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Effectiveness of health literacy interventions on contraceptive use among women of reproductive age in rural and urban Indonesia: A systematic review

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Abstract

Purpose: To evaluate the effectiveness of health literacy interventions, such as health education, health promotion, and digital media use, in improving knowledge, attitudes, and contraceptive use among women of reproductive age (WRA) in Indonesia, as well as to compare outcomes in rural and urban areas. **Methods:** This systematic review, guided by the PRISMA 2020 framework, analyzed data from 2019 to 2024 on health literacy interventions related to contraception. Literature was sourced from four databases: Lens.org, PubMed, Scopus, and Google Scholar. **Results:** Out of 10,451 articles were identified (Lens.org: n=1,598; PubMed: n=84; Scopus: n=121; Google Scholar: n=8,648), with 154 articles assessed for eligibility and 22 included in the final review. Common interventions included leaflets, videos, mobile apps, and counseling, which effectively improved WRA's knowledge, attitudes, and contraceptive behaviors. Technology-based methods were more effective in urban areas, while community-based approaches were more effective in rural settings. **Conclusion:** Health literacy interventions improve contraceptive outcomes among WRA in Indonesia. Their effectiveness varies by the type of intervention and the geographic context. A combined approach of community empowerment and technology, tailored to local settings, is key to enhancing contraceptive health literacy.

Keywords: contraceptives; health literacy; Indonesia; intervention; women of reproductive age

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INTRODUCTION

The family planning (FP) program has been a government initiative since the 1970s to control population growth in Indonesia [1,2]. Although the population growth rate has declined to 1.11%, the lowest since the 1970s [3], Indonesia's population is projected to reach 282.4 million by 2024, making it the fourth most populous country globally [4,5]. Such high population density may contribute to unequal access to resources and health services, which can affect societal well-being [6]. To address this, the FP program promotes birth regulation, proper spacing, and ideal maternal age by upholding reproductive rights, as mandated by Undang-Undang No. 52 of 2009 [7]. It is implemented through the use of contraceptives to reduce birth rates, support maternal and child health, and promote sustainable development [8]. The program primarily targets women of reproductive age (WRA) aged 15–49 years, with contraceptive coverage in Indonesia reaching 56.26% [9,10,11].

Women dominate contraceptive use, as most contraceptive methods are designed for them and tailored to their needs [12]. This highlights the significant role women play in family planning.

Previous research emphasizes that factors such as education, living location (rural or urban), availability of healthcare facilities, and access to information greatly influence contraceptive use. Adequate exposure to information helps women understand various contraceptive methods and their side effects, facilitating better decision-making [13].

In this context, enhancing health literacy and education becomes a key element in supporting decision-making related to contraception. Quality health education can increase women's knowledge, encourage active participation in FP programs, and increase contraceptive acceptance rates [14,15]. These efforts must be supported by equitable healthcare facilities and accessible information, both in urban and rural areas, to ensure the program's overall success.

Health literacy refers to an individual's ability to access, understand, and apply health information to make informed decisions [15]. Nutbeam's model outlines three levels of health literacy—functional, interactive, and critical—which shape how individuals engage with health information and services. It also includes knowledge, attitudes, motivation, intention, personal skills, and self-efficacy in managing health [16]. In the context of family planning (FP), health literacy is essential for improving WRA's knowledge, attitudes, and use of contraceptives. Studies show that adequate knowledge facilitates contraceptive use, while a lack of understanding poses a significant barrier [17,18,19].

Various interventions are crucial in improving knowledge, attitudes, and contraceptive use, such as peer education, brochures, leaflets, and booklets [20]. In Indonesia, health literacy interventions have targeted women of reproductive age (WRA), including pregnant women, newlyweds, and contraceptive users, through diverse approaches ranging from traditional counseling to digital media. Educational methods such as in-person counseling, audiovisual materials, and mobile applications have significantly enhanced contraceptive knowledge and understanding among these groups [21,22,23].

The effectiveness of health literacy interventions is closely linked to contextual factors such as geographic location, access to information, and the availability of healthcare services [24,25]. In Indonesia, significant disparities persist between urban and rural areas, where limited access to resources in rural communities contributes to lower contraceptive use [26]. National data further underscore this gap, showing that rural populations generally possess lower levels of contraceptive knowledge compared to their urban counterparts [27,28].

These regional disparities are further compounded by distinct barriers faced by different population groups. Rural women, for instance, often encounter challenges related to occupation, limited information access, psychological concerns, and financial constraints [29,30,31]. Meanwhile, urban communities may struggle with deeply rooted social norms and cultural expectations that influence contraceptive behavior [32,33]. Such differences highlight the need for health literacy interventions that are context-specific and culturally sensitive. To design equitable and effective family planning programs, it is crucial to understand which strategies work, where they are most effective, and for whom they are most effective [34].

