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# Evaluating the effectiveness of castor oil for labour induction: a narrative review

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**ABSTRACT**

**Background and Objectives.** The process of artificially stimulating the uterus to initiate labour is commonly referred to as labour induction. This procedure should be offered to women only when supported by scientific evidence demonstrating that the benefits of initiating labour early outweigh the associated risks. These risks include complications related to prematurity or post-term pregnancy. Various methods for inducing labour are available, categorized into pharmacological and mechanical approaches. Among pharmacological methods, the administration of exogenous prostaglandins such as Dinoprostone and misoprostol is the most widely used. Mechanical methods include transcervical catheters, amniotomy, and membrane sweeping. Additionally, international guidelines mention several "non-traditional" methods, such as acupuncture, herbal remedies, homeopathy, hot baths, enemas, sexual activity, and castor oil. The objective of this review is to evaluate the effectiveness of castor oil as a method for inducing labour.

**Methods.** A bibliographic search was conducted using three biomedical databases: PubMed, Embase, and CINAHL. The research question was formulated using the PIO (Population, Intervention, Outcome) framework.

**Results.** The most recent clinical guidelines advise against the routine use of castor oil for labour induction. However, some studies have reported its effectiveness as a non-traditional method for initiating labour.

**Conclusions.** Given the demonstrated effectiveness of castor oil in stimulating uterine contractions, its low cost, and the lack of significant side effects associated with its use, this method remains an area of interest for further research.

## INTRODUCTION

The procedure of artificially stimulating the uterus to induce labour is commonly referred as induction of labour (IOL) [1]. This technique aims to stimulate uterine contractions before the start of spontaneous labour and is indicated when the maternal and perinatal risks of continuing pregnancy outweigh those associated with expedited birth [2]. IOL is frequently used in birth centres worldwide. Its use must be clinically justified and carefully evaluated since the risks of IOL itself [3]. The indications for IOL can be categorized into high-priority indications (chorioamnionitis, preeclampsia, post-term pregnancy, significant maternal illness, antepartum haemorrhage, foetal compromise, rupture of membranes) and other indications [4].

The frequency of IOL has increased in recent decades. In developed countries, 20 to 25% of women undergo IOL annually [5]. In Italy, the latest national data available indicates a percentage of induced births at 31.5% [6].

Before the starts of any labour's changes, the uterine cervix is approximately three and a half centimetres long. It is mainly composed of collagen and 10-15% of smooth muscle. Numerous changes must occur to initiate labour and allow dilatation of the cervical canal [7]. A wide range of methods is available for labour induction, each with different mechanisms of action, side effects, costs, duration, need for continuous maternal-foetal monitoring, and varying resource usage. The choice of one method over another depends on the indication for induction, guidelines and protocols, urgency to achieve delivery, clinical factors, and the preferences of both the woman and the healthcare provider [8].

Induction methods are divided into pharmacological and mechanical: among the pharmacological methods, prostaglandins are commonly used as they induce rapid cervical dilatation; however, they require hospital admission and continuous monitoring of side effects, especially foetal tachycardia [5]. The use of prostaglandins is recommended for inducing labour in women with an unfavourable cervix (Bishop score < 6). Several Cochrane reviews [7, 8] have demonstrated the effectiveness of PGE2 in its various formulations compared to placebo, particularly in achieving delivery within 24 hours [9, 10]. Synthetic oxytocin is also widely used, despite possible negative effects such as increased infection risk for the mother and baby, abnormal uterine contractions, higher incidence of instrumental delivery, uterine hyperstimulation, and lower maternal satisfaction with the birth experience [11]. Among the traditional methods, the use of oral misoprostol, a synthetic analogue of prostaglandin E1, has also proven effective in inducing labour [12, 13]. Initially used for the prevention and treatment of gastric ulcers and generally to prevent damage to the gastrointestinal mucosa, misoprostol is an inexpensive drug, stable at room temperature, and available in many countries worldwide, making it particularly useful in resource-poor settings [14]. For this reason, the World Health Organization has included misoprostol in the list of essential medicines [15]. Misoprostol acts on the cervix, facilitating cervical dilation and simultaneously promoting uterine contractions [16]. There is an extensive bibliography demonstrating the efficacy and superiority of misoprostol compared to other PGE2-based drugs. Specifically, misoprostol shows greater effectiveness in reducing the time between induction and delivery, increasing the likelihood of achieving vaginal delivery within 24 hours, ensuring greater safety in the case of premature rupture of membranes, and reducing the risk of caesarean section [17]. On the other hand, Dinoprostone is a synthetic preparation chemically and structurally identical to prostaglandin E2 (PGE2), which is naturally present in maternal tissues, particularly in the placenta, uterus, amniochorion membranes, and cervix. Its primary local effects include changes in cervical consistency, dilation, and effacement, as well as indirectly inducing uterine contractile activity by stimulating the myometrial response to endogenous or exogenous oxytocin [18].

