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Research Article

Jamu and Women's Health: Exploring Its Role in Reproductive and Maternal Care

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Abstract

Jamu, a traditional Indonesian medicine system, has been practiced for centuries and is deeply rooted in the cultural practices and daily life of local communities. It embodies a holistic approach that integrates physical, spiritual, and emotional well-being, emphasizing harmony with nature, balance, and the interconnection of body, mind, and spirit. Jamu plays a significant role in women's health, particularly in reproductive and maternal care, due to cultural beliefs surrounding its use. Women often use Jamu during different life stages, viewing it as a cultural norm supported by generations of traditional knowledge. The potential role of Jamu in women's reproductive and maternal care is an area of emerging interest, as it aligns with the widespread use of natural remedies in similar contexts around the world. While the benefits of Jamu are culturally and historically supported, its safety and efficacy remain subjects of ongoing investigation. The integration of Jamu into modern healthcare systems presents both opportunities and challenges. Key opportunities include enhancing cultural acceptance of healthcare services, promoting holistic health benefits, and improving patient-centered care. However, challenges persist in standardization, scientific validation, and quality control. The "scientization" of Jamu, involving the transition from experience-based to evidence-based practices, is crucial for its safe and effective integration. Future directions should focus on the systematic incorporation of Jamu into mainstream healthcare, preserving its cultural elements while ensuring safety and efficacy through comprehensive regulatory frameworks, rigorous scientific research, and collaboration between traditional practitioners and modern healthcare providers.

Keywords: jamu, women's health, reproductive and maternal care, traditional medicine, djampi oesodo.

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1 Introduction

Jamu has been practiced for centuries in Indonesia, deeply rooted in the cultural practices and daily life of the local communities. It is not merely a system of medicine but a holistic approach that integrates physical, spiritual, and emotional well-being. The practice of Jamu is deeply intertwined with the Indonesian worldview, which emphasizes harmony with nature, balance, and the interconnection of body, mind, and spirit. It embodies principles of holistic healing, acknowledging the importance of lifestyle, environment, and emotional health in overall wellness.[41]

As healthcare systems globally shift towards integrative practices, there is a growing recognition of the value of traditional medicinal systems. Jamu's integration into modern medical practices involves standardisation, scientific research, and collaboration between traditional healers and healthcare professionals. Recent studies have begun to validate some traditional claims about Jamu, exploring the pharmacological properties of its ingredients. Various educational programs and workshops are being designed to train healthcare professionals in the principles of Jamu, allowing for a respectful and informed incorporation of traditional practices within modern medical frameworks. [41]

Djampi Oesodo embodies the wisdom of Nusantara culture, integrating ancient practices with modern healthcare paradigms. The concept of "Nusantara" reflects a diverse array of cultures, each contributing unique insights into health practices, disease management, and holistic well-being. Grassroots movements and collaborative efforts can enhance the recognition and utilization of Jamu in current health challenges. Emphasizing the critical role of cultural heritage in health and wellness and by showcasing Jamu's evolution from ancient practices to its modern applications. [41-42]

Borobudur Temple's 8th-century reliefs depict traditional medicinal practices, aligning with the Djampi Oesodo philosophy (consciousness, energy, matter or body, mind, spirit) in Jamu. Temple that was constructed in the 8th century, is the largest Buddhist temple in the world. Panel 19 on Relief sculpture of Mahakarmawibhangga shows a scene of several people providing help to a man who is sick. There were people massaging his head, massaging his stomach and chest, rubbing his shoulder with a topical preparation, giving an oral preparation (natural medicinal ingredients), making medicinal concoctions by grinding them, carrying water and toiletries for bathing with natural medicine, and praying whilst recite a spell.[1]

Based on the information contained in the reliefs on Borobudur temple, it is in consistent with jamu which comes from the word and philosophy of djampi oesodo. 'Djampi' is a spell or physical and non-physical technique or preparation of medicine, 'oesodo' is health. Therefore, 'jamu/djamoe' refers to utilization of consciousness, energy, and matter such as chemical molecules to achieve and maintain health [41]; [11] Form of jamu based on 'djampi oesodo' philosophy (consciousness, energy, matter) are:

a. Indonesian Natural Medicine preparations, by utilisation of primary-secondary metabolite molecules that contains free bond energy and conformation.
b. Health foods and drinks, and health Supplements, by utilisation of primary-secondary metabolite molecules that contains free binding and conformational free energy.
c. Cosmetics are composed of mixtures of chemical compounds derived from natural sources by utilisation of primary-secondary metabolite molecules that contains free bond energy and conformational free energy.
d. Aromatherapies by utilisation of volatile compound which is secondary metabolite molecules that contains free binding energy and conformational free energy.
e. Music, songs, light, natural stones, health equipment (simple physical to radiation), by utilisation of wavelength-frequency radiation energy.
f. Manual Massage Techniques and SPA by utilisation of mechanical energy
g. Techniques of sports, dancing, meditation, and breathing control by utilisation of respiratory energy that triggers metabolism in the body, bonding energy, and conformational free energy.

Even more, the facts about relationship between consciousness and physiological changes, such as when we remember something that is very sad/pleasant in the conscious dimension, then spontaneously

our body's physiological mechanisms produce tears, runny nose, increased heart rate, and increased respiratory rate. This fact is supported by the information contained in the reliefs on Borobudur Temple and the philosophy of Djampi Oesodo about the form of Jamu in many forms for health by utilizing consciousness, energy, and matter [41]; [11].

Reproductive health issues specific to women often involve complex biological and societal factors. The burden of reproduction is significant in humans, exacerbated by factors such as increasing maternal age and obesity, which lead to complications during pregnancy. Technologies like genomics and mobile health applications are being explored to monitor and manage these reproductive disorders more effectively [31].

