



Research paper

Effects of *Anethum graveolens* L. (Dill) essential oil on the intensity of retained intestinal gas, flatulence and pain after cesarean section: A randomized, double-blind placebo-controlled trial



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ABSTRACT

Aim: Retained intestinal gas (bloating) and flatulence commonly occur after cesarean section (C-section), leading to complications such as pain and dehiscence sutures. To manage this complication, prescription medications are often used that have potential side effects for both mothers and their infants. The present study evaluated the effect of an herbal medicine, the essential oil of *Anethum graveolens* (dill), on the intensity of bloating and flatulence after C-section.

Methods: A total of 118 eligible women who had delivered via C-section were enrolled in this double blind, placebo-controlled study to receive either dill essential oil (n=60) or placebo (n=58). After discontinuation of intravenous fluids, mothers received an oral dose of 40 drops of either dill essential oil (equivalent to 10.8 to 14.8 mg carvone) or a placebo oil, once every 20 min for one hour (i.e. three doses). A visual analogue scale (VAS) form was used to evaluate the intensity of bloating, flatulence and pain at baseline and then at intervals of 20 min after each dose was given.

Results: The participant demographics, and values for intensity of flatulence and severity of pain, were comparable between the two groups at baseline. Compared to baseline values, a 33% reduction in intensity of flatulence was reported in the dill group versus a 12% decrease in the placebo group 20 min after the third dose of the intervention had been administered ($P=0.001$). Although the rate of the reported severe intestinal pain significantly decreased in both study groups from baseline to the 20 min after the third dose of the intervention, this decrease was approximately three times greater in the dill group (10%) than that of the placebo (3.5%) ($P<0.001$). Participants did not report any side effects either during or after the study.

Conclusion: Dill essential oil was shown to effectively decrease flatulence and relieve intestinal pain after C-section. The results of the study, therefore, suggest that dill essential oil could be safely used to treat post C-section flatulence and abdominal pain as an alternative to prescription medications.

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1. Introduction

One of the frequent complications following any surgery is abdominal distension, i.e. the retention of air in the intestines, slow peristalsis, and altered bowel motility. These digestive tract symptoms are largely due to the effects of anaesthesia. (Frantzides et al., 2006). Abdominal distension and flatulence are even more common after cesarean section (C-section) given the intestinal manipulation that inevitably occurs during abdominal surgery (Thomas et al., 1990). Often, this retained intestinal gas, following

C-section, causes abdominal distension that can lead to abdominal pain, increased bowel sounds, respiratory problems, chest pain, belching and flatulence (Thomas et al., 1990). Besides causing patient discomfort, abdominal distension puts the incisional sutures under increased pressure; indeed, dehiscence sutures are more common after C-section than following any other abdominal surgery (Magann et al., 2002). Furthermore, all of the above complications may interfere with early mother-infant interactions and lead to increased healthcare costs, especially in societies with higher rates of C-section (Rowe-Murray and Fisher, 2002). Therefore, finding strategies to alleviate abdominal distension and gas retention after C-section could prevent pain, decrease hospital stay and improve neonatal care.

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Medications used for relieving such post-cesarean discomfