination.
Methods: A systematic search was conducted in PubMed, ProQuest, Garuda, and JSTOR for studies published between 2020 and 2025. Eligible studies included children aged 4–6 years, utilized Snakes and Ladders as an intervention, and reported outcomes related to motor and cognitive development. Data extraction and quality assessment were independently performed by three reviewers using the PRISMA Flow Diagram and CAST Checklist.
Results: Six studies involving a total of 89 participants met the inclusion criteria. Findings indicate that Snakes and Ladders significantly improves both motor and cognitive outcomes in early childhood. Following two cycles of intervention, the proportion of children meeting motor development benchmarks increased from 37% to 86%. Cognitive development also improved, with average scores rising from 7.4 to 13 after four weeks. The percentage of children categorized as highly developed increased from 20% to 47%, and 72% achieved expected developmental milestones after six weeks.

Conclusion: The Snakes and Ladders game is an effective educational tool for enhancing motor and cognitive development in children aged 4–6 years. Integration of such games into early childhood education is recommended to support holistic development.

Keywords: cognitive, motoric, snakes and ladders game, stimulation

Introduction

Child development is a multifaceted process shaped by various environmental, social, and cognitive factors. Among these, game-based learning has emerged as a significant approach to fostering both motor and cognitive growth in early childhood (Fradisa et al., 2022). Games that incorporate structured rules and interactive elements enable children to engage in problem-solving, build self-confidence, develop strategic thinking, and enhance fine motor coordination.

One traditional game that has attracted increasing interest in early childhood education is Snakes and Ladders (Qomariah et al., 2022). Originally conceived as a medium for conveying moral and ethical lessons, the game has evolved into an educational tool that supports the stimulation of cognitive and motor skills. As described by Kurniawaty (2022), the game involves players rolling dice and advancing on a numbered board, encountering ladders that accelerate progress and snakes that set players back. This combination of chance and strategy introduces key developmental elements such as decision-making, number recognition, hand-eye coordination, and turn-taking.

Despite its popularity, the specific effects of Snakes and Ladders on children's motor and cognitive development remain underexplored in empirical literature. While various studies highlight the general benefits of board games in improving problem-solving, strategic thinking, and social interaction, few have focused explicitly on Snakes and Ladders (Rohmawati et al., 2022). Evidence from classroom-based interventions suggests that this game may enhance cognitive skills and learning outcomes when implemented consistently.

From a motor development perspective, Snakes and Ladders supports fine motor coordination through activities such as dice rolling and piece movement—skills that are essential for academic readiness and daily functioning (Sulistyowati, 2023). Neglecting the educational potential of such games could lead to missed opportunities for meaningful, screen-free learning experiences in early childhood settings.

Moreover, the rise of digital entertainment has reduced children's engagement with traditional board games, raising concerns about whether such games remain effective in stimulating cognitive and motor skills compared to digital alternatives (Ayu et al., 2024; Nurasih et al., 2020). Therefore, a systematic review and meta-analysis of existing studies is warranted to provide empirical support for the educational application of Snakes and Ladders.

Objective

This study aims to systematically analyze and synthesize research findings related to the impact of Snakes and Ladders on children's motor and cognitive development. Specifically, it evaluates outcomes in number comprehension, memory retention, strategic thinking, fine motor skills, and hand-eye coordination. Additionally, this study identifies gaps in the existing literature and compares the effectiveness of Snakes and Ladders with other traditional and

digital learning tools, offering evidence-based recommendations for future research and educational practice.

Method

Study Design

This systematic literature review follows the PRISMA 2020 (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines.

Search Strategy

The search strategy covers the period from January 1, 2021, to December 31, 2024, and includes various databases such as PubMed, ProQuest, GARUDA, and JSTOR. The search is limited to the past five years to ensure that the study incorporates the most current and relevant information related to the specific topic. Research and developments in a scientific field can evolve over time, making it essential to consider recent literature for a comprehensive understanding. Additionally, restricting the search period to the last five years helps researchers manage the number of studies to be evaluated and synthesized.

The search was conducted using the "ALL fields" option and keywords in advanced search engines, as detailed in the appendix (Table 1). This search was performed by two authors of this article (DR and AIF), who independently explored the aforementioned electronic databases.