Regarding mechanical methods, including the use of transcervical catheters, amniotomy, and membrane sweeping, numerous studies [19, 20] in recent years have demonstrated their efficacy and safety for pre-induction of labour in the case of an unfavourable obstetric finding. Mechanical methods are believed to work by stimulating the endogenous production of prostaglandins through the stretching of amniochorion membranes and myometrial cells, and by promoting the production of endogenous oxytocin via the Ferguson reflex. Current literature data [21, 22] have highlighted a comparable rate of caesarean sections to the use of prostaglandins (PGE2), similar efficacy to prostaglandins, a reduced risk of uterine hyperstimulation with foetal heart rate alterations compa-

red to prostaglandins, a reduced risk of caesarean sections compared to the use of oxytocin, and a good safety profile in women with previous caesarean sections.
Additionally, it should be noted that mechanical methods are all low-cost. Among mechanical methods, the most widely used is the balloon catheter. The advantages of using the balloon catheter are the possibility of employing it in an outpatient setting, which results in a reduction in hospital stay and a decrease in the caesarean delivery rate [5]. Additionally, it does not require continuous monitoring and reduces the risk of uterine hyperstimulation [5].
International guidelines also mention a series of "non-traditional" methods such as acupuncture, herbs, homeopathy, hot baths, enemas, sexual activity, and castor oil. Recent indications report that the available evidence does not support the use of these methods for labour induction [8].
Given these premises, the aim of this study is to provide a response regarding the effectiveness of using castor oil as a method for inducing labour.

## MATERIALS AND METHODS

For the bibliographic search, three biomedical databases – PubMed, Embase, and CINAHL – were consulted. No time restrictions were applied to ensure the search strategy was as inclusive as possible and aligned with the study's objectives. The research question was developed using the PIO framework, defined as follows:

- P (Population): pregnant women requiring labour induction for obstetric reasons.
- I (Intervention): use of castor oil.
- O (Outcome): induction and initiation of labour.

Only articles in English, including case report were included in the review. No restrictions were applied regarding the population's age, gestational age at induction, the presence of obstetric pathologies, or any specific obstetric conditions. Regarding the intervention, all methods of castor oil administration were considered, including variations in dosage and timing. The application of the PIO framework facilitated evidence synthesis and contributed to the development of this narrative review. SANRA guidelines have been followed for the preparation of the review [23]. Due to the topic of the review, a narrative review has been performed summarizing the findings.

