**The Open Public Health Journal**
*DOI: 10.2174/0118749445371776250220115516, 2025, 18, e18749445371776*
**ISSN: 1874-9445**
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**RESEARCH ARTICLE** **OPEN ACCESS**

# Preventing Postpartum Complications with Otaria Gymnastics: Improving the Welfare of Postpartum Mothers in Indonesia

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**Abstract:**

***Background:*** The process of uterine involution in postpartum mothers must proceed effectively, as any disruption may lead to uterine subinvolution, which can cause complications.

***Objective:*** This study aimed to examine the potential of Otaria gymnastics to prevent complications postpartum and improve the welfare of postpartum mothers.

***Methods:*** A quantitative research approach was adopted with a quasi-experimental design using pretest-posttest with the control group. The inclusion criteria involved mothers with normal pregnancies. An independent T-test was conducted to assess the effect of Otaria gymnastics on the decrease in uterine fundus height in cm and by using finger palpation. Moreover, the Chi-square test was carried out to determine the color change in the lochia and the intensity of fundus uterine contractions.

***Results:*** The results showed that Otaria gymnastics up to the seventh day significantly affected the decrease in the height of the uterine fundus, both by measuring in centimeters and using finger palpation. Likewise, it substantially reduced contraction intensity and changes in lochia.

***Conclusion:*** These findings support the application of Otaria gymnastics as an effective intervention to prevent complications and improve the welfare of postpartum mothers in Indonesia.

**Keywords:** Otaria gymnastic, Postpartum complications, Welfare of postpartum mothers, Fundus uterine contractions, Postpartum mothers, Maternal mortality.



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*Cite as:* Rianti E, Fratidhina Y, Triwinarto A, Tarwoto , Mumpuni , Nurulhuda U. Preventing Postpartum Complications with Otaria Gymnastics: Improving the Welfare of Postpartum Mothers in Indonesia. Open Public Health J, 2025; 18: e18749445371776. http://dx.doi.org/10.2174/0118749445371776250220115516

Received: November 16, 2024
Revised: January 05, 2025
Accepted: January 07, 2025
Published: February 27, 2025



## 1. INTRODUCTION

The maternal mortality rate that occurs in the postpartum period is increasing globally. In low- and middle-income countries, about two-thirds of maternal deaths occur in the postpartum period. Among women who die postpartum, 80% of deaths occur within one week of giving birth [1]. More than a third of maternal deaths are caused by postpartum complications, and overall maternal knowledge of postpartum

red flags is still low [2]. Maternal mortality rates are critical to public health and reflect a country's quality of life. According to Vallely, *et al*., the leading cause of about 79% of maternal deaths in the world is due to conditions that are not treated immediately, such as postpartum bleeding [3]. Postpartum hemorrhage is the leading cause of obstetric bleeding among the direct causes of 72% of maternal mortality and accounts for about 25% of maternal deaths worldwide. It is estimated that the average uterine contraction causes 75% of postpartum bleeding, which is preventable. Therefore, controlling and handling uterine contractions are important in reducing maternal mortality rates [4].

Maternal mortality is still a serious and complex public health problem in Indonesia. In 2021, the figure was 59.69%; in 2022, it dropped to 49% [5]. Then, in 2023, it decreased to 48.32% [4]. However, this figure is still far from the Sustainable Development Goals (SDGs) target, i.e., to reduce the global maternal mortality rate by less than 70 per 100,000 live births by 2030 [6].

Factors contributing to maternal mortality in Indonesia include limited access to quality health services, especially in remote rural areas, and a lack of trained health workers [7]. Cultural and educational factors also play an essential role, as many pregnant women do not have enough knowledge about safe pregnancy care and childbirth [8]. The high maternal mortality rate in Indonesia reflects weaknesses in the healthcare delivery system and unequal access to health services in the community [9]. Many cases of mothers giving birth are referred to higher hospitals, which can result in delays in handling complications [10]. Postpartum women did not receive timely or sufficient assessments, which could result in missed opportunities for the early detection or management of complications. As a result, this gap in care may lead to disappointment for both mothers and caregivers, as their decision to deliver in a healthcare facility may not ensure the level of care and experience they expected [11].

Uterine involution is the process of returning the reproductive organs of the postpartum mother's uterus to its pre-pregnancy condition. This process must proceed well so that complications do not occur, namely uterine subinvolution or delayed uterus returning to standard size, which results in bleeding. Indicators of the uterine involution process are assessed through a decrease in the height of the uterine fundus, a change in the lochia's color, and the uterine fundus's contraction strength. For the uterine involution process to proceed well, postpartum mothers need effective and optimal postpartum care, including early mobilization and postpartum exercises [12]. The color of the lochia, which usually changes from red to brown and eventually to white, also reflects the healing process. Good contraction strength helps reduce the risk of bleeding and ensures proper uterine function after childbirth [2].