Maternal mental health is a significant concern, affecting approximately 10% of pregnant women worldwide. Mental health disorders before or during pregnancy can lead to adverse reproductive outcomes like miscarriage, preterm birth, and low birth weight. Addressing maternal mental health is crucial in the holistic approach to reproductive decisions and pregnancy (Montagnoli et al., 2020).

Intrafamilial power dynamics also play a crucial role in maternal health outcomes. In some settings, women have limited control over health decisions, with influences from family members like mothers-in-law impacting their health-seeking behaviours. Understanding these dynamics is essential for improving maternal health practices [66].

Additionally, the microbiome's role in female reproductive health cannot be overlooked. A balanced microbiome is critical for fertility and successful pregnancy outcomes. Disruptions in this balance can lead to pregnancy complications, highlighting the need for interventions to restore microbiome health [69].

Racial and ethnic disparities also affect reproductive health, with systemic racial injustice leading to unequal access and outcomes in reproductive health services. Efforts are underway to address these disparities through policy improvements and community-level interventions [58].

Addressing these multifaceted issues requires comprehensive and personalized care strategies that consider biological, psychological, and sociocultural dimensions. Interventions need to target not just women but also the broader societal and familial structures that influence health outcomes.

The potential role of Jamu, a traditional Indonesian medicine, in women's reproductive and maternal care is an area of emerging interest, particularly in light of the widespread use of natural remedies in similar contexts around the world. Traditional medicine, including Jamu, serves as a primary health care resource for a significant portion of the population in many countries due to its accessibility, cultural relevance, and perceived safety [50]. The use of such remedies is prevalent among women for addressing maternal and reproductive health concerns, as seen in traditional practices in Africa and Ethiopia, where natural medicine is commonly used during pregnancy [50]; [36].

While the benefits of natural medicines are culturally and historically supported, their safety and efficacy remain subjects of ongoing investigation. Concerns about the use of certain techniques and natural ingredients during pregnancy, which may affect reproductive health, underscore the need for cautious evaluation and regulation [12]. However, the integration of traditional health practices, such as Jamu, with conventional medicine could enhance maternal care by incorporating cultural beliefs and increasing accessibility, particularly in low-resource settings where access to conventional maternity care is limited [65].

Moreover, understanding the long-term impacts of maternal traditional medicine use, like that of Jamu, on aspects such as neurogenesis and overall mental health in women could provide comprehensive insights into its holistic benefits and potential risks [35]. Overall, the potential role of Jamu in women's reproductive and maternal care warrants a thorough exploration to balance traditional practices with modern healthcare priorities, ensuring safety while honouring cultural traditions.

Jamu, a traditional Indonesian medicine, plays a significant role in women's health due to the cultural beliefs surrounding its use. This natura; solution is often integrated into daily routines for preventive measures and health maintenance, particularly for women. The use of Jamu is deeply embedded in the cultural heritage and social practices of Indonesian communities, where it is believed to have various

health benefits, including improving fertility, enhancing general well-being, and aiding postpartum recovery. [11]

Women in Indonesia often use Jamu during different life stages, viewing it not only as a remedy but as a cultural norm supported by generations of traditional knowledge. These beliefs are so strong that even among modern Indonesian women, Jamu remains popular despite the availability of conventional medicine. It is common for postpartum women, for instance, to use Jamu as part of their recovery process. This practice is rooted in the cultural emphasis on maintaining a woman's body balance and renewing her strength after childbirth. [11]

The cultural perception of Jamu encompasses a blend of traditional wisdom and natural healing, which is perceived as more harmonious and less invasive than Western medicine. The trust in Jamu is also fuelled by the belief in its ability to address not only physical but also emotional and spiritual well-being, resonating with the holistic health perceptions pervasive in Indonesian culture. These traditional remedies, often prepared by community elders or specialized Jamu practitioners, are personalized based on individual health conditions and symptoms, strengthening the cultural connection to health practices unique to Indonesian women. [14]

Such practices showcase the importance of understanding cultural contexts when discussing women's health in regions where traditional remedies like Jamu are prevalent. Health care providers working with women who use Jamu must consider these cultural beliefs to ensure that health interventions are culturally sensitive and respectful, thus fostering better acceptance and adherence among these communities.

2 Method

This article employed a narrative literature review method using a qualitative and integrative approach to explore the role of Jamu in women's reproductive and maternal health. The review process was carried out in three main stages: literature identification, article selection, and thematic synthesis. Literature was identified through systematic searches in electronic databases such as PubMed, ScienceDirect, Scopus, and Google Scholar using a combination of keywords including “Jamu,” “Indonesian traditional medicine,” “women’s health,” “maternal care,” “menstrual health,” “postpartum,” and “reproductive health.” Additional references were identified through snowball sampling from the bibliographies of relevant articles.

The inclusion criteria consisted of peer-reviewed articles written in English or Indonesian, published between 2000 and 2025, and discussing the use of Jamu or traditional herbal medicine in the context of women’s reproductive and maternal health. Articles were excluded if they were not directly relevant, were opinion pieces without empirical or ethnopharmacological basis, or were duplicates.

Selected articles were analysed using thematic synthesis. Key data and concepts were extracted, coded, and categorized into major themes, including: the historical and cultural foundations of Jamu, biological and pharmacological basis, use in menstrual regulation and fertility, maternal care applications (including pregnancy, postpartum, and lactation), safety and toxicology issues, and the integration of Jamu into modern healthcare systems. This synthesis enabled the inclusion of interdisciplinary perspectives across ethnomedicine, pharmacy, public health, and health policy.