Although numerous studies have explored the outcomes of contraception-related health literacy interventions, few have systematically compared their effectiveness across regional and demographic contexts in Indonesia. This systematic review aims to fill that gap by examining how these interventions affect knowledge, attitudes, and behaviors in both urban and rural settings. The results are expected to inform more tailored and evidence-based family planning strategies, help policymakers make data-driven decisions for resource allocation, and support the development of adaptive intervention models that address the unique needs of diverse communities.

METHODS

This study employed a systematic review design, guided by the PRISMA (Preferred Reporting Items for Systematic Review and Meta-Analyses) 2020 statement to ensure methodological rigor and transparency [35]. Literature published from 2019 to 2024 was analyzed to capture the most recent developments in contraceptive-related health literacy interventions. This time frame was chosen to capture the shift in health promotion strategies following the COVID-19 pandemic, particularly the increased use of digital tools and mobile health platforms that have transformed health education and literacy interventions [36,37].

The literature search was conducted from October 18 to 22, 2024, using four scientific databases: Lens.org, PubMed, Scopus, and Google Scholar. To ensure broad coverage, keywords were applied in both Indonesian and English, including terms such as "education," "promotion," "campaign," "intervention," "program," "contraceptive," "contraception," "family planning," "reproductive women," and "Indonesia," as well as their Indonesian equivalents. Boolean operators such as "AND" and "OR" were used to refine the search strategy (e.g., "education" AND ("contraceptive" OR

"family planning") AND "reproductive women" AND "Indonesia").

Before searching, the research process began with a preparation phase that involved developing a research protocol. This phase aimed to determine the research topic, formulate questions and objectives, and construct a PICOS (Population, Intervention, Comparison, Outcome, Study design) framework [38]. The PICOs in this study identified the population as WRA (15–49 years) living in rural and urban areas of Indonesia. The interventions included various health literacy methods—such as health education, health promotion, social media campaigns, mobile app usage, or a combination of these—focused on contraceptive methods. The comparison groups included individuals who did not receive the intervention or comparisons between urban and rural populations. Intervention effectiveness was assessed through changes in knowledge, attitudes, or contraceptive use, supported by statistical tests to demonstrate the significance of the results. Only original studies reporting measurable outcomes of intervention effectiveness were included.

During this preparation stage, inclusion and exclusion criteria were also established. The eligibility criteria were: (1) Articles published between 2019 and 2024; (2) Available in full text; (3) Written in English or Indonesian; (4) Using experimental or observational study designs; and (5) Reporting quantitative outcomes (e.g., p-values) related to contraceptive literacy among WRA in Indonesia. Articles were excluded if they were reviews, opinion pieces, lacked full text, or did not meet the outcome focus or geographic relevance (i.e., outside Indonesia).

Following the development of the protocol, a literature search was conducted using the PRISMA guidelines to ensure methodological rigor. The process consisted of four key stages: identification, screening, eligibility, and inclusion [35]. In the identification stage, articles were retrieved using the selected keywords and limited to publications from the last five years. The screening stage involved removing duplicates and selecting articles based on titles and abstracts for relevance. Articles that met the initial criteria were moved to the eligibility stage for full-text assessment based on the established inclusion and exclusion criteria.

Study quality was evaluated using the Joanna Briggs Institute (JBI) Critical Appraisal Tools, adapted to each study design. All included studies were then described narratively and summarized in tables, outlining the intervention types, study settings (urban or rural), research designs, and key outcomes. The literature search process is illustrated in the PRISMA Flow Diagram presented in Figure 1.

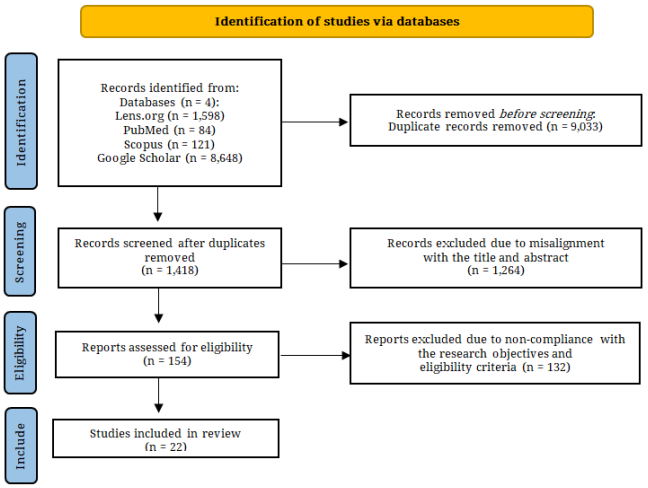

Figure 1. PRISMA Flow Chart

RESULTS

Based on the literature search following PRISMA guidelines, the identification phase resulted in 10,451 articles. Articles that did not meet the criteria were excluded, including duplicates (9,033), those irrelevant to the abstract and title (1,264), and those that did not meet the eligibility criteria (132). Ultimately, 22 articles that met the criteria were included in this study. The results of the systematic review on health literacy interventions related to contraceptive methods among WRA can be seen in Tables 1 and 2.