According to Jeong *et al*., the welfare of postpartum mothers includes physical, mental, and emotional health [13]. Physically, the main focus of significant recovery during postpartum is uterine involution, wound healing in the perineum, and adaptation of body systems [14]. These aspects are a strong foundation for understanding the importance of comprehensive care for postpartum mothers and its impact on the long-term health of mothers and babies. Social support, family, and health workers also have a crucial role in maintaining the welfare of postpartum mothers [15].

After childbirth, for approximately six weeks, the body of the postpartum mother will undergo physiological recovery during pregnancy and childbirth [16]. Ensuring the mother can go through it well in this phase is crucial. Improving postpartum mothers' physical and emotional well-being can support the adaptation process in caring for the baby, prevent postpartum complications, and positively impact overall well-being [17]. In Asia, the prevalence of postpartum maternal welfare problems ranges between 4.4% to 57.7%. This data reflects a more significant proportion of the postpartum maternal population experiencing health problems [18]. This shows that the welfare of postpartum mothers is a critical problem and needs special attention.

Physical exercise can effectively manage postpartum physical and mental problems. Although there is a paucity of instruction regarding how to properly engage in physical exercise after childbirth, many postpartum women are reluctant to do so due to ambiguous suggestions about what is safe to do. Furthermore, inactivity is linked to poorer levels of self-efficacy for physical exercise during the postpartum phase. Consequently, to promote physical exercise behavior, it is essential to assist moms in boosting their postpartum self-efficacy [19].

Structured physical exercise can not only realize the well-being of postpartum mothers but also prove to be effective in preventing and reducing symptoms of postpartum depression. So, maintaining compliance with the exercise program is very important to improve mothers' mental and physical well-being [20]. One of the efforts that can be made to improve the welfare of postpartum mothers is with the postpartum gymnastic of Otaria. Otaria gymnastics (*Otot Abdominis Rianti*/ Rianti Abdominal Muscle) is a postpartum gymnastics-modified relaxation technique and abdominal muscle exercise with caregiver assistance [21]. Otaria’s gymnastics is designed to enhance the mobility of postpartum mothers and accelerate the process of uterine involution. According to the stages, Otaria gymnastics suggests early mobilization from the first 2 hours to 7 days of postpartum gymnastics, and uterine involution goes well [12]. Physical fitness exercises, such as Otarian gymnastics, have been shown to help speed up the healing process, improve blood circulation, and increase pelvic floor muscle tone, thus relieving fatigue and postpartum pain. Therefore, postpartum mothers need to perform Otaria exercises to prevent complications and improve the well-being of postpartum mothers.

## 2. MATERIALS AND METHODS

### 2.1. Study Design and Sampling Techniques

This study's design was a quasi-experimental pretest-posttest with a control group. The inclusion criteria were mothers with normal pregnancies, involving circumstances in which the fetus's growth and development occur in the

mother's womb, from conception to delivery [22]. Sampling was carried out by accidental sampling.

### 2.2. Study Location and Duration

The research was conducted in Jakarta and Lampung, Indonesia.

### 2.3. Population and Sample

#### *2.3.1. Population*

The study population was all mothers giving birth at the South Jakarta Inpatient Health Center and Bandar Lampung.

#### *2.3.2. Eligible Population*

[a] The intervention population was all mothers who gave birth during the study at the Pasar Minggu Health Center, South Jakarta, and the Kota Karang Health Center, Bandar Lampung.
[b] The control population was all mothers who gave birth during the study at the Jagakarsa Health Center, South Jakarta, and the Kemiling Health Center, Bandar Lampung.

#### *2.3.3. Sample*

[a] The intervention sample was 80 mothers who gave birth and performed Otaria gymnastics from the first 2 hours of childbirth to the 7$^{th}$ day of postpartum and were willing to be the research sample.
[b] The control sample consisted of 80 mothers who gave birth and underwent early mobilization (according to the Health Center's Standard Operating Procedures) from the first 2 hours of childbirth to the 7$^{th}$ day postpartum, all of whom were selected and consented to participate in the study.

