

Potential of Transdermal Hormonal Contraception in Indonesia: A Systematic Literature Review

Ulfa Nadia Nurul Firdaus^{1*}, Nurul Wahidah¹, Yulianti Hayati¹, Aryl Alfath Muhammad Iqbal², Dhiny Isma¹

¹Midwifery Academy Bakti Indonesia Bogor, Bogor, Indonesia

²Pharmacy Academy Persada Sukabumi, Sukabumi, Indonesia

Corresponding author: ulfanadia98@gmail.com

ARTICLE INFO

ABSTRACT

Article history

Submitted:
07 January 2026

Revised:
10 February 2026

Accepted:
06 April 2026

Keywords:

Hormonal
contraception;
Microneedle patch;
Transdermal
contraception.

Indonesia is one of the most populous countries in the world. Projections indicate that Indonesia's population will reach 321 million by 2045. One effort to curb population growth is through the Family Planning (FP) program. Transdermal hormonal contraceptive methods have been developed, offering advantages such as more efficient, painless administration, reduced biohazardous waste, and innovative and practicality. This study analyzes the potential of transdermal hormonal contraceptive methods to support efforts to curb growth in Indonesia. This study, using a systematic review, was conducted with the PICO framework. A systematic review was conducted by searching the literature from 2020 to 2025 in two academic databases: ScienceDirect and PubMed. Of the 384 initial articles identified, 4 met the criteria and were analyzed to extract relevant findings on transdermal hormonal contraceptives. The review revealed that transdermal contraceptives have significant potential to reduce birth rates and unplanned pregnancies due to their effectiveness and convenience. However, their adoption is heavily influenced by education, counseling quality, family planning service policies, and equitable access. In Indonesia, the use of transdermal/patch contraceptives remains low due to their relatively high price, exclusion from free family planning services, and the need for a doctor's prescription. Furthermore, many healthcare professionals are unfamiliar with its effectiveness and benefits and therefore rarely recommend it. These findings provide a valuable roadmap for policymakers and healthcare professionals in Indonesia to receive adequate training and keep up to date with the latest knowledge to become more confident in recommending this method.



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INTRODUCTION

Indonesia is one of the countries with the largest population in the world, so controlling population growth is crucial (Nurullah, 2021). Data shows that the world population is estimated at around 8.25 billion in 2025 (Statistics Times, 2025). Specifically in Indonesia, projections estimate the population will reach 321 million in 2045 (BPS Indonesia, 2023). One effort to reduce population growth is the Family Planning (KB) program, implemented by the National Family Planning Coordinating Board (BKKBN) (Nurullah, 2021).

Various existing contraceptive methods, such as pills, hormonal injections, and intrauterine devices (IUDs), often have limitations in terms of comfort and compliance, thus becoming a major problem, causing high rates of unplanned births (Jiang et al., 2023; Li et al., 2019). It is stated that more than 40% of births in the world are unplanned pregnancies, and 20% of them end in abortion (Lee et al., 2021).

Considering these factors, long-term contraceptive methods have been developed, which offer advantages such as being more efficient, painless, reduction of biohazardous waste, and innovative and practical (Enkova et al., 2023; Jiang et al., 2023). In 2002, transdermal contraceptives appeared; this method is applied by attaching a patch to the skin, which provides

comfort because it only needs to be attached to the skin and does not require daily control (Enkova et al., 2023).

The first patch marketed contained 150 µg of norelgestromin and 35 µg of ethinyl estradiol. The patch is applied once a week for three weeks (21 days), followed by one week without patch use in each cycle (Enkova et al., 2023; Stanczyk et al., 2022; Thomas & Chen, 2025). The latest developments in contraceptive technology have led to a more advanced innovation: the microneedle patch (MN patch). This technology combines the advantages of the transdermal method with the long-acting reversible contraception (LARC) system. Microneedle patches containing levonorgestrel have been proven to provide stable hormone release for more than a month, without pain or sharp waste, and can be applied by the user at home (Li et al., 2019). Further development in the form of an immediate detachment mechanism allows the microneedle to detach in just seconds, providing greater ease of use (Lee et al., 2021).

Despite being available in 60 countries, uptake of this method remains low due to varying contraceptive counseling practices and limited provider knowledge of contraceptive options (Gemzell-Danielsson et al., 2024). This demonstrates that, despite the identified need for evidence-based policy, there remains a gap between the potential benefits of transdermal methods and their adoption rates in society.