Table 1 presents the results of various interventions in rural and urban areas, along with effective methods to improve health literacy on contraceptive use. Table 2 provides a concise comparison by categorizing interventions based on living residence and outlining the approaches used to enhance knowledge, attitudes, and use of contraception. Various interventions can improve health literacy—particularly knowledge, attitudes, and contraceptive use—tailored to the specific needs of rural and urban settings. In rural areas, simple and accessible methods such as leaflets, mHealth apps, and community-based programs (e.g., counseling and socialization) have proven effective. For example, Kampar saw a significant increase in IUD knowledge scores from 7.70 to 10.41 (p=0.000) [40], while Bantul showed improved attitude scores from 4.00 to 6.73 (p=0.006), although knowledge gains were not significant (p=0.182) [39]. A women's empowerment program in Suku Anak Dalam increased knowledge from 4.03 to 8.17 and attitudes from 3.66 to 7.71 (p=0.000) [46]. Additionally, audiovisual media and counseling, as seen in Sumedang, boosted contraceptive knowledge from 36.1% to 83.3% (p<0.001) [21]. These methods are effective due to their simplicity, cultural relevance, and wide acceptance in rural communities.

Table 1. Data extraction of health literacy intervention articles on contraceptive methods according to criteria

Authors/year	Living residence	Study design	Sample & location	Type of intervention	Results
[39]	Rural	Pre-experimental with one group pretest-posttest design	WRA in RT 01, 10, 11, 12, and 13 of Dusun Pringgolayan, Kabupaten Bantul, DIY	Education through community service using leaflets about pregnancy risks and contraceptive methods	Education with leaflets significantly improved WRA attitudes toward pregnancy risks and contraception, with attitude scores rising from 4 to 6.73 (p-value=0.006). Knowledge scores also increased from 76.83 to 84.94, though not significantly (p-value=0.182). This intervention effectively improved WRA's attitudes and understanding of contraception.
[40]	Rural	Pre-experimental with one group pretest-posttest design	96 WRA in Desa Karya Indah, Kabupaten Kampar, Riau	Health education using leaflets about IUD contraception	The average knowledge score about IUDs increased from 7.70 (SD=4.140) to 10.41 (SD=1.739) after leaflet intervention, with a p-value=0.000, showing a significant effect. The percentage of mothers with good knowledge increased from 54.2% to 88.5%.
[41]	Urban	Pre-experimental with one group pretest-posttest design	45 WRA in Bidan Praktik Mandiri (BPM) Rachmawati, Kelurahan Lubang Buaya, Kota Jakarta Timur	Health promotion with a video on IUD contraception	Significant increase in knowledge after the health promotion using video, with pre-test scores averaging 12.02, rising to 15.64 on the post-test (p-value=0.000), indicating the effectiveness of the video.
[42]	Urban	True experiment with pretest-posttest with control group design	48 WRA (third trimester pregnant women) in the Andalas Health Center work area, Kecamatan Padang Timur, Kota Padang, West Sumatra	IEC about IUD contraception and counseling on IUD use	IEC significantly improved knowledge and IUD use. Knowledge in the intervention group increased from 56.94 to 64.02 (p-value=0.000), and 20.83% of respondents chose IUD, compared to 4.17% in the control group (p-value=0.004).
[43]	Urban	Pre-experimental with one group pretest-posttest design	30 WRA actively using contraception at Sematang Borang Health Center, Kota Palembang, South Sumatra	Audiovisual media (video) on IUD contraception	Knowledge of WRA about IUD contraception significantly increased after audiovisual media intervention. Before the intervention, 13.3% of respondents had good knowledge, which increased to 70% post-intervention (p-value=0.0001), indicating the effectiveness of audiovisual media.
[44]	Urban	Pre-experimental with one group pretest-posttest design	36 WRA in the work area of Naras Health Center, Kota Pariaman, West Sumatra	Health promotion with IUD booklet (Booklet)	Knowledge and attitudes of WRA about IUD contraception significantly increased after the intervention with the booklet. The average knowledge score increased from 5.19 to 7.22, and attitude from 28.67 to 33.64 (p-value=0.000), indicating a significant effect of the booklet on knowledge and attitudes.
[45]	Rural	Randomized Controlled Trial (RCT)	207 WRA with unmet need in 51 villages, 17 kecamatan in Kabupaten Sleman, DIY	mHealth intervention using the Skata app about contraceptive use	The mHealth intervention increased participation in the family planning program, with a 1.85 times greater chance (OR = 1.85; 95% CI = 1.06-3.25). Although knowledge increased significantly (p=0.0002), no association was found between the intervention and knowledge level (p=0.1287). However, there was a significant relationship between the intervention and family planning participation (p=0.030).
[46]	Rural	Mixed methods: Quasi-experimental with pre-test and post-test design and Focus Group Discussion (FGD)	36 WRA, members of the Suku Anak Dalam (SAD) in Desa Bukit Suban, Kecamatan Air Hitam, Kabupaten Sarolangun, Jambi	Women's empowerment through counseling on family planning participation (program socialization, contraceptive demonstration, and counseling on contraceptive choice)	Significant improvement in knowledge, attitudes, and family planning practices among WRA in SAD after the intervention. Knowledge increased from 4.03 (pre-test) to 8.17 (post-test, p=0.000), attitude from 3.66 to 7.71 (p=0.000), and practice from 3.14 to 7.79 (p=0.000). The intervention, including socialization, demonstration, and counseling, significantly improved all three aspects and supported women's empowerment.
[47]	Urban	Quasi-experimental with non-equivalent control group design	60 WRA in Kelurahan Piai Tangah, Kecamatan Pauh, Kota Padang, West Sumatra	Health education using the Android Smart Akseptor app on contraception	Using the Smart Akseptor app significantly improved knowledge in WRA. The average pretest score for the app group was 6.97, increasing by 0.600 after the intervention (p=0.010), while the control group showed no change (p=0.764). The posttest comparison between groups showed a significant difference (p=0.001), indicating the effectiveness of the app.