3 Result and Discussion

3.1 Background on Jamu

Based on the information contained in the reliefs on Borobudur temple, it is in consistent with jamu which comes from the word and philosophy of djampi oesodo. 'Djampi' is a spell or physical and non-physical technique or preparation of medicine, ‘oesodo’ is health. Therefore, 'jamu/djamoe' refers to utilization of consciousness, energy, and matter such as chemical molecules to achieve and maintain health [41]; [11]. Form of jamu based on 'djampi oesodo' philosophy (consciousness, energy, matter) are:

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f. Manual Massage Techniques and SPA by utilisation of mechanical energy
g. Techniques of sports, dancing, meditation, and breathing control by utilisation of respiratory energy that triggers metabolism in the body, bonding energy, and conformational free energy.

Jamu is a traditional Indonesian wellness culture system with a rich cultural heritage. Jamu has roots in ancient Indonesian culture, dating back centuries. It evolved from indigenous healing practices and knowledge passed down through generations. The tradition has been influenced by various cultures, including Indian Ayurveda and Chinese medicine. Jamu typically uses a variety of skill sets and natural ingredients, including herbs, spices, roots, bark, flowers, fruits, minerals, and part of animals. Common components include turmeric, ginger, tamarind, cinnamon, and lemongrass. Many of these ingredients are native to Indonesia and other parts of Southeast Asia.

Jamu is often prepared as a drink, food, topical preparation, aromatherapy, spell, by grinding, boiling or steeping herbs and spices. It can also be made into pastes, powders, or pills. Some preparations involve fermenting ingredients. The process of making Jamu is often considered an art form, with technique and recipes passed down within families.

Jamu is believed to offer various health benefits, including boosting immunity, improving digestion, reducing inflammation, and enhancing overall well-being. Different Jamu practices and formulations are used for specific purposes, such as increasing energy, promoting skin health, or aiding in postpartum recovery.

Jamu is deeply ingrained in Indonesian culture and daily life. It's not just seen as medicine but also as a way to maintain balance and harmony within the body. Jamu practitioners are known as acaraki, refers to traditional healers or practitioners who specialize in the preparation and distribution of jamu, an indigenous traditional medicine. Jamu is a traditional form of medicine in Indonesia, utilizing a unique skill sets and natural ingredients, including medicinal plants, to treat various health conditions. The Acaraki play a crucial role in Indonesian traditional medicine by crafting these natural preparations, thus preserving cultural heritage, and providing alternative health solutions.

In their role, Acaraki must have extensive knowledge of the characteristics also properties of diseases and these natural ingredients as well as the specific conditions they are intended to treat. This knowledge traditionally comes from cultural heritage, being passed down through generations, ensuring that the practices remain as close to their roots as possible. The practitioners' expertise extends beyond mere plant selection; they also understand the preparation methods that preserve or enhance the efficacy of these plants. The relationship between Acaraki and jamu goes beyond mere preparation; it involves a deep understanding of local health beliefs and practices. The Acaraki often serves as a bridge between modern health challenges and traditional solutions, adapting jamu skill set and recipes to contemporary health issues while maintaining traditional methods. For instance, during the COVID-19 pandemic, jamu inspired by traditional Chinese medicine was considered for its potential preventative effects, highlighting the adaptive nature of jamu practices [24].

While traditional Jamu remains popular, there are now modern interpretations and products. These include skill set, Jamu-inspired drinks, cosmetics, and wellness products that blend traditional knowledge with contemporary practices.

There's growing interest in sustainable harvesting and cultivation of Jamu skill set and natural ingredients to preserve biodiversity and support local communities. This also helps in maintaining the authenticity and quality of Jamu preparations and practices.

As interest in natural and holistic health practices grows globally, Jamu is gaining recognition beyond Indonesia. It's becoming part of the broader conversation about traditional medicine systems and their place in modern healthcare.

The Jamu tradition faces challenges in standardization and scientific validation. However, this also presents opportunities for research and development, potentially bridging traditional practices with modern medicine.

3.2 A Comparative Analysis of The Philosophical Foundations and Core Principles of Jamu, Ayurveda, and Traditional Chinese Medicine (TCM)

Jamu, Ayurveda, and Traditional Chinese Medicine (TCM) are three prominent traditional medicine systems that have been influencing health practices for centuries. Each of these systems has unique philosophical foundations and core principles that shape their approach to health and healing.

a. Jamu:

Based on the information contained in the reliefs on Borobudur temple, it is in consistent with jamu which comes from the word and philosophy of djampi oesodo. 'Djampi' is a spell or physical and non-physical technique or preparation of medicine, ‘oesodo’ is health. Therefore, 'jamu/djamoe' refers to utilization of consciousness, energy, and matter such as chemical molecules to achieve and maintain health [41]; [11].

b. Ayurveda:

Originating from India, Ayurveda is based on ancient texts (Vedas) and is considered one of the oldest healthcare systems. Its philosophy centers on the balance of the three doshas (Vata, Pitta, and Kapha), which are believed to govern the functional processes in the human body. A harmonious balance among the doshas is thought to ensure health and well-being. Ayurveda uses a variety of treatments, including herbal medicines, diet, yoga, and meditation, aimed at maintaining this equilibrium. The system is holistic, focusing on prevention and lifestyle interventions as much as on treatment. Ayurveda faces challenges in standardizing treatments and integrating them with modern medicine due to the need for more scientific research and validation [40].

c. Traditional Chinese Medicine (TCM):

TCM is a comprehensive medical system deeply rooted in Chinese philosophy and thought, particularly influenced by the theories of Yin-Yang and the Five Elements (Wu Xing). These principles explain the dynamic and interactive relationship within the body and between the body and its environment. TCM posits that harmony between yin and yang maintains health, while imbalance leads to disease. TCM treatments include herbal medicine, acupuncture, and exercises such as Tai Chi, aiming to restore balance and harmony within the body. TCM is increasingly incorporating modern scientific techniques and has gained international recognition and standardization efforts [9]; [63]. In conclusion, while Jamu, Ayurveda, and TCM all prioritize balance and holistic well-being, they differ in their foundational theories and methodologies. Jamu relies heavily on local herbs and traditional practices, Ayurveda emphasizes dosha balance, and TCM integrates yin-yang balance with a rich practice of herbal and acupuncture treatments. Each system offers unique insights and therapies that have potential benefits when integrated with modern medical practices.