In addition to this gap, scientific studies on transdermal contraception in Indonesia are still relatively limited, both in terms of effectiveness, safety, and user acceptance. National policies and guidelines also do not specifically accommodate the widespread use of this method compared to other contraceptive methods. Given these limitations, this review aims to analyze the literature related to the use of transdermal contraception and identify the potential and challenges of implementing transdermal contraception in Indonesia.

METHOD

This study will use a literature review based on the PICO (Population, Intervention, Comparison, Outcome) framework. Inclusion criteria include articles published between 2020 and 2025, in English or Indonesian, with a focus on transdermal contraceptive patches. A literature search was conducted in the ScienceDirect and PubMed databases using a combination of keywords for each PICO element, with Boolean operators (AND, OR).

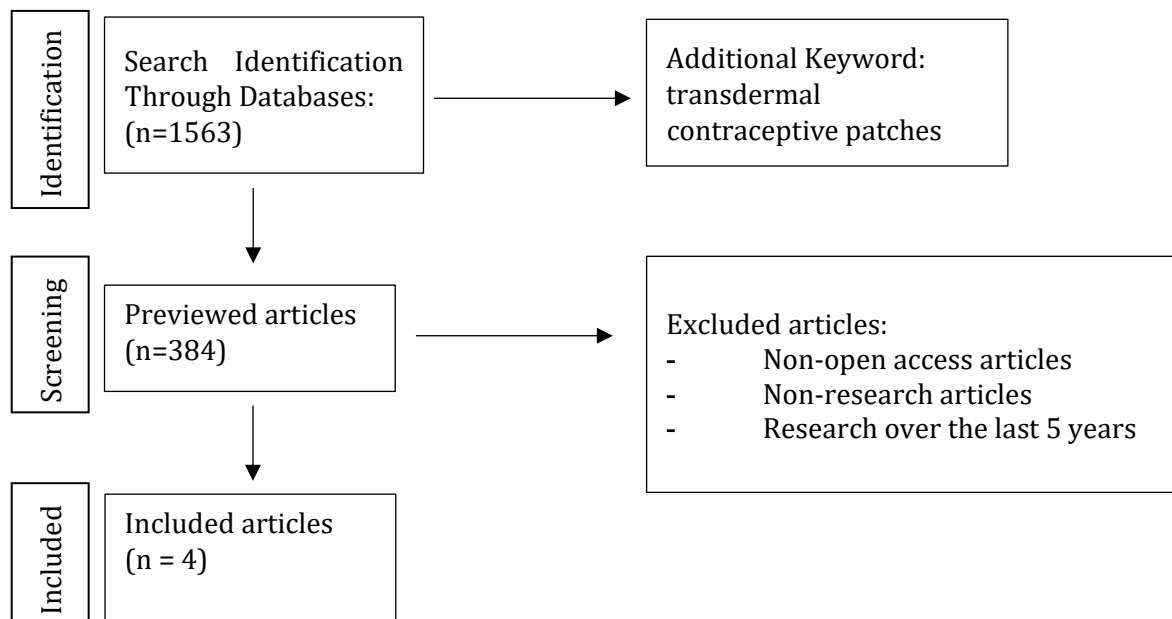


Figure 1. PRISMA diagram

The research process in this study began with identifying articles from various databases using key keywords, such as "transdermal contraceptive patches." This step aimed to obtain relevant literature. This study used platforms such as ScienceDirect and PubMed. The identified

articles were then de-duplicated to ensure each remaining article was complete, resulting in 384 articles for further screening.

Next, the remaining articles were screened to assess their relevance to the research focus. During this stage, articles without free full-text, inappropriate study designs, and those published more than 5 years ago were excluded. This selection process ensured that only articles providing significant information were considered. This stage is crucial for filtering articles by topic relevance, ensuring the efficiency and accuracy of the research process. In the final stage, articles were screened using more specific inclusion criteria, namely, those that included relevant discussions of transdermal contraceptive patches. Articles meeting these criteria were included in the Systematic Literature Review (SLR) analysis.