Authors/year	Living residence	Study design	Sample & location	Type of intervention	Results
[21]	Rural	Pre-experimental with pre and post-test design in a single group	36 WRA (newlywed women) in Kecamatan Darmaraja, Kabupaten Sumedang, West Java	Health education with audiovisual media, such as video and infographics on family planning and contraceptive methods	Audiovisual education with video and infographics significantly improved understanding of family planning and contraceptive methods. Before counseling, 36.1% of respondents had good understanding, which increased to 83.3% after video and 86.1% after infographics (p-value < 0.001). However, there was no significant change in contraceptive method choice (p-value > 0.05). Video counseling (N-Gain 0.635) was more effective than infographics (N-Gain 0.718).
[48]	Urban	Pre-experimental with one group pretest-posttest design	20 WRA (age 30-45) in Kecamatan Jetis, Kota Yogyakarta	Community service education on family planning and contraceptive methods	The intervention was effective in improving WRA's knowledge about family planning and contraceptive methods, with average pre-test scores increasing from 9.58 to 10.53 on the post-test (p=0.038).
[22]	Rural	Quasi-experimental with one group pretest-posttest design	36 WRA (age 25-35) in Desa Kedungrejo, Tanjunganom, Kabupaten Nganjuk, East Java	Health education using the "Klik KB" app about contraception	Significant increase in knowledge after using the "Klik KB" app, with average scores rising from 17.89 to 20.77 (p=0.001). The percentage of WRA with good knowledge also increased from 44.4% to 83.3%.
[23]	Urban	Quasi-experimental with one group pre-test and post-test design	41 WRA in the work area of Perumnas Health Center, Kecamatan Lubuklinggau Barat, Kota Lubuklinggau, South Sumatra	Health education using a lecture method on the use of IUD contraception	The education had a significant impact on the knowledge of WRA about IUD contraception, with the average score increasing from 10.72 (pretest) to 13.84 (posttest, p-value = 0.001). The percentage of respondents with good knowledge increased from 26.8% to 51.2%.
[49]	Urban	Quasi-experimental with pretest and posttest non-randomized approach and control group	34 WRA (third-trimester pregnant women receiving antenatal care) at Singgani Health Center, Kota Palu, Central Sulawesi	Balanced Counseling Strategy Family Planning (FP-BCS) involving the provision of Maternal and Child Health (MCH) booklets and interactive counseling on modern contraception	FP-BCS significantly improved attitudes, subjective norms, and intentions regarding modern contraception in the intervention group (p=0.000). The control group showed improvements only in intention (p=0.031) and subjective norms (p=0.005), but not in attitude (p=0.081). A significant difference was confirmed between the two groups (p < 0.05). FP-BCS was effective in improving attitudes, subjective norms, and intentions toward modern contraception use among pregnant women
[50]	Urban	Quasi-experimental	55 WRA (pregnant women) in the work area of health centers in Kota Cirebon, West Java	The intervention group received postpartum contraception counseling via the "Si KB Pintar" app, while the control group used flipcharts and pocketbooks.	Family planning counseling using the "Si KB Pintar" app significantly increased postpartum contraception use. App users were 2.4 times more likely (OR=2.421, 95% CI: 1.080–5.428) to use contraception compared to those using flipcharts and pocketbooks (p-value=0.021). This confirms that digital counseling is effective in increasing contraception use.
[51]	Rural	Pre-experimental with one group pretest-posttest approach	76 WRA (contraceptive users aged 20-49 years) in Desa Cadaskertajaya, Kecamatan Telagasari, Kabupaten Karawang, West Java	Reproductive health and contraception education through education, group discussions, and Q&A sessions in community service	Reproductive health and contraception education significantly improved knowledge and self-efficacy of contraceptive users. Of the 76 participants, 72 experienced an increase in knowledge (p-value 0.000), and all participants also showed an improvement in self-efficacy (p-value=0.000).
[52]	Rural	Pre-experimental with one group pretest-posttest approach	52 WRA in RT 06, Desa Karang Satria, Kecamatan Tambun Utara, Kabupaten Bekasi, West Java	Counseling on Long-Acting Contraceptive Methods (LACMs)	Counseling significantly increased knowledge and the selection of LACMs. Before counseling, 51.9% of participants had insufficient knowledge, which decreased to 9.6% after counseling, with 21.2% having good knowledge (p-value=0.000). The selection of LACMs increased from 0% to 7.7% after counseling (p-value=0.000).