Tabel 1. All fileds on search strategy phase

Source	Link	Keywords	Num
Pubmed	https://encr.pw/b2CV3	((snakes and ladders game[All fields]))	13
ProQuest	https://encr.pw/Z6boa	(snakes AND ladders) AND motoric	7
GARUDA	https://l1nq.com/TG0Op	Snakes And Ladders	14
JSTOR	https://l1nq.com/wtyc5	(((snakes and ladders) AND (motor)) OR (cognitive))	1,426
		Total	**1,460**

Inclusion Criteria

Participan

The participants included in this study are children aged 4–6 years who are in the stage of motor, stimulation, and cognitive development. There are no restrictions based on gender, religion, or race.

Intervention

The use of the Snakes and Ladders game to enhance cognitive and gross motor development in early childhood involves several structured and systematic strategies. Educational Snakes and Ladders has been proven effective in improving children's thinking abilities, including understanding numerical concepts, counting skills, and problem-solving abilities. From the perspective of gross motor development, this game plays a crucial role in enhancing movement coordination, balance, and large muscle strength through physical activities such as jumping and running.

Outcome

Motor and cognitive development in children were measured using observation sheets and documentation.

Study Design

We will include quasi-experimental, pre-experimental, and qualitative studies to assess the effects of the Snakes and Ladders game. Articles based on single-case studies, descriptive studies, literature reviews, systematic reviews, and opinion articles will be excluded. Only studies written in English will be included.

Exclusion Criteria

Studies not published in English will be excluded. Individuals under the age of 12, as well as families with chronic illnesses or mental disorders in individuals over the age of 65, will be excluded from the study. Articles focusing on single-case studies, case reports, editorials, Letters to the Editor, correspondence, narrative reviews, scoping reviews, literature reviews, systematic reviews, conference abstracts, book chapters, and opinion articles will not be considered in this analysis.

Study Selection and Data Extraction

Three authors (KSP, DR, HM) independently reviewed all titles and abstracts according to the previously outlined design. If consensus could not be reached between the two authors, the senior researcher (YR) made the final decision regarding the inclusion of the article in question. The remaining three authors (IS, AIF, SU) independently extracted data from each study included in the dataset. The selected studies for inclusion included information on authorship, year, country, design, sample size, intervention, instruments, outcomes, and findings.*Penilaian kualitas*

Two researchers (KSP, DR), independently conducted a quality assessment of the included studies. Discrepancies in assessments are discussed together, and if additional clarification or completion is required then it is consulted with the senior researcher (YR). This meticulous process ensures that quality evaluations are carried out strictly and in accordance with scientific standards.

CASP evaluation

We used the Critical Appraisal Skills Programme (CASP) to assess the quality of primary and secondary outcomes based on the following domains: study design, risk of bias,

inconsistency, indirectness, imprecision, and other considerations. The application of the CASP tool was guided by its 10-question checklist, evaluating aspects such as clarity of the research question, appropriateness of methodology, recruitment strategy, data collection, reflexivity, ethical considerations, data analysis, and findings. Each study was assessed systematically to determine its reliability and relevance.