## RESULTS

### *The correlation between castor oil and induction*

Castor oil, also known as *Oleum Palmae Christi*, is obtained from the seeds of *Ricinus communis* and has been used for centuries for its therapeutic purposes. It was first described in the Ebers Papyrus of ancient Egypt over 3,500 years ago [24]. It is a triglyceride characterized by a high content of a hydroxylated unsaturated fatty acid, the Ricinoleic acid. After the oral ingestion of castor oil, the Ricinoleic acid is released by lipases in the intestinal lumen and then absorbed, inducing a strong laxative effect [25]. The United States Food and Drug Administration classifies castor oil as a laxative, but several studies suggest its effectiveness in inducing labour [26].
Prostaglandin E2 levels in the portal vein seem to increase after the use of castor oil. Furthermore, prostaglandin E2 receptors are targets of Ricinoleic acid. The prostaglandin EP3 receptor is responsible for mediating the effects of castor oil. In fact, pharmacological and molecular biology studies have shown the presence of prostaglandin EP3 receptors in the pregnant uterus. Their activation can induce the contraction of the smooth muscle of the uterus. This molecular and physiological mechanisms explain the correlation between castor oil and labour [7, 9, 17].
The most recent guidelines indicate that labour induction with castor oil is not recommended, as the evidence does not support this method [8, 27, 28]. Nevertheless, in many centres, this "non-traditional" method of induction is routinely used. A survey among members of the American College of Nurse-Midwives revealed that 90 out of 172 midwives interviewed had used natural supplements for labour stimulation, and 93% of those who used natural methods had used castor oil [14]. In the context of out-of-hospital midwifery in the United States, castor oil is the most used method of induction in nulliparous women and the second most popular method, after membrane stripping, among multiparous women [24]. The use of castor oil as a method of labour induction was evaluated by Cochrane in 2013 with respect to a series of birth-related outcomes. The results are limited because the number of participants in the studies examined was too small to draw significant conclusions. The only result highlighted by the review is that castor oil induces nausea. In any case, the effectiveness of castor oil in inducing labour was not investigated [10].

***Castor oil: induction of labour and other obstetric and neonatal outcomes***

The living literature on the use of castor oil for labour induction is not extensive. The data collected from a sample of 1,653 patients indicate that the intake of castor oil increases the prevalence of vaginal births compared to the control group. Furthermore, the effectiveness of labour induction is significantly higher in the castor oil group than in the control group [29]. Administering a non-pharmacological intervention through a of castor oil promotes cervical maturation and the onset of labour [30, 31].

Regarding the association between castor oil use and the presence of meconium-stained amniotic fluid, the results are controversial. Some studies report an association between the intake of the substance and meconium-stained fluid [32], while others find no correlation in the groups studied [33, 34]. A 2022 review [35], which included 12 studies, reported data on the association between castor oil use and the presence of meconium-stained amniotic fluid in 6 of the studies. All six authors reported that there were no differences in the presence of meconium-stained amniotic fluid between the castor oil group and the control group. This information is relevant for understanding the effects of castor oil on pregnancy and childbirth, as meconium in the amniotic fluid can indicate foetal stress.

The duration of labour, including the first, second and third stage, and its total duration, seems to be shorter in the castor oil group compared to the control group [32]. However, no differences are observed concerning the outcome of "prolonged labour" when comparing castor oil to no treatment [33]. Data on the APGAR score are also conflicting. At the first minute, patients who took castor oil appear to obtain lower scores for their neonates, compared to the group without the intake of the substance [32]. However, other studies do not detect any differences between the groups examined [31, 33, 34]. Recent data from a review, indicate that there are no significant differences in the APGAR scores between the group that took castor oil and the control group [35].

The percentage of caesarean sections also seems to decrease among patients who took castor oil compared to the control group [35] and the use of castor oil does not increase the risk of caesarean section [31].

The correlation between the presence of nausea after taking castor oil has already been discussed and clarified by Cochrane [36] and other study [34, 37].

## DISCUSSION AND IMPLICATIONS FOR PRACTICE

Castor oil is considered one of the so-called non-traditional methods for labour induction. It is a very ancient molecule and has been used for a long time. This concept is reinforced by literature [38], which has demonstrated that this method plays a role in increasing the rate of vaginal delivery compared to those who receive no treatment, with a high safety profile and a very low rate of adverse effects following its administration. In general, based on current literature data, it seems reasonable to consider the use of castor oil for labour induction in women with low-risk pregnancies, especially given the high rate of side effects associated with oxytocin [34, 39]. Furthermore, castor oil is a resource that can be considered among the methods for labour induction, especially in resource-poor countries where access to healthcare services is often very difficult, due to its low cost and ease of procurement.