### 2.4. Sample Size Consideration

The number of samples in the study was 160 participants, determined using a one-sided hypothesis test for two population means at a 5% significance level using the formula given below:

$$n = \frac{2a^2[Z1 - \alpha + Z1 - \beta]^2}{(\mu 1 - \mu 2)^2}$$

### 2.5. Data Collection

[1] In the first 2 hours after giving birth at the Health Center, the midwife, as an enumerator who has been trained to carry out the first intervention, measured the height of the uterine fundus using a meter and palpation with a finger, then continued with an examination of the color of the lochia, and the frequency of uterine contractions. Afterward, the midwife accompanied the postpartum mothers to do Otaria gymnastics (according to the Otaria gymnastics guidebook for midwives/health workers and postpartum mothers) [23]. The measurement and inspection results were then recorded on the result sheet.
[2] At 6 hours postpartum, the mother was again given an intervention, namely Otarian gymnastics. Each time before the intervention, measurements were made of the height of the uterine fundus using a meter and palpation with a finger, a check of lochia color, and the frequency of contractions. Furthermore, Otaria gymnastics was carried out 24 hours postpartum.
[3] On the 2$^{nd}$ day of postpartum, the mother returned from the Health Center. Then, the midwife followed up at the postpartum mother's house to measure the height of the uterine fundus and check the color of the lochia and the frequency of contractions. Next, the mother performed Otaria gymnastics with the assistance of the caregiver/the closest person who has been trained (according to the Otaria gymnastics guidebook for caregivers).
[4] Furthermore, Otaria gymnastics was performed on the 3$^{rd}$, 4$^{th}$, 5$^{th}$, 6$^{th}$, and 7$^{th}$ days postpartum [23].

### 2.6. Research Instrument, Validity, and Reliability Test

The preparation of research instruments included creating questionnaires for the research variables, which were then tested for validity and reliability. Given that the research design was a quasi-experiment, the questionnaire was designed only to examine changes in postpartum complications resulting from the intervention. Consequently, the validity test conducted was a construct validity test, which evaluates the degree to which the measuring instrument accurately reflects the intended measurement based on its defined concept.

The definition of variables must be clear so that the assessment of construct validity is easy. The definition is derived from theory. If the definition is based on the right theory and the question or item statement is appropriate, construct validity declares the instrument valid [24]. The results of the reliability test are based on Cronbach's alpha values, which are as follows: fundus height (finger) was 0.654, TFU (cm) was 0.626, and Lochia was 0.796. There are several guidebooks in models, modules, and booklets made for midwives, postpartum mothers, and caregivers. They are useful as a guideline for performing Otaria postpartum exercises on the second to seventh day after childbirth. A questionnaire assessment matrix, a date list, and instruments for collecting research data were prepared. This matrix ensures that each item or question is aligned with the research objectives and accurately measures the variables under investigation. Measuring instruments in this study were weight scales, height gauges, gloves, masks, and complete stationery. These tools ensure that the data collected is accurate, objective, and aligned with the research objectives while prioritizing health and safety throughout the data collection process. Participants who provided their informed consent were then requested to complete the questionnaire. This process ensures respect for the rights and dignity of participants while ensuring that the research is conducted ethically. Informed consent was obtained from the participants, who fully understood and willingly agreed to their involvement in the study.

### 2.7. Data Analysis

In this study, an analysis was carried out to assess the impact of Otaria gymnastics using the independent samples t-test, and the Chi-Square test was carried out to determine the color change of the lochia and the state of contraction of the uterine fundus.

### 2.8. Ethical Approval

The implementation of the research was carried out after obtaining a research ethics letter from the Ethics Committee of the Health Polytechnic of the Ministry of Health of Tanjung Karang, with the number 226/EC/KEP-TJK/VII/2018.

## 3. RESULTS

The average age of postpartum mothers was 28.69 (range 18-40) years. Their average weight was 59.66 kg (range 40-85), and their average height was 155.73 cm (range 138-169). Moreover, the average parity was 2.14 (range: 1 – 4) (Table **1**).

**Table 1. Overview of age, weight, height, and parity of postpartum mothers.**

| Variable | Frequency | Mean | SD | Min-Max |
|---|---|---|---|---|
| **Age** | 160 | 28.69 | 5.06 | 18 – 40 |
| **Weight** | 160 | 59.66 | 9.18 | 40 – 85 |
| **Height** | 160 | 155.73 | 5.68 | 138 – 169 |
| **Parity** | 160 | 2.14 | 0.85 | 1 – 4 |

The Otaria gymnastics intervention conducted on postpartum mothers up to the seventh day revealed no differences in contraction intensity across both the intervention and control groups, with all participants (100%) reporting no contraction intensity (Table **2**).