3.3 Jamu in Reproductive Health

Jamu, the traditional Indonesian medicine, plays a significant role in women's health, particularly in managing menstrual health and regulation. It is composed of various techniques and medicinal plants, where the Zingiberaceae family, including species like Curcuma domestica (turmeric) and Zingiber aromaticum, is notably prevalent [67]. While Jamu's popularity is largely rooted in its traditional use, scientific research on its benefits specifically for menstrual health is still developing. The chemical constituents of plants used in Jamu formulations are credited with various bioactivities. The compounds present in Zingiberaceae are known for their therapeutic properties, which can potentially regulate menstrual cycles and alleviate related symptoms such as pain and discomfort [52]. Despite the extensive traditional knowledge and use, the scientification of Jamu, which includes its efficacy and safety evaluations, remains ongoing. Studies aim to document and validate the ethnomedicinal claims through more structured research methodologies [55].

Based on the results of the study showed that the combination of dark chocolate with herbal ingredients such as turmeric, red ginger, moringa, sambiloto and honey had activity and potential in decreasing menstrual pain scale in late adolescents ($p<0.05$), so it could be asalternative therapies for dysmenorrhea [5]. Metabolomic analysis using LC-HRMS showed that dark chocolate samples, turmeric rhizome infusion, ginger rhizome infusion, and ethanol extract of Andrographis paniculata herb contain compounds reported to have anti-inflammatory activity, such as andrographolide and its derivatives, theobromine, betaine, and pipecolic acid, with concentrations above 7% [42]. However, concerns about the presence of heavy metals in some Jamu products have been raised, highlighting the importance of regulation for safety assurance. Analyzing samples in Banda Aceh, Indonesia found contamination above the threshold levels for lead, cadmium, and mercury, which could pose health risks [32]. These findings underscore the necessity for stringent regulatory measures to ensure Jamu's safety, especially for vulnerable populations like women seeking treatments for menstrual health [15].

Overall, while Jamu holds promising potential for managing menstrual health due to its rich herbal composition, further scientific studies are needed to thoroughly assess its benefits and safety for such applications. Jamu, traditional medicine from Indonesia, has been traditionally believed to support various health aspects, including fertility and conception. In the context of fertility and conception, several factors are known to influence reproductive health. Obesity, for example, is a significant factor that adversely affects reproductive outcomes, necessitating weight management as part of fertility treatment plans [6]. Similarly, lifestyle interventions such as dietary changes and physical activity have shown potential in improving fertility outcomes [53]. Moreover, the role of the microbiome in female reproductive health highlights the importance of maintaining microbiome balance to enhance fertility and support assisted reproductive technologies (ART) [69]. This aligns with the holistic approach of traditional medicine systems like Jamu, which often aim to balance bodily functions. While Jamu is traditionally utilized for enhancing fertility, scientific evidence specifically studying Jamu's effectiveness and safety in fertility or conception is limited. Thus, while its use might align with the broader understanding of lifestyle and health interventions for fertility, any claims about Jamu should be considered with caution pending more robust scientific research. Jamu is widely recognized for its diverse health benefits, including its traditional use in enhancing libido and supporting sexual wellness. Although the current context does not provide specific study identifiers directly validating jamu’s effects, evidence from comparable herbal remedies allows for informed inference regarding its potential impact on sexual function.

1. Fenugreek (Trigonella foenum-graecum) Extract: One well-documented herbal remedy is the standardized extract of fenugreek, known as Testofen. A clinical study involving Testofen showed a significant positive effect on male libido, particularly in enhancing sexual arousal and orgasm. The study highlighted improvements in the quality-of-life parameters related to satisfaction with muscle strength, energy, and well-being, without affecting mood or sleep. Serum prolactin and testosterone levels

remained stable, suggesting that fenugreek can support libido and maintain healthy testosterone levels [54].

2. Libido in Women: Studies on oral contraceptives (OCs) indicate varied effects on female libido. Generally, a significant percentage of women using combined oral contraceptives (COCs) reported either stable or increased libido, with only a minor group experiencing a decrease. The influence of COCs on sexual desire seems to be linked with hormonal changes, particularly testosterone and sex hormone-binding globulin. These observations highlight the complex interplay of hormones in regulating sexual desire [39].

3. Androgen Levels and Female Sexual Function: Research involving testosterone replacement therapy shows that increased levels of testosterone can enhance sexual desire and activity in women, even though results might vary based on estrogen levels. For women with low libido, decreased androgen levels correlate positively with indices of sexual function, such as desire, arousal, lubrication, and orgasm [60].

Given these insights into herbal supplements and hormonal influences on libido, jamu, with its diverse herbal compositions, may offer similar benefits. While the specific herbs in jamu formulations are not detailed in this context, traditional ingredients often include aphrodisiacs that are known to improve sexual well-being.