Authors/year	Living residence	Study design	Sample & location	Type of intervention	Results
[53]	Urban	Pre-experimental with one group pretest-posttest design	111 WRA from 16 kelurahan in Kecamatan Gunungpati, Kota Semarang, Central Java	Health education with video media on IUD contraception	Video media education significantly increased knowledge and attitudes about IUDs. The average knowledge score increased from 10.72 (sufficient) to 13.84 (good, p-value 0.000). Likewise, the average attitude score increased from 8.85 (positive) to 13.27 (positive, p-value=0.000).
[54]	Rural	Pre-experimental with one group pretest-posttest design	43 WRA (aged 20-45 years) in Mawar Posyandu, under the working area of Angkona Health Center, Kabupaten Luwu Timur, South Sulawesi	Health education on contraception	Family planning education effectively increased knowledge about contraception. Before counseling, 25.6% of participants had good knowledge, which increased to 93% after counseling (p-value=0.000). Among the 43 respondents, 39 experienced an increase in knowledge.
[55]	Urban	Pre-experimental with a one-group pretest-posttest design	42 Family Planning (FP) acceptors who do not use IUD in Kelurahan Purwoyoso, Kota Semarang, Central Java	Health education on IUD contraceptive devices using PowerPoint and leaflet media	The education significantly improved knowledge and attitudes regarding the use of IUDs. Before the education, 21.4% of respondents had good knowledge, which increased to 95.2% afterward (p=0.000). Positive attitudes also increased from 42.9% to 76.2%, while negative attitudes decreased (p=0.000).
[56]	Urban	Pre-experimental with a one-group pretest-posttest design	64 WRA at Anggut Atas Health Center, Kecamatan Ratu Samban, Kota Bengkulu, Bengkulu	Education using video about IUD contraceptive	Video was effective in increasing knowledge about IUD contraception. Before the intervention, 93.8% had poor knowledge (average score = 3.83), which improved to 92.2% with good knowledge (average score = 8.86), with a p-value of 0.000, indicating a significant effect.
[57]	Rural	Quasi-experimental with a pretest-posttest design involving intervention and control groups	70 WRA (aged 20-49 years) in Desa Tegalrejo, Kecamatan Sawit, Kabupaten Boyolali, Central Java	Health education using leaflet media about IUD contraceptive devices	Health education using leaflet media effectively increased knowledge about IUD contraception. Before the intervention, 80% of the control group had sufficient knowledge, which increased to 62.9% in the intervention group. The average score rose from 16.71 to 20.06 (p-value = 0.000), indicating a significant difference between the control and intervention groups.