Result

Study Selection

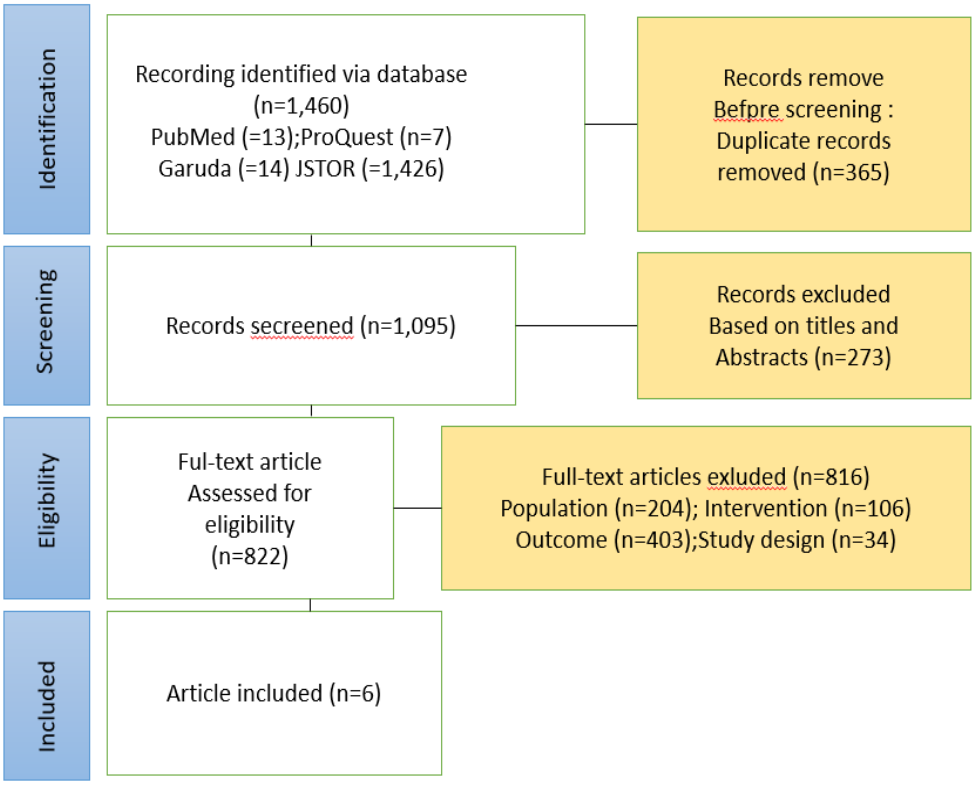

Figure 1. PRISMA Flow Diagram for the Screening Process

In the identification phase, 1,460 articles were found through various databases: PubMed (13), ProQuest (7), Garuda (14), and JSTOR (1,426). Subsequently, 365 articles were removed due to duplication. In the screening phase, three researchers (KSP, DR, AIP) reviewed 1,095 articles, of which 273 were eliminated based on irrelevant titles and abstracts. In the eligibility phase, 822 articles were evaluated in full text. Of these, 816 articles were excluded because they did not meet the established criteria, for reasons such as population mismatch (204), intervention (106), outcome (403), and study design (34). Thus, only 6 articles met the inclusion criteria and were included in the final analysis. Detailed information can be found in Figure 1.

Study Characteristics

Table 2. Data Characteristics from the Study

Author	Intervention and fasilitator seting	Number of session	Duration	Method or media	Topic
Hazhari et al. (2021) Indonesia	Snakes and Ladders Game Teacher at TK Al-Firmansyah Cikande	2 cycles	-	Classroom Action Research Snakes and Ladders as a Medium	The Use of Snakes and Ladders Game to Enhance Gross Motor Development in Early Childhood.
Setiawati dan Suyadi 2021 Indonesia	Snakes and Ladders Game Researcher	-	-	Role play Snakes and Ladders as a Medium	The Application of Learning Strategies Through the Snakes and Ladders Game: Challenges in Enhancing Cognitive Development in Early Childhood.
Vinda Ayu Prihatini 2022 Indonesia	Giant Snakes and Ladders Game Researcher at RA Harapan Ummi, Semarang City	1 Session Opening: 30 minutes Main Activity (Giant Snakes and Ladders Game): 60 minutes Closing Activity: 30 minutes	120 minutes	Role play Giant Snakes and Ladders Game as a Medium	The Implementation of Giant Snakes and Ladders Game in Developing Cognitive Skills in Early Childhood

Nisa et al 2022 Indonesia	Snakes and Ladders Game Researcher	2 Cycles Each cycle consists of 2 sessions	-	Role play Snakes and Ladders as a Medium	Improvement of Gross Motor Skills in 4-5 Year-Old Children Through Educational Snakes and Ladders Game Media.
Pratami dan Kamtini 2023 Indonesia	Snakes and Ladders Game Researcher	4 Cycles	-	Role play Snakes and Ladders as a Medium	The Effect of Educational Snakes and Ladders Game on the Cognitive Development of Children Aged 5-6 Years.
Sinambela et al.2023 Indonesia	Snakes and Ladders Game Researcher at Bintang Pertiwi Kindergarten, Riau Islands	2 Cycles	-	Role play Snakes and Ladders as a Medium	The educational Snakes and Ladders game can stimulate the cognitive development of children aged 5-6 years.

Table 2 presents data from six studies conducted in Indonesia that employed the Snakes and Ladders game as an educational intervention to support early childhood development. The interventions varied in session frequency, duration, and setting, yet shared a common goal of enhancing either gross motor or cognitive skills. Hazhari et al. (2021) used a classroom action research method facilitated by a teacher to improve gross motor development through two cycles of the traditional game. Setiawati and Suyadi (2021), although not specifying duration or session count, applied role play to address cognitive development challenges. Vinda Ayu Prihatini (2022) used a 120-minute session with a Giant Snakes and Ladders format to develop cognitive skills, structured with opening, main, and closing activities. Nisa et al. (2022) applied role play in two cycles (each consisting of two sessions) to improve motor skills in 4–5-year-olds. Pratami and Kamtini (2023) carried out four cycles using the game to enhance cognitive development in children aged 5–6 years, while Sinambela et al. (2023) implemented two cycles at a kindergarten in the Riau Islands with a similar cognitive focus. Collectively, these studies demonstrate the game's adaptability and effectiveness as a playful, interactive learning tool for stimulating key developmental domains in early childhood education.