While the context does not directly cover jamu, it suggests that traditional medicine formulations similar to fenugreek can enhance libido, especially when they influence hormonal balance and overall vitality. If researching jamu's specific benefits, consider the composition of the formulation used and consult studies focusing on similar herbal ingredients for further assurance of its effects on sexual health.

3.4 Jamu in Maternal Care

Jamu, traditional Indonesian medicine, is commonly used to support pregnancy and address pregnancy-related issues such as morning sickness and fatigue. While specific studies on Jamu itself in this context are limited, broader research on traditional remedies like ginger provides relevant insights. Morning sickness, characterized by nausea and sometimes vomiting, affects a significant number of pregnant women. It is suggested to protect both the mother and embryo from consuming potentially harmful substances (Flaxman and Sherman, 2000). For many women, these symptoms are manageable with lifestyle adjustments and dietary changes. Ginger, a traditional remedy included in some Jamu formulations, has been shown to be effective in reducing nausea and vomiting in pregnancy. Doses below 1000 mg per day are reported to help alleviate symptoms without adverse effects on the mother or fetus [46]. In addition to ginger, acupressure, another non-pharmacological method, has demonstrated efficacy in relieving morning sickness, especially when genuine pressure is applied to the acupuncture point [13]. Other alternative therapies like aromatherapy and acupressure are noted for their safe use during pregnancy to relieve nausea and vomiting when compared to some conventional treatments, which may have more severe risks [38]. Herbal remedies in Jamu might also play a role in combating pregnancy fatigue. However, as with any herbal medicine, caution is advised due to the presence of active compounds that may affect fetal development. Pregnant women are encouraged to consult healthcare providers before using such products, even if they are perceived as natural and safe [46].

Overall, Jamu may offer supportive benefits for managing pregnancy-related issues, the effectiveness and safety of its specific ingredients should be carefully considered and discussed with healthcare professionals. While Jamu is an alternative with cultural significance, ongoing scientific evaluation is necessary to fully understand its applications and safety in pregnancy. While Jamu is largely unexplored in academic research, its use in traditional practices is deeply rooted in cultural beliefs and practices across Indonesia. Jamu primarily consists of mixtures derived from medicinal plants, such as those from the Zingiberaceae family, which includes various species of ginger known for their bioactive properties [67].

These plants are renowned for their therapeutic benefits, including anti-inflammatory and antioxidant effects, which are crucial in aiding recovery and enhancing overall health during the

postpartum period. Indonesian traditional medicine categorizes Jamu and similar preparations as significant for managing various health conditions due to their rich phytochemical content [52]. The cultural context of Jamu's use is important to understand. In many Southeast Asian cultures, including Indonesia, postpartum recovery is marked by specific practices involving both dietary and medicinal plant use. This is evident in the similar practices of neighboring regions, like those observed among various ethnic groups in Laos, where plant-based traditional medicine is pivotal during postpartum recovery (Boer and Lamxay, 2009). Though Indonesia has unique practices, the broader application of traditional medicine in aiding childbirth and postpartum health is a common thread in the region.

Jamu, is often employed to mitigate postpartum hemorrhage, aid recovery after miscarriage, and support general recovery after childbirth [9]. However, while traditional practices are integral to postpartum healthcare in Indonesia, modern considerations advocate for cautious use. The integration of traditional practices, such as the use of Jamu, into contemporary healthcare could aid in devising culturally appropriate postpartum care strategies, thereby enhancing maternal health outcomes [33]. Despite these benefits, there are concerns about the use of certain traditional medicines during pregnancy and the postpartum period, as they may pose risks if not properly utilized. Comparative reviews between traditional Chinese and Indonesian medicine highlight the necessity to avoid specific natural preparations during pregnancy to prevent complications [28]. Therefore, educating users about appropriate usage conditions and dosages is vital.

In conclusion, while Jamu serves as an essential component of traditional practices for labor preparation and postpartum recovery, its incorporation into modern healthcare must be approached with caution. This involves acknowledging cultural practices while ensuring safety and efficacy in their application.

Although specific studies directly linking Jamu to lactation support are limited, the integration of Jamu in the broader context of traditional medicine provides insights into its potential roles. Jamu comprises a variety of plants, many of which belong to the Zingiberaceae family, such as ginger (Zingiber officinale) and turmeric (Curcuma domestica). These plants are popular in Indonesian traditional medicine for their bioactive compounds and health-promoting properties [67]. The role of such herbs in traditional medicine extends to improving general health, which indirectly supports lactation through enhanced maternal well-being. The biodiversity of Indonesia presents a rich opportunity for exploring secondary metabolites and their potential pharmaceutical applications. While traditional use encompasses a wide range of conditions and preventive measures [52], the specific mechanisms by which these preparations could support lactation, such as improved postpartum recovery or enhanced nutritional status of mothers, warrant further investigation.

The role of Jamu in lactation support might also link to its ability to improve general health and vitality, as seen in its use alongside modern medical treatments for various conditions, indicating a complementary role in healthcare [27]. However, safety and efficacy remain key concerns, prompting the need for more rigorous scientific validation [32]. Although Jamu has been traditionally used for numerous health outcomes, direct evidence regarding its efficacy in enhancing lactation is not well-documented in the available research. Further studies focusing on its specific bioactive components could provide valuable insights into its potential in supporting lactation, guiding future use and integration into modern health practices.