Table 2. Data extraction of health literacy intervention articles on contraceptive methods based on rural and urban areas

Living residence	Authors/ year	Location	Type of intervention	Conclusion
Rural	[39]	Dusun Pringgolayan, Kabupaten Bantul, DIY	Community service through education with leaflets	Leaflet education successfully improved attitudes of WRA towards reproductive health and contraceptive use, though knowledge improvement was not significant.
	[40]	Desa Karya Indah, Kabupaten Kampar, Riau	Health education using leaflets	Women's knowledge about IUD increased after receiving health education using leaflets, with the majority having good knowledge after the intervention.
	[45]	51 villages in 17 districts, Kabupaten Sleman, DIY	mHealth intervention using Skata app	mHealth intervention with Skata app increased WRA participation in the family planning program, although it did not significantly impact knowledge. It helped WRA use contraception and plan families.
	[46]	Desa Bukit Suban, Kecamatan Air Hitam, Kabupaten Sarolangun, Jambi	Women's empowerment through participation mentoring in family planning (family planning socialization, contraceptive demonstration, and counseling on contraception)	The intervention, including socialization, contraceptive demonstrations, and counseling, successfully increased knowledge, attitudes, and family planning practices among women of childbearing age in SAD, supporting women's empowerment.
	[47]	Kecamatan Darmaraja, Kabupaten Sumedang, West Java	Health education using audiovisual media (video and infographics)	Education using video and infographics effectively improved understanding of family planning and contraception, although it did not affect the choice of contraceptive method. The effectiveness of the education increased with the addition of infographics.
	[22]	Desa Kedungrejo, Tanjunganom, Kabupaten Nganjuk, East Java	Health education using "Klik KB" app	Using the "Klik KB" effectively increased WRA knowledge about contraception, with most respondents showing good knowledge after using the app.
	[51]	Desa Cadaskertajaya, Kecamatan Telagasari, Kabupaten Karawang, West Java	Reproductive health and contraception education through community service	Reproductive health and contraception education improved knowledge and self-efficacy of family planning acceptors, particularly in understanding reproductive health, family planning programs, and contraceptive methods.

Living residence	Authors/ year	Location	Type of intervention	Conclusion
			with health education, brainstorming, and Q&A sessions	
	[52]	Desa Karang Satria, Kecamatan Tambun Utara, Kabupaten Bekasi, West Java	Long-term contraceptive method (MKJP) counseling	Counseling effectively increased knowledge and selection of MKJP, with more participants knowing and choosing MKJP after counseling.
	[54]	Mawar Posyandu, Angkona Public Health Center, Kabupaten Luwu Timur, South Sulawesi	Contraception health education	Family planning education effectively increased contraception knowledge, with most participants showing improvement after education.
	[57]	Desa Tegalrejo, Kecamatan Sawit, Kabupaten Boyolali, Central Java	Health education using leaflets	Health education using leaflets effectively increased WRA knowledge about IUD contraception.
Urban	[41]	Bidan Praktik Mandiri (BPM) Rachmawati, Kelurahan Lubang Buaya, Kota Jakarta Timur	Health promotion using video	Health promotion using video effectively increased WRA knowledge about IUD family planning, with significant improvement after the intervention.
	[42]	Andalas Public Health Center, Kecamatan Padang Timur, Kota Padang, West Sumatra	IEC and counseling	IEC on family planning effectively increased knowledge and use of IUD contraception, though factors like ineffective communication and time constraints affected IUD usage decisions.
	[43]	Sematang Borang Health Center, Kota Palembang, South Sumatra	Use of audiovisual media (video)	Audiovisual media intervention effectively increased WRA knowledge about IUD contraception, with the majority of respondents showing good knowledge after the intervention.
	[44]	Naras Health Center, Kota Pariaman, West Sumatra	Health promotion using Bookledy (IUD booklet)	The booklet intervention effectively increased WRA knowledge and attitudes towards IUD contraception.
	[47]	Kelurahan Piai Tangah, Kecamatan Pauh, Kota Padang, West Sumatra	Education using Smart Akseptor Android app	Using the Smart Akseptor app effectively increased WRA knowledge, with the app group showing significant improvement compared to the control group.
	[48]	Kecamatan Jetis, Kota Yogyakarta	Community service through health education	Health education effectively increased WRA knowledge about family planning and contraceptive methods.
	[23]	Perumnas Public Health Center, Kecamatan Lubuklinggau Barat, Kota Lubuklinggau, South Sumatra	Health education through lectures	Lectures effectively increased WRA knowledge about IUD family planning, with significant improvement in knowledge scores and the percentage of respondents with good knowledge.
	[49]	Singgani Health Center, Kota Palu, Central Sulawesi	Family Planning-Balanced Counseling Strategy (FP-BCS) with MCH book and interactive counseling on modern contraception	FP-BCS effectively improved attitudes, subjective norms, and intentions to use modern contraception in the intervention group, while the control group only showed improvement in intention and subjective norms. The study concluded that FP-BCS positively affected contraceptive behavior among pregnant women.
	[50]	Cirebon Public Health Center, Kota Cirebon, West Java	Intervention group: Family planning counseling using Si KB Pintar app, control group: counseling using a flipchart and pocketbook	Family planning counseling using the Si KB Pintar app was more effective in increasing postpartum contraceptive use compared to flipcharts and pocketbooks. The app significantly improved contraceptive use.
	[53]	16 kelurahan in Kecamatan Gunungpati, Kota Semarang, Central Java	Health education using video	Health education using video effectively increased knowledge and attitudes of WRA towards IUD, with significant improvement in both aspects after the education.
	[54]	Kelurahan Purwoyoso, Kota Semarang, Central Java	Health education with PowerPoint and leaflets	Health education with PowerPoint and leaflets effectively increased knowledge and positive attitudes towards IUD contraception, while reducing negative attitudes.
	[56]	Anggut Atas Health Center, Kecamatan Ratu Samban, Kota Bengkulu, Bengkulu	Education using video media	Video effectively increased knowledge about IUD contraception, with most respondents showing improved knowledge after the intervention.