Table 3. CASP Cheklist for the quality of studies

Author/year	**Q1**	**Q2**	**Q3**	**Q4**	**Q5**	**Q6**	**Q7**	**Q8**	**Q9**	**Q10**
Nisa et al. 2022	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes
Alvan hazhari et al. 2022	Yes	Yes	?	Yes	No	Yes	Yes	Yes	Yes	Yes

Pratami et al. 2023	Yes	Yes	?	Yes	No	Yes	Yes	Yes	Yes	Yes
Prihatini et al. 2022	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes
Sinambela et al. 2023	Yes	Yes	?	Yes	No	Yes	Yes	Yes	Yes	Yes
Atika Setiawati et al. 2021	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes

Table 3 presents the results of a Critical Appraisal Skills Programme (CASP) checklist assessment used to evaluate the quality of six studies involving the Snakes and Ladders game as an intervention in early childhood education. The assessment consists of ten criteria (Q1–Q10), where "Yes" indicates that the study met the criterion, "No" indicates it did not, and "?" indicates uncertainty or lack of sufficient information. All studies consistently scored "Yes" on most items, particularly on questions related to study design, data collection, and clarity of findings (Q1, Q2, Q4, Q6–Q10), suggesting generally high methodological quality. However, none of the studies clearly addressed Q5, which typically relates to ethical considerations or confounding factors. Additionally, some studies, such as those by Hazhari et al. (2022), Pratami et al. (2023), and Sinambela et al. (2023), did not provide enough detail to confidently assess Q3, indicating potential gaps in describing the research population or recruitment strategy. Overall, while the studies are methodologically sound in most aspects, consistent shortcomings in reporting on ethical or participant-related concerns suggest areas for improvement in future research.

***Deeper Analysis of Cognitive Effects**:*

The reviewed studies indicate that Snakes and Ladders improves not only general cognitive development but also specific domains such as problem-solving, numerical reasoning, and memory retention. For instance, studies demonstrate enhanced number recognition and strategic thinking in children who played the game regularly.

Discussion

This systematic review confirms that the Snakes and Ladders game is an effective educational tool for enhancing both gross motor and cognitive development in early childhood. Ramahwanti et al. (2025) and Ramahwanti & Mashudi (2022) emphasize that this game has been widely researched and shown to provide significant developmental benefits. Its interactive and enjoyable format supports children's physical coordination, balance, and cognitive engagement.

Evidence from multiple studies reveals significant improvements in children's developmental outcomes following Snakes and Ladders interventions. For instance, Nurasiah et al. (2020) demonstrated cognitive gains through structured play, while Roslianti et al. (2023) reported that play therapy incorporating Snakes and Ladders improved brain stimulation and motor creativity. These findings are consistent with the theory that sensorimotor experiences directly influence cognitive development.

Motor development improvements were assessed using observation and documentation tools, such as those employed by Nisa et al. (2022) and Alvan Hazhari et al. (2021), focusing on skills like running and jumping. Cognitive gains were assessed through interviews and questionnaires, which measured number recognition, symbolic thinking, and simple arithmetic skills (Pratami & Kamtini, 2023; Setiawati & Suyadi, 2021; Prihatini & Mursid, 2022; Sinambela et al., 2023).

A notable finding from Nisa & Lesmana Alim (n.d.) reported an increase in children meeting gross motor milestones from 37% to 86% post-intervention. Wardani et al. (2021) and Sahudi et al. (2021) corroborated these results, showing improvements in strength, balance, and coordination. Alvan Hazhari et al. (2021) further emphasized the game's utility in engaging large muscle groups, reinforcing physical development through enjoyable activities.

Cognitively, Pratami & Kamtini (2023c) and Amri et al. (2021) demonstrated that Snakes and Ladders enhances symbolic thinking and letter recognition. Muqdamien et al. (2021) and Cahyanti et al. (2023) highlighted its value in teaching number concepts, arithmetic operations, and logical reasoning. Ngadha et al. (2022) and Nurbaizura et al. (2022a) further identified critical thinking and problem-solving as core cognitive skills enhanced during gameplay.