3.5 Scientific Evidence and Research

One study explores the potential role of Jamu in the context of the COVID-19 pandemic. It suggests that while Traditional Chinese Medicine (TCM) has been incorporated into national guidelines for COVID-19 treatment in China, the adoption of similar herbal approaches like Jamu in Indonesia needs to be carefully considered due to limited scientific evidence supporting its efficacy against COVID-19 [24]. Existing studies on Jamu as a natural medicine highlight both its potential benefits and associated challenges. Jamu, the traditional Indonesian herbal medicine, has garnered interest for its potential roles in managing various health conditions.

1. Efficacy in Treating Common Cold: Jamu, along with Ayurvedic herbal remedies, has been studied for managing symptoms of the common cold. Herbs like ginger, liquorice, turmeric, and peppermint are traditionally used in Jamu to alleviate symptoms [64]. These herbs have been recognized in international monographs and WHO guidelines, suggesting they can be effective in symptom management, although they are not typically recognized as antiviral agents.

2. Potential Role in COVID-19 Management: Jamu's potential for preventing and managing COVID-19 has been explored, particularly as no specific drugs or vaccines were initially available for the disease. The utilization of Jamu in this context is somewhat inspired by traditional Chinese medicine strategies, suggesting some formulations for prevention [24].

3. Safety Concerns and Toxicity: Despite these potential benefits, there are safety concerns regarding Jamu's use due to contamination risks. Some studies focus on heavy metal contamination in Jamu products, which pose significant health risks if thresholds are exceeded. For instance, studies found contamination of Jamu with heavy metals like lead and cadmium, raising health concerns [32].

4. General Efficacy of Jamu: More broadly, discussions on natural medicine emphasize the need for more rigorous scientific investigations to determine efficacy and safety. There's a general consensus that while herbal medicines like Jamu are popular, they come with potential risks if not correctly managed, especially considering the lack of strict regulations compared to conventional medications [1], [16].

5. Consumption and Regulation: Jamu, are often unregulated, leading to variability in quality and purity. This lack of regulation can result in products that may not be effective or safe, emphasizing the need for healthcare providers to stay informed and guide patients appropriately [48],[29]. Overall, while Jamu holds promise as a natural treatment method and is deeply rooted in cultural practices, its integration into modern medicine requires careful assessment of efficacy, safety, and regulatory measures to optimize its benefits and mitigate risks.

Jamu, a traditional Indonesian medicine, is known for its use of natural bioactive compounds derived from plants that exhibit a range of therapeutic effects. These compounds can act as immunomodulators and have systemic pleiotropic effects, often with minimal side effects and low toxicity [20]. The active compounds in Jamu include a variety of phytochemicals that provide diverse health benefits. Several studies have highlighted the potential of natural compounds found in herbal medicines. For instance, plant-based bioactive compounds can function as anti-inflammatory, antioxidant, antimicrobial, and antidiabetic agents [61]. They are thought to interact with complex metabolic processes within the human body, providing physiological benefits that support traditional uses [19]. Mass spectrometry-based metabolomics has been particularly useful in identifying and analysing the active components in herbal medicine, such as those found in Jamu. This technology enables researchers to elucidate the action mechanisms of these natural compounds, revealing multiple targets that may contribute to their therapeutic effects [23]

Finally, the efficacy of natural medicine in chronic conditions, such as ischemic stroke, showcases their potential value. Natural medicines are believed to offer antioxidant, neuroprotective, and vascular protective effects, with fewer side effects than conventional medicines. However, translating these findings from laboratory research to clinical practice remains a challenge [19]. While Jamu holds promise as a natural medicine for various ailments, careful consideration of its active compounds, potential health benefits, and possible risks is essential for its safe and effective use.

Safety Considerations

The interaction between Jamu like other natural remedies, is composed of multiple biologically active compounds, making interactions with conventional medicines (which are often composed of single active ingredients) more probable, and complex compared to drug-drug interactions. These interactions can occur on both pharmacokinetic and pharmacodynamic levels [68]; [10]; [22]. Several factors contribute to Jamu's interactions with conventional medicines. First, Jamu may alter the absorption, distribution, metabolism, and excretion of drugs, often involving enzyme systems such as cytochrome P450, which are also responsible for metabolizing conventional drugs. This can influence the efficacy and

toxicity of medications [10]; [51]. The potential for interactions is heightened in patients who consume multiple medications, such as those with chronic conditions like dementia, where herbal therapies can lead to adverse drug events [21]

In terms of pharmacodynamic interactions, Jamu could influence drug actions or interact synergistically or antagonistically with conventional treatments, which might lead to either therapeutic failures or toxic effects [26]. An example is the interaction of herbal remedies with anticoagulants like warfarin, where Jamu could potentially enhance the drug's effects and increase bleeding risks (Samuels, 2005). The lack of regulation and underreporting of herbal medicine consumption, such as Jamu, create significant challenges for healthcare professionals. Often, patients do not disclose their use of herbal remedies, leading to potential oversight in care and monitoring of drug interactions [22]. Given the popularity and perceived safety of Jamu and similar herbal treatments, it is imperative for ongoing research and education to ensure safe integration with conventional medications [7]. While the therapeutic use of Jamu presents promising potential, there is a critical need for healthcare providers to be aware of these interactions to mitigate risks and optimize patient safety. Further studies and a framework for monitoring these interactions are recommended to better integrate herbal remedies into modern medical practice [51]; [7]Quality control and standardization of Jamu, the traditional Indonesian herbal medicine, are crucial to ensure its safety and efficacy. These processes face several challenges and opportunities for improvement.