In urban areas, technology-driven interventions such as digital apps, audiovisual, and visual media have proven highly effective in improving contraceptive health literacy. For instance, the Si KB Pintar app in Cirebon significantly increased postpartum contraceptive use (OR=2.42; p=0.021) [50], while the Smart Akseptor app in Padang raised knowledge scores from 6.97 to 7.57 (p=0.010) [47]. In Jakarta Timur, video-based interventions boosted IUD knowledge from a pre-test mean of 12.02 to 15.64 (p=0.000) [41]. These technology-based approaches, which are easily adopted by urban populations, have shown greater success in enhancing contraceptive health literacy in urban settings, offering broad reach and accessibility.

Overall, rural areas tend to rely on straightforward educational methods, such as direct education and mentoring, while urban areas favor technology-driven approaches to disseminate contraception information. Although effectiveness may vary, all interventions have successfully enhanced health literacy on contraception in both settings. The key takeaway is that context-specific interventions—such as digital solutions in urban areas and simplified media in rural areas—are most effective when tailored to local needs.

DISCUSSION

Health literacy results from health education and communication that aim to improve individuals' understanding of how to access, comprehend, and use health information effectively. In the context of reproductive health, health literacy is crucial, particularly in helping WRA make informed decisions about contraception methods that suit their conditions and needs [16,58]. Knowledge about contraception, including its types, benefits, purposes, and the myths and facts surrounding it, is essential for WRA to use contraceptive methods correctly. Several studies have shown that good health literacy can influence positive attitudes toward contraception and the intention to use it, thereby supporting the success of family planning programs [21,46].

Beyond knowledge, health literacy also encompasses attitudes toward contraception, which are influenced by social and cultural factors. Research shows that appropriate education can improve the community's attitudes and perceptions toward contraceptive use, as demonstrated in a counseling program for the Suku Anak Dalam community, which successfully increased their understanding and attitudes toward family planning and contraception [46]. Moreover, the intention to use contraception is influenced by positive attitudes and the subjective norms present in society. Communities with more open attitudes toward contraception tend to have a stronger intention to use it, indicating that health literacy plays a major role in fostering positive behavioral changes [49,59,60].

Interventions to improve health literacy in Indonesia have successfully enhanced the understanding of contraception. One effective approach is community-based education tailored to local conditions. In rural villages, as seen in women's empowerment programs, education through socialization and counseling has been shown to improve knowledge and contraceptive use [49,51]. However, challenges remain, especially for communities with limited literacy and numeracy skills. Low literacy levels make it difficult for individuals to access information effectively, necessitating more accessible educational materials [61]. Therefore, programs tailored to local needs and that can reach communities with varying literacy levels are crucial to ensuring the success of family planning programs and reducing knowledge gaps related to reproductive health [58].

Health literacy interventions in Indonesia differ between rural and urban areas due to disparities in access, digital infrastructure, and sociocultural contexts. In rural settings, personal and community-based approaches such as leaflets, videos, and face-to-face counseling are more commonly used and effective, particularly among groups with limited literacy and digital access [39,40,21]. For example, in the Suku Anak Dalam community, participatory counseling significantly improved knowledge, attitudes, and contraceptive practices [46]. These differences imply that rural interventions must prioritize accessibility, cultural relevance, and community engagement. Implementing such strategies requires collaboration with local health workers and leaders to ensure trust and acceptance, emphasizing the need for low-tech, human-centered solutions to reach underserved populations.