The interplay between motor and cognitive domains is underscored by Aulia et al. (2022), who argue that physical activity strengthens cognitive functioning. Ahmad et al. (2024) and Nurbaizura et al. (2022) added that the game's social aspects—such as turn-taking, rule-following, and emotional regulation—enhance socio-emotional development, supporting a holistic developmental framework.

Methodologically, most studies used Classroom Action Research (CAR), as seen in Nisa & Lesmana Alim (n.d.) and Alvan Hazhari et al. (2021), though limited by small sample sizes and lack of control groups. In contrast, Pratami & Kamtini (2023b) used a quasi-experimental design with purposive sampling and statistical analysis, offering stronger causal evidence despite its limited scalability. Descriptive qualitative studies (e.g., Prihatini & Mursid, 2022; Setiawati & Suyadi, 2021) provided rich contextual insights but lacked quantifiable metrics.

Despite the positive findings, challenges remain. Implementation issues such as children's initial hesitation, lack of confidence, and varying teacher facilitation quality may affect outcomes. Teacher involvement is critical, as noted by Hasanah et al. (2023) and Setiawati & Suyadi (2021), especially in providing clear instructions, adapting gameplay to children's levels, and ensuring structured yet enjoyable learning.

Conclusion

The educational Snakes and Ladders game has been shown to have a significant positive impact on the motor and cognitive development of children aged 4-6 years. The improvement in children's gross motor skills and cognitive abilities through this game demonstrates that play-based methods are an effective approach in early childhood education. By integrating Snakes and Ladders into the curriculum, it is hoped that children can grow and develop well, mastering essential foundational skills for their future lives. Further research is also needed to explore other forms of educational games that may contribute to early childhood development. Thus, educational games like Snakes and Ladders can be an effective tool in supporting children's holistic growth and development.

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Not applicable.

Authors' contribution

Each author contributed equally in all the parts of the research. All authors have critically reviewed and approved the final draft and are responsible for the content and similarity index of the manuscript.

Conflict of interest

The researchers stated that there is no conflict of interest related to the implementation and publication of the results of this research. The entire research process, from planning, data collection, analysis, to report preparation, was carried out independently without any influence or pressure from any third party. A commitment to research ethics is upheld throughout the research process, ensuring transparency, accuracy and honesty in reporting results. Respondents' participation was voluntary with informed consent, and their confidentiality and privacy were maintained in accordance with applicable research ethics standards. With this statement, researchers hope that the research results can be trusted and used as a valid reference for the development of science and health practices related to ethnomedicine and reproductive health.

Ethical consideration

Not applicable.

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References

1. Berland, G. K., Elliott, M. N., Morales, L. S., Algazy, J. I., Kravitz, R. L., Broder, M. S., Kanouse, D. E., Muñoz, J. A., Puyol, J. A., Lara, M., Watkins, K. E., Yang, H., & McGlynn, E. A. (2001). Health information on the Internet: Accessibility, quality, and readability in English and Spanish. JAMA, 285(20), 2612–2621. https://doi.org/10.1001/jama.285.20.2612
2. Colledge, A., Car, J., Donnelly, A., & Majeed, A. (2008). Health information for patients: Time to look beyond patient information leaflets. Journal of the Royal Society of Medicine, 101(9), 447–453. https://doi.org/10.1258/jrsm.2008.080149
3. Dhamcharee, V., Romyanan, O., & Ninlagarn, T. (2001). Genetic counseling for thalassemia in Thailand: Problems and solution. Southeast Asian Journal of Tropical Medicine and Public Health, 32(2), 331–335.
4. Ebrahim, S., Raza, A. Z., Hussain, M., Khan, A., Kumari, L., Rasheed, R., Mahmood, S., Khatri, M. A., Bijoora, M., Zaheer, R., Sattar, N., Sohail, W., Zakir, H., Jafry, F. H., Memon, A., Anwer, S., & Fatima, K. (2019). Knowledge and beliefs regarding thalassemia in an urban population. Cureus, 11(9), e5268. https://doi.org/10.7759/cureus.526
5. Malik-Soni, N., Shaker, A., Luck, H., Mullin, A. E., Wiley, R. E., Lewis, M. E. S., Fuentes, J., & Frazier, T. W. (2022). Tackling healthcare access barriers for individuals with autism from diagnosis to adulthood. Pediatric Research, 91(5), 1028–1035. https://doi.org/10.1038/s41390-021-01465-y
6. Mbanda, N., Dada, S., Bastable, K., Granholm, I., & Wändell, P. E. (2021). A scoping review of the use of visual aids in health education materials for persons with low-literacy levels.