**Table 2. Overview of postpartum maternal contractions after Otaria gymnastics on day 7.**

| Group | Contraction | | | |
|---|---|---|---|---|
| | No longer exists | | Infrequently | |
| | Frequency | % | Frequency | % |
| **Intervention** | 80 | 100 | 0 | 0 |
| **Control** | 80 | 100 | 0 | 0 |

**Table 3. Overview of the color of the postpartum maternal lochia on the 7th day.**

| Group | Lochia | | | |
|---|---|---|---|---|
| | Serosa | | Sanguinolent | |
| | Frequency | % | Frequency | % |
| **Intervention** | 79 | 98.75 | 1 | 1.25 |
| **Control** | 40 | 50 | 40 | 50 |

Regarding the Otaria gymnastics intervention performed on postpartum mothers up to the seventh day, the results showed that in the intervention group, 98.75% of participants exhibited serosa-colored lochia, while 1.25% displayed sanguinolent-colored lochia. Meanwhile, in the control group, 50% of participants showed the color of lochia sanguinolent, and 50% showed the color of lochia serosa (Table **3**).

Based on the Otaria gymnastics intervention carried out on postpartum mothers up to the seventh day, a significant decrease was found in the height of the uterine fundus, both in centimeters ($p < 0.05$) and by the palpation method with fingers ($p < 0.05$). The average height of the uterine fundus in the intervention group was 0.32 cm and 1.85 fingers on day 7, while the control group showed a height of 3.94 cm and 6.91 fingers (Table **4**).

**Table 4. Effect of Otaria gymnastics on the decrease in uterine fundus height on the 7th day of Otaria gymnastics in cm and finger units.**

| | Group | Frequency | Mean | SD | 95% CI | P value |
|---|---|---|---|---|---|---|
| **Day 7 (centimetres)** | Intervention | 80 | 0.32 | 0.75 | -3.85-3.39 | 0.001 |
| | Control | 80 | 3.94 | 0.74 | -3.85-3.39 | |
| **Day 7 (finger)** | Intervention | 80 | 1.85 | 3.34 | -5.80-5.81 | 0.001 |
| | Control | 80 | 6.91 | 0.28 | -5.81-4.32 | |

## 4. DISCUSSION

The research results on the impact of Otaria gymnastics on the welfare of postpartum mothers can be interpreted in existing literature. Previous studies have reported that postpartum physical activity positively impacts maternal physical and psychological recovery [25]. As a form of exercise specifically for postpartum mothers, Otaria gymnastics showed improved results, which were aligned with previous findings. These similarities reinforce that exercise-based interventions can effectively improve maternal well-being after childbirth.

However, some differences need to be considered. Otaria gymnastics focuses on the recovery of the muscles associated with the labor process, which may not be focused on other types of physical activity [12]. This shows the potential of Otaria gymnastics as a more targeted and efficient intervention for postpartum recovery. This difference provides opportunities for further research on the specific mechanisms underlying the effectiveness of Otarian gymnastics.

The results of this study have important practical implications for maternal health services. Otaria gymnastics can be integrated into postpartum care programs as a safe and effective non-pharmacological intervention to improve the health and well-being of postpartum mothers. Health workers can recommend and guide postpartum mothers to do Otaria exercises as part of their recovery routine. This can improve the quality of postpartum care and potentially reduce complications associated with the postpartum period.

Implementing Otaria gymnastics in postpartum care can support global efforts to promote postpartum mothers' mental and physical health. By improving maternal well-being, this intervention also indirectly impacts the health of babies and families, an integrated aspect of the third

SDGs. Therefore, the results of this study are relevant in the context of individual health and have the potential to contribute to the achievement of broader sustainable development goals, especially in maternal and child health aspects.

During pregnancy, the muscles of the abdomen, around the uterus, as well as the vagina become stretched and weakened. Postpartum gymnastics exercises aim to help re-tighten these muscles [26]. Physical activity after childbirth can strengthen the contraction of the uterine muscles due to increased levels of extracellular calcium ions bound to calmodulin, which then increases the activity of myosin kinase and phosphorylase. This process causes muscle pulling and continuous contraction of the uterus. Repeated contractions and retraction of the uterus will trigger the narrowing and rupture of blood vessels, which can interfere with blood flow to the uterus. As a result, muscle tissue may lack the nutrients it needs and shrink in size. In addition, the unsmooth flow of blood to the uterus also contributes to uterine atrophy, allowing the organ to return to its standard size [27].