RESULTS

Table 1. The summary of the reviewed articles

No	Authors/ Years	Titles	Method	Findings/ Results
1	Gorbunova, 2024	Transdermal contraception and quality of life	This study used an observational design with a comparative approach that aimed to compare the effects of using two types of hormonal contraceptive methods on women's quality of life, as well as measuring their effectiveness, safety, and comfort of use.	<ul style="list-style-type: none"> - The results of this study indicate that the use of a hormonal patch containing norelgestromin and ethinyl estradiol as a transdermal contraceptive method is highly effective, proven to prevent unintended pregnancies in 100% of women who use it. Furthermore, the patch does not affect the body's hormonal or non-hormonal balance and is well-tolerated by women who use it. - Effectiveness decreases in women who weigh ≥ 90 kg
2	Jiang et al., 2023	Advances in microneedle patches for long-acting contraception	This study design combines experimental approaches (in vitro and in vivo) with user preference studies to provide a comprehensive overview of the potential of the microneedle patch as an effective, safe, and well-accepted long-term contraceptive method.	<ul style="list-style-type: none"> - Three types of microneedle patches that have been tested are a dissolvable microneedle patch, a polymer-based biodegradable microneedle patch, and a silk fibroin-based microneedle patch have been shown to be effective in providing a gradual and sustained release of contraceptive hormones. - Easy to use in the application - Long-term clinical trials are needed
3	Enkova et al., 2023	The modern method of hormonal contraception is the transdermal patch	This study used an open-label clinical study design, allowing participants to know that they were using the contraceptive patch. In addition, this study also involved a randomized controlled trial (RCT) comparing the effectiveness of the	The Evra transdermal contraceptive patch is a highly effective and safe contraceptive method, comparable to the birth control pill, with a low failure rate and high efficacy. It requires only one weekly application, which improves user compliance compared to daily pills. The patch's main advantage is its higher bioavailability, as it does

No	Authors/ Years	Titles	Method	Findings/ Results
			transdermal patch with oral contraceptives.	not undergo digestive or liver metabolism, making it more effective. Side effects tend to be mild to moderate, such as skin irritation, with a user satisfaction rating of 88%. The patch is also unaffected by hot weather or high humidity, as well as physical activity, further enhancing its comfort and ease of use. Overall, the Evra patch offers a practical, convenient contraceptive solution that is highly appreciated by its users.
4	Lee et al., 2021.	Immediate Detachment of Microneedles by Interfacial Fracture for Sustained Delivery of a Contraceptive Hormone in the Skin	This study used an experimental design that included a series of in vitro and ex vivo tests to develop and evaluate a microneedle (MN) patch capable of releasing hormones continuously within the skin.	The microneedle patch adheres firmly and detaches immediately upon removal. It releases levonorgestrel gradually over several weeks, making it an effective long-term contraceptive system.

Based on an analysis of four articles, transdermal contraceptives, both conventional hormonal patches and microneedle (MN) patches, have consistently proven highly effective, safe, and convenient as modern contraceptive methods. The hormonal patch, containing a combination of norelgestromin and ethinyl estradiol, is capable of preventing unwanted pregnancies up to 100% without disrupting hormonal or non-hormonal balance and is well-received by users (Gorbunova, 2024).

Transdermal patches like Evra have also shown effectiveness equivalent to birth control pills with low failure rates, but are superior in terms of compliance because they only need to be used once a week, have higher bioavailability, and relatively few side effects (Enkova et al., 2023). These findings indicate that transdermal patches improve quality of life and user comfort compared to oral methods.

On the other hand, the innovation of microneedle patches offers great potential as a long-term contraceptive method with stable and sustained hormone release, minimal pain, and ease of use. Various types of microneedles, from dissolvable, biodegradable polymer-based to silk fibroin-based, have been shown to release contraceptive hormones gradually and effectively (Jiang et al., 2023). The development of microneedles that can be firmly attached to the skin, then immediately removed while the needle remains in place to release levonorgestrel over several weeks, further strengthens the potential of this technology as a practical long-term contraceptive system (Lee et al., 2021).