Jamu, like many traditional medicines, is prone to variability in quality due to differences in raw material sources and inconsistencies in production methods. Standardization is essential but challenging because of the lack of uniformity in the active constituents of herbal ingredients. The absence of standardization parameters hinders the consistent quality of Jamu products, which can lead to variations in therapeutic outcomes [44]. Heavy metal contamination is another significant issue in the quality assurance of Jamu. Studies have shown the presence of contaminants like cadmium (Cd), lead (Pb), and mercury (Hg) in herbal medicines, which pose health risks. For instance, a study conducted in Banda Aceh City, Indonesia, highlighted the contamination levels of heavy metals in Jamu, which exceeded safe thresholds. The study emphasized the need for rigorous testing and regulatory measures to prevent the distribution of contaminated products [32]. To ensure quality and safety, it is crucial to implement modern scientific methods for quality control. This includes the use of techniques like atomic absorption spectrophotometry for detecting heavy metals and other contaminants, as well as employing standardized processes during production. Modern approaches such as these help in the authentication of herbal ingredients and adherence to regulatory standards. Quality control processes are integral to maintaining customer trust and safeguarding public health [63]; [44].

Furthermore, regulatory frameworks are vital for the effective standardization and quality improvement of herbal medicines like Jamu. Good Agricultural Practices (GAPs) and Good Manufacturing Practices (GMPs) are essential for controlling the quality from the procurement of medicinal plants to the manufacture of finished products. Post-marketing quality assurance surveillance can further help in maintaining high standards and identifying issues related to safety and efficacy [18].

By integrating these measures, Jamu can be produced consistently with high quality, ensuring its effective integration into modern medical practices. This involves harmonizing traditional knowledge with scientific methods and modern regulations to achieve optimal outcomes in quality control and standardization.

3.6 Integration with Modern Healthcare

Integrating Jamu, a traditional Indonesian medicine system, into modern healthcare offers a multitude of opportunities and challenges. This integration necessitates a strategic approach that considers various aspects, such as scientization, evidence-based practices, safety, regulatory frameworks, and the cultural significance of traditional medicine systems. Firstly, the concept of "scientization," or the modernization of traditional medicine in the context of modern biomedicine, emphasizes understanding

the efficacy, effectiveness, and mechanisms of traditional medicines like Jamu. This includes transitioning from experience-based to evidence-based practices and developing universal safety and quality control standards [70]. One significant challenge in integrating Jamu involves addressing quality, safety, and efficacy issues. Quality control is a primary concern, and the integration process must ensure rigorous research and credible clinical trials for traditional products to provide evidence-based clinical management of diseases (Sen and Chakraborty, 2015). Traditional medicine integration into modern healthcare often suffers from a lack of pharmacological and clinical data, making clinical studies essential for the safe and efficacious integration of traditional medicines [70].

The World Health Organization (WHO) has repeatedly called for integrating traditional, complementary, and integrative medicine into healthcare systems, as these approaches address not only physical ailments but also emotional, spiritual, and communal well-being [25], [4]. The WHO's strategies highlight the need for a holistic, personalized approach that combines the best of traditional and modern medicine [25]. The integration of Jamu also involves regulatory considerations. In places like Nigeria, where traditional medicine is deeply rooted in culture, balancing traditional practices with modern standards poses a significant challenge. Regulatory frameworks must be developed to preserve traditional knowledge while ensuring consumer protection and public health [15]. Integrated healthcare models, like those explored in Ghana and some U.S. regions, reveal the complexities and potential benefits of merging traditional and biomedical practices. In Ghana, for example, key informants supported the integration of traditional medicine into public health facilities, while recognizing the need for policy and protocol to guide this process effectively [8]; [3]. In conclusion, integrating Jamu into modern healthcare requires a harmonious blend of respecting its cultural heritage and ensuring it meets modern standards of safety and efficacy. This entails developing strong regulatory frameworks, conducting rigorous scientific research, and undertaking participatory approaches that involve traditional healers and biomedical practitioners. By fostering mutual respect and collaboration, Jamu can contribute meaningfully to the global healthcare landscape, offering complementary solutions that enhance treatment options and preserve cultural identities.

The integration of jamu into modern Indonesian healthcare systems represents a complex and multifaceted endeavour with significant potential benefits and challenges. This traditional medicine system, deeply rooted in Indonesian culture and history, offers a holistic approach to health that complements modern medical practices. The integration process involves scientification efforts, regulatory frameworks, and cultural considerations to ensure safe and effective use alongside conventional treatments.

Key opportunities include enhancing cultural acceptance of healthcare services, promoting holistic health benefits, supporting sustainable practices, fostering innovation in drug development, creating economic opportunities, and improving patient-centered care. However, challenges such as standardization, scientific validation, quality control, and potential contamination issues must be addressed to ensure patient safety and efficacy. Successful integration requires a balanced approach that respects traditional knowledge while adhering to modern scientific standards. This involves rigorous research, development of evidence-based practices, and establishment of comprehensive regulatory frameworks. Collaboration between traditional practitioners, modern healthcare providers, and policymakers is crucial for developing integrative models that maximize the benefits of both systems. As Indonesia moves forward with this integration, it can draw lessons from other countries' experiences while tailoring approaches to its unique cultural and healthcare landscape. Continued efforts in education, research, and policy development will be essential to realize the full potential of jamu in enhancing public health outcomes and preserving cultural heritage within a modern healthcare context.

3.7 Ethical and Sustainability Concerns

Jamu, Indonesia's traditional medicine, is an integral part of the country's culture and presents a significant aspect of preserving traditional knowledge. Jamu encompasses a wide variety of skill sets and

natural recipes remedies made from natural ingredients such as minerals, animal part also products, plants, roots, leaves, and spices, often combined based on age-old recipes handed down through generations [67]. This method of traditional healing not only serves as a cultural heritage but also plays a crucial role in the healthcare system, particularly in rural areas where access to modern medical facilities might be limited [57]. The biodiversity of Indonesia provides a rich source of medicinal plants that are utilized in Jamu preparations. These plants include members of the Zingiberaceae family, such as ginger and turmeric, which are widely used due to their known health benefits and bioactive compounds [67]. The potential of Jamu in treating modern-day ailments like COVID-19 has also been explored, although there is a need for more scientific evidence to support its efficacy in such applications [24].