The action of castor oil targets the receptors for prostaglandin E2, with Ricinoleic acid acting on these receptors. The EP3 receptor specifically mediates the effects of castor oil on the intestinal and uterine muscles [35]. The understanding of this mechanism of action underlies the results of other studies [40], which highlight the high rate of vaginal delivery after castor oil administration compared to control groups. Regarding the adverse effects of castor oil, the only ones described in some studies [29, 40, 41] were nausea and diarrhoea, which were never found to be debilitating for the women who took the preparation.

There are many guidelines [8, 27, 28], in the topic of labour induction available today, and in the most recent international recommendations and guidelines, the use of non-traditional induction methods, including castor oil, is not indicated. As already emphasized by a previous study, it would be useful to develop guidelines for the use of herbal medicines, particularly castor oil, in pregnant women [29]. However, considering the literature available to date, we can conclude that castor oil can still be considered, especially in countries where access to healthcare resources is difficult for most people and in low-risk pregnancies. The role of the midwife in this context is crucial, and it is therefore important for midwives to collaborate effectively with obstetricians and discuss the use of castor oil as a safe method to promote cervical dilation and prevent undue caesarean surgery [30, 42-44].

## CONCLUSIONS

In this review we analysed the state of the art on castor oil, and, more generally, on the mechanisms available for the induction of labour. Castor oil, which falls under non-traditional methods for labour induction, is not recommended by major national and international guidelines. However, considering its action on the uterine muscles, its low cost, and the absence of important side effects from its administration, it is still a method that is worth to be investigated.

However, the poor methodological quality, the limited number of studies, and the heterogeneity among studies prevent a definitive assessment of the effectiveness of this method for labour induction. It's worthily to note and acknowledge among the limitation of the present review that the heterogeneity in control group selection in the cited studies, underscores the need for future studies with standardized comparison groups to provide a clearer understanding of the role of castor oil in labour induction. Future studies will help clarify which interventions are most effective and which patient populations may benefit from this approach.

Major obstetric organizations have not endorsed castor oil for labour induction. For example, the American College of Obstetricians and Gynecologists (ACOG) and the UK's National Institute for Health and Care Excellence (NICE) explicitly advise against using castor oil to induce labour, given the lack of robust evidence of benefit. These bodies prioritize induction methods with well-documented efficacy and safety profiles, a standard that castor oil does not currently meet. The above-analysed studies on castor oil are few and methodologically limited, yielding inconsistent findings. As discussed, side effects are a key concern – castor oil's cathartic action commonly causes gastrointestinal distress (nausea, vomiting, and diarrhoea). Moreover, there is apprehension about potential foetal effects; some reports observed a higher incidence of meconium-stained amniotic fluid after castor oil use, which raises concern for neonatal meconium aspiration and related complications. Considering these issues – insufficient high-quality evidence and possible risks – professional guidelines have concluded that castor oil should not be routinely used for induction.

In conclusion, high-quality evidence supporting castor oil for labour induction remains insufficient. Both ACOG and NICE emphasize that further research is needed before castor oil could be considered an evidence-based option. Any future studies would require rigorous design and larger sample sizes to conclusively determine efficacy and safety. Until such data are available, there is consensus that clinicians and patients should adhere to established medical guidelines for induction, utilizing methods with proven safety and effectiveness.

## COMPLIANCE WITH ETHICAL STANDARDS

***Authors' contribution***

A.Me., A.Ma.: Conceptualization, writing – original draft. V.R., E.D., L.L., C.V., P.M., A.L., B.M: Writing – review & editing.

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The authors declare that they have no conflict of interests.

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