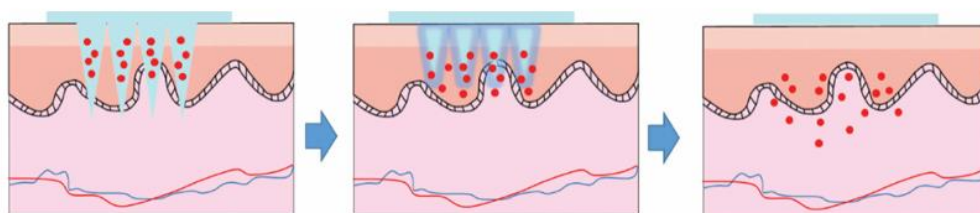


Figure 2. Illustration of a microneedle patch releasing active substances onto the skin (Jiang, et al. 2023)

DISCUSSION

Transdermal contraception holds significant promise for reducing pregnancy rates. Findings from various studies indicate that transdermal contraception offers significant advantages in terms of effectiveness, convenience, and compliance compared to conventional hormonal contraceptive methods (Enkova et al., 2023). In addition, the patch contraceptive method does not cause significant weight gain; this is an advantage over other hormonal methods, such as injections or implants, which are often associated with weight gain (Searchlight Pharma Inc., 2024; Fsrh, 2019). This suggests that the transdermal patch could be a relevant option for women who want a practical and easy-to-use contraceptive (Galzote et al., 2017). However, the success of its adoption depends heavily on education, improving the quality of counseling, supporting family planning service policies, and expanding access so that this method can be used by more women, including in developing countries like Indonesia.

In Indonesia, the use of transdermal contraception still faces various challenges despite its advantages. These include higher prices compared to pills or injections, the lack of a patch as a free government family planning service, and the requirement for a doctor's prescription, which limits access. These factors make the patch less popular than more accessible methods like pills, injections, IUDs, or implants.

Furthermore, the knowledge of healthcare providers or health workers also significantly influences the low use of transdermal contraceptives. Many healthcare workers still lack an understanding of their effectiveness and benefits, so they rarely recommend them to patients (Gemzell-Danielsson et al., 2024). This limited information directly impacts user choice and makes this method less widely known. This is in line with research in various countries, which shows that health workers have a role in making decisions about contraceptive use in women.

However, it is crucial to recognize the limitations of the studies supporting these findings. Most research was conducted in developed countries with advanced healthcare systems, which may make these contexts less applicable to Indonesia. The risk of selection bias is also significant, especially in studies involving participants with greater healthcare access. These limitations may affect the effectiveness and acceptability of transdermal contraceptives.

The implications of these findings for public health policy and practice are significant. First, integrating transdermal contraceptives into national family planning programs, potentially through subsidies or free provision, can increase accessibility, offering users a convenient and non-invasive contraceptive option. Second, prioritizing training and capacity building for health workers will equip them to provide accurate and comprehensive information, helping patients make informed choices. Third, implementing a structured and systematic contraceptive counseling system on a wide scale has been effective in improving user understanding and participation, thereby increasing contraceptive uptake and adherence.

According to information processing theory, information is more effectively received when presented in a clear, sequential manner, allowing clients to process each piece of information step by step. The process of identifying problems, exploring needs, and making decisions in structured counseling helps clients build a more stable understanding (Simanjuntak et al., 2016).

Thus, the low level of transdermal contraceptive use is not due to a lack of effectiveness, but rather to a combination of systemic, structural, and informational factors. Therefore, comprehensive, systems-based interventions are essential to optimize the use of this method in family planning programs.

CONCLUSION

Building on these research needs, this study shows that transdermal contraception has the potential to be an effective and practical family planning method. However, its use in Indonesia remains limited due to three main barriers: unequal access, relatively high costs, and limited knowledge and recommendations from health workers. These findings emphasize that increasing adoption of this method depends not only on product availability but also on the health care support system.

Addressing these challenges requires strategic steps, including: (1) integration of transdermal contraception into national programs with subsidies or financing schemes, (2) training and capacity building for health workers to be more active in providing education and recommendations, and (3) targeted public education campaigns to increase public awareness and acceptance. Coordinated efforts between the government, health care providers, and other stakeholders are key to expanding access and ensuring women have safer, more effective, and more informed contraceptive options.

AUTHOR'S DECLARATION

Authors' contributions and responsibilities

UNF: Writing the original draft, visualization, conceptualization; funding research; **NW, YH, DI:** Assisting with reviews, validating concepts and results, funding research; **AAM:** Assisting with reviews, validating concepts and results.

Availability of data and materials

All data used in this study are available from the authors.

Competing interests

The authors declare no competing interests.

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