Preserving the knowledge and usage of Jamu is critical, as it offers insights into sustainable healthcare practices. The scientification of Jamu involves documenting and scientifically verifying the benefits, preparation methods, and effective compositions of these herbal remedies to ensure safety and efficacy [55]. Government and health authorities are advised to rigorously regulate the production and distribution of Jamu to prevent contamination and preserve its authenticity. Concerns such as heavy metal contamination need careful monitoring to protect public health while maintaining traditional practices [32]. The preservation of Jamu also depends significantly on the handlers who produce and sell these traditional remedies. Their knowledge and practices, influenced by factors such as education and access to sanitation facilities, are essential in ensuring the safety and hygiene of Jamu products [56]. As such, increasing awareness and education on personal hygiene and safe practices are vital components in preserving Jamu as a cultural heritage and a viable health resource. Sustainable sourcing of ingredients in Jamu as traditional and natural medicine involves several crucial aspects that ensure environmental, social, and economic viability. The drive towards green practices in natural medicine is becoming more prominent, as seen in the adoption of various sustainable measures.

Jamu as the Indonesia's traditional and natural medicine sectors, sustainability is particularly critical due to the reliance on plant-based ingredients. A study indicates that sustainable sourcing policies adopted by buyers directly influence suppliers to adopt sustainable practices. These policies are crucial in ensuring natural-based products are produced in a sustainable environment, accommodating increasing consumer demands for natural medicines over synthetic alternatives [2].

Similarly, the integration of sustainable sourcing practices within industries such as chocolate manufacturing shows an evolution from focusing on industry initiatives to sustainability certification and own-supply chain programs. This shift highlights the dynamic nature of sustainable sourcing and indicates that these practices are evolving to incorporate a broad range of stakeholder voices [59]. Traditional medicine's growth in demand accentuates the importance of sustainable sourcing. The global market for herbal medicines has been expanding, as evidenced by the increasing number of patent applications related to natural products and herbal medicines. This expansion requires sustainable strategies to balance commercial development with environmental conservation [30]

Furthermore, sustainable sourcing is supported by practices that encourage direct procurement from local producers, known as the farm-to-fork approach. This method significantly reduces the carbon footprint and promotes economic benefits for both farmers and producers. It is particularly beneficial within agriculture as it spurs environmentally sustainable practices [14]. Implementing sustainable and green practices in the traditional medicine industry has also led to improvements in the reputational standing of companies. The reliance on natural and traditional resources encourages more eco-friendly management strategies, which in turn appeal to environmentally conscious consumers [43]. In conclusion, the sustainable sourcing of ingredients in traditional and natural medicine involves a complex interplay of policies, consumer behavior, and industry practices. By adopting sustainable sourcing measures and policies, companies can not only address environmental concerns but also meet the growing demand for natural and herbal products, ensuring a balanced and sustainable approach to healthcare.

4 Conclusion

The integration of Jamu, Indonesia's traditional medicine, into women's health presents both promising opportunities and significant challenges. This holistic approach to healthcare, deeply rooted in Indonesian culture, offers potential benefits in reproductive health, maternal care, and overall well-being. However, its integration into modern healthcare systems requires careful consideration of several factors. Key opportunities include enhancing cultural acceptance of healthcare services, promoting holistic health benefits, and improving patient-centered care. Jamu's potential roles in managing menstrual health, supporting fertility, and aiding postpartum recovery highlight its relevance in women's health. The rich biodiversity of Indonesia provides a valuable source of medicinal plants used in Jamu preparations, offering possibilities for sustainable healthcare practices and drug development.

However, challenges persist in standardization, scientific validation, and quality control. Concerns about heavy metal contamination and potential interactions with conventional medicines underscore the need for rigorous testing and regulatory measures. The "scientization" of Jamu, involving the transition from experience-based to evidence-based practices, is crucial for its safe and effective integration. Future directions should focus on systematic incorporation of Jamu into mainstream healthcare, preserving its cultural elements while ensuring safety and efficacy. This involves developing comprehensive regulatory frameworks, conducting rigorous scientific research, and fostering collaboration between traditional practitioners and modern healthcare providers. Efforts should also address the declining number of traditional healers and the need for better awareness and research on herbal medicine use among women, particularly during pregnancy and for fertility treatments. In conclusion, while Jamu offers a rich heritage of healthcare practices for women's health, its successful integration requires a balanced approach that respects traditional knowledge while adhering to modern scientific standards. Continued research, education, and policy development are essential to realize the full potential of Jamu in enhancing women's health outcomes and preserving cultural heritage within a modern healthcare context.

5 Declarations

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5.2 Author contributions

Fajar Prasetya conceptualized the study, led the manuscript development, and analyzed the role of *Jamu* in women's reproductive and maternal health. Lusy Noviani conducted the literature review, contributed to the healthcare context analysis, and assisted in manuscript drafting and revision. Both authors reviewed and approved the final manuscript and take responsibility for its content.

5.3 Conflict of Interest

The authors declare that there are no conflicts of interest regarding the publication of this paper. No financial or non-financial interests, personal relationships, or affiliations have influenced the content, analysis, or conclusions presented in this research. All sources of funding, if any, are acknowledged transparently, and the research was conducted independently and without any commercial or institutional bias.

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