In contrast, health literacy interventions in urban areas rely more on digital technologies and audiovisual media. Digital applications like Smart Akseptor and Si KB Pintar are used to provide counseling and education on contraception, which has proven effective in improving WRA's knowledge and contraceptive use, particularly postpartum [47,50]. The use of digital applications aligns with better access to technology and higher digital literacy in urban areas. However, some technology-based applications have also been introduced in rural areas, such as Klik KB and Skata, which have shown effectiveness in increasing WRA participation in family planning programs, though

results in improving contraceptive knowledge vary [45,22]. These technology-based approaches facilitate access to information, but must still be adapted to the local social and cultural context.

This is consistent with previous research in a village in Uganda, which found that after three years of health education interventions and family planning counseling, health literacy regarding family planning improved, and more women began using contraception [62]. This finding reinforces the importance of long-term, consistent intervention strategies, particularly in rural settings where changes often require time and trust-building. On the other hand, in urban areas, shorter-term interventions using digital media, such as social media campaigns, webinars, and health apps organized by various healthcare facilities, are more common and can quickly reach large audiences [63,64,65].

Furthermore, specific interventions, particularly audiovisual media, demonstrate similar effectiveness across both rural and urban areas. These media combine visual and auditory elements, which enhance engagement and make information more accessible, especially for individuals with varying literacy levels. In rural regions like Sumedang, for example, videos and infographics significantly improved understanding of family planning among WRA [21]. Similarly, in urban areas such as Jakarta Timur, Palembang, Bengkulu, and Semarang, these tools also showed a notable increase in contraceptive knowledge [41,43,56,53]. Audiovisual media simplify complex concepts and improve both attention and retention, ensuring they are effective across diverse educational backgrounds. Additionally, other forms of visual media, including leaflets, PowerPoint presentations, and booklets, have proven successful in both rural and urban settings. In areas like Bantul, Boyolali, Semarang, and Pariaman, these visual tools enhanced knowledge and attitudes toward contraception [39,40,44,55,57], reinforcing the value of clear, visual messaging in promoting health literacy.

Interestingly, interventions that combine multiple methods tend to show more optimal results in both regions. This is evident in the success of the Family Planning-Balanced Counseling Strategy (FP-BCS) in Palu, which combines interactive counseling with guidebooks [49], as well as the empowerment program in Bukit Suban Village, which combines socialization, tool demonstrations, and counseling [46]. These findings emphasize the need to tailor health literacy interventions on contraception to regional characteristics. In rural areas, personal and community-based approaches, with support from conventional media, are still relevant, while in urban areas, utilizing digital technology can be optimized. However, combining various methods should always be considered to maximize the effectiveness of interventions in both regions.

The Indonesian government has also launched various initiatives to improve health literacy regarding contraception, such as the Kampung Keluarga Berkualitas (Kampung KB) program, which aims to raise awareness and improve access to family planning services. Additionally, the Generasi Berencana (GenRe) program targets youth and potential WRA, while collaboration with the private sector extends the reach of programs through awareness and education campaigns [66-69]. These efforts aim to reduce unintended pregnancies, improve family quality of life, and support the empowerment of women and communities as key elements in achieving success for family planning programs.

Despite various initiatives, challenges persist, particularly with low education levels, social and cultural norms, and limited access to information [70-72]. To address these, more coordinated efforts are needed. In rural areas, combining mobile health apps with community-based counseling can bridge information gaps. In urban areas, digital campaigns should be more inclusive and culturally relevant. Collaboration between the government, private sector, and local communities can further strengthen these interventions, ensuring they are both effective and contextually appropriate [73-75].

Overall, good health literacy regarding contraception is essential for supporting the success of family planning programs. Adequate knowledge, positive attitudes, and the willingness to access information can increase WRA participation in family planning programs. Therefore, diverse approaches, whether based on traditional media, community methods, or technology, should continue to be developed and tailored to local needs to achieve optimal outcomes.

CONCLUSION

Health literacy interventions, such as health education, health promotion, and the use of digital media, effectively improve knowledge, attitudes, and contraceptive use behaviors among women of reproductive age (WRA) in Indonesia. However, their success varies depending on the type of intervention and location, with differences between rural and urban areas influencing the outcomes. Interventions that incorporate community empowerment and technology have a more significant impact.

To improve contraceptive health literacy in Indonesia, a holistic approach combining community

empowerment, technology, and community-based health promotion is recommended. Strategies should be tailored to local contexts, and collaboration among the government, communities, and other sectors is crucial for increasing contraceptive use and achieving nationwide coverage.

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