Non-pharmacological methods, such as health education, exercise, and relaxation therapy, can be applied during pregnancy and postpartum to improve the mother's quality of life. One intervention often recommended in postpartum maternal care is exercise, which includes every body movement that increases energy consumption. Exercise can be a planned and structured movement, considering frequency, intensity, and duration, to maintain or improve health [28].

After one to two hours of delivery, the position of the fundus is generally between the umbilicus and the pubic symphysis. In the 6 to 12 hours postpartum range, the fundus is usually as high as the umbilicus. If the position of the palpable fundus is higher than that of the umbilicus, this is an unusual finding and needs to be investigated immediately to prevent possible excessive bleeding. This condition is often caused by a full bladder, which can push the uterus to move upwards and deviate from the midline. It is best to ask the patient to urinate and then recheck the position of the uterus. Generally, the fundus will drop by about 1 cm per day after delivery and become no longer palpable 10 to 14 days after giving birth [29].

The uterine muscles contract after removing the placenta due to the influence of oxytocin. The intensity of uterine contractions can decrease within 1-2 hours due to decreased oxytocin levels in the blood vessels. The uterus stays tight, thus reducing the risk of bleeding in most primipara mothers, and they may experience mild cramps in the early days. Uterine contractions usually stop about 1-2 weeks after delivery, although they can last longer in different mothers [30]. Uterine contractions resemble menstrual cramps and help prevent excessive bleeding by pressing on the blood vessels in the uterus. Muscle tone is still good in the primipara, so the uterus remains tight, and postpartum mothers generally only experience mild cramps. Meanwhile, in multipara, uterine relaxation is usually stronger due to repeated stretching of muscle fibers in previous pregnancies, resulting in a loss of muscle tone that causes more muscular uterine contractions and relaxation. In the first days after giving birth, contractions can be felt quite strongly and frequently and will decrease in intensity after 3-4 days. At 7 days after birth, contractions are less frequent, and after about 2 weeks, contractions are almost no longer felt [31].

The results of this study are in line with the findings of research by Wada *et al*. (2020) that blood discharge (lochia) in most of the participants on day 7 was brownish-yellow or dark yellow, namely lochia serosa because lochia serosa appeared on days 7 to 14 [32]. From days 1-4 postpartum, the lochia was dark red, referred to as lochia rubra. From the 3$^{rd}$ to 7$^{th}$ day, the lochia sanguinolent with a pink or brownish-red color appeared as the blood decreased. Furthermore, from days 7 to 14, the lochia turned pale with a pink colour called lochia serosa [33].

## CONCLUSION

This study concluded that Otaria gymnastics significantly influenced the well-being of postpartum mothers. Mothers participating in gymnastics until the seventh day experienced decreased uterine fundus height, contraction intensity, and lochia discoloration.

Otaria gymnastics is important to improve maternal and child health. The findings of this study can be used to develop clinical practice guidelines and policies to prevent complications and improve the welfare of postpartum mothers. The research provides new insights into maternal health and contributes to global efforts to prevent maternal mortality.

## AUTHORS' CONTRIBUTION

It is hereby acknowledged that all authors have accepted responsibility for the manuscript's content and consented to its submission. They have meticulously reviewed all results and unanimously approved the final version of the manuscript.

## ABBREVIATION

**SDGs** = Sustainable Development Goals

## ETHICS APPROVAL AND CONSENT TO PARTICIPATE

This study was approved by the Ethical Committee Health Polytechnic of Tanjung Karang, with the ethical approval reference number 226/EC/KEP-TJK/VII/2018.

## HUMAN AND ANIMAL RIGHTS

All procedures performed in studies involving human participants were in accordance with the ethical standards of institutional and/or research committee and with the 1975 Declaration of Helsinki, as revised in 2013.

## CONSENT FOR PUBLICATION

Informed consent was obtained from all participants (the 35-point CIOMS-WHO 2016 informed consent was attached that we used when applying for ethical approval at the Health Polytechnic of Tanjung Karang).

## STANDARDS OF REPORTING

STROBE guidelines were followed.

## AVAILABILITY OF DATA AND MATERIALS

The data supporting the article's findings are available in the Health Polytechnic of Jakarta I at https://repository.poltekkesjakarta1.ac.id/file?id=1410, reference number 372/Kebidanan.

## FUNDING

None.

## CONFLICT OF INTEREST

The authors certify that they have no financial or other conflicts of interest.

## ACKNOWLEDGEMENTS

The authors would like to thank all the participants who participated in this research.

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