Patient Education and Counseling, 104(5), 1105–1114. https://doi.org/10.1016/j.pec.2020.11.034
7. Mettananda, S., Pathiraja, H., Peiris, R., Bandara, D., De Silva, U., Mettananda, C., & Premawardhena, A. (2019). Health-related quality of life among children with transfusion-dependent β-thalassaemia major and haemoglobin E β-thalassaemia in Sri Lanka: A case-control study. Health and Quality of Life Outcomes, 17(1), 137. https://doi.org/10.1186/s12955-019-1207-9
8. Minutolo, A., Damiano, E., De Pietro, G., Fujita, H., & Esposito, M. (2022). A conversational agent for querying Italian patient information leaflets and improving health literacy. Computers in Biology and Medicine, 141, 105004. https://doi.org/10.1016/j.compbiomed.2021.105004
9. Mubarokah, K. N. (2019). Health literacy and health behavior in the rural areas. KNE Life Sciences, 4(10), 402–411. https://doi.org/10.18502/kls.v4i10.3702
10. Nazla Prasetyo, N., Maliangkay, K. S., Novianti, P. A., Pertiwi, R., & Annisa, S. R. (2023). Health accessibility in rural areas for the elderly in Indonesia. Jurnal Rumpun Ilmu Kesehatan, 3(2), 176–184. https://doi.org/10.55606/jrik.v3i2.1716
11. Pander Maat, H., & Lentz, L. (2010). Improving the usability of patient information leaflets. Patient Education and Counseling, 80(1), 113–119. https://doi.org/10.1016/j.pec.2009.09.030
12. Park, J., & Zuniga, J. (2016). Effectiveness of using picture-based health education for people with low health literacy: An integrative review. Cogent Medicine, 3(1), 1264679. https://doi.org/10.1080/2331205X.2016.1264679
13. Rahmah, R., & Makiyah, S. N. N. (2022). Quality of life of children with thalassemia in Indonesia: Review. Indonesian Journal of Nursing Practices, 6(1), 41–47. https://doi.org/10.18196/ijnp.v6i1.10477
14. Saffi, M., & Howard, N. (2015). Exploring the effectiveness of mandatory premarital screening and genetic counselling programmes for β-thalassaemia in the Middle East: A scoping review. Public Health Genomics, 18(4), 193–203. https://doi.org/10.1159/000430837
15. Setiawan, H., Ediati, A., & Winarni, T. I. (2018). Genetic counseling to reduce the level of depression in parents of children with thalassemia major. Proceedings of the 3rd International Conference on Health Science (ICHS 2018), 102–106. https://doi.org/10.5220/0007055801020106
16. Setiawan, H., Firmansyah, A., & Richard, S. D. (2023). The role of nurses to control beta thalassemia disease in Indonesia: A perspective. Journal of Taibah University Medical Sciences, 18(5), 579–583. https://doi.org/10.1016/j.jtumed.2023.02.007
17. Setiawan, H., Sandi, Y. D. L., Andarini, E., Kurniawan, R., Richard, S. D., & Ariyanto, H. (2021). The effect of genetic counseling on depression, anxiety, and knowledge level among diabetes mellitus patients. Kontakt, 23(4), 247–254. https://doi.org/10.32725/kont.2021.035
18. Setiawan, H., Setiawan, D., Suhanda, S., & Mustopa, A. H. (2021). Development of Android-based mobile application “Cyber Gen” for genetic counselling implementation among thalassemia patients. Journal of Physics: Conference Series, 2111(1), 012037. https://doi.org/10.1088/1742-6596/2111/1/012037

19. Setiawan, H., Suhanda, S., & Setiawan, D. (2022). Coaching clinic as a strategy to improve knowledge and competence of nurses in providing genetic counseling interventions among thalassemia patients. International Journal of Community Based Nursing and Midwifery, 10(1), 84–85. https://doi.org/10.30476/ijcbnm.2021.92764.1883
20. Sørensen, K., Van den Broucke, S., Fullam, J., Doyle, G., Pelikan, J., Slonska, Z., & Brand, H. (2012). Health literacy and public health: A systematic review and integration of definitions and models. BMC Public Health, 12, 80. https://doi.org/10.1186/1471-2458-12-80
21. Wenang, S., Schaefers, J., Afdal, A., Gufron, A., Geyer, S., Dewanto, I., & Haier, J. (2021). Availability and accessibility of primary care for the remote, rural, and poor population of Indonesia. Frontiers in Public Health, 9, 721886. https://doi.org/10.3389/fpubh.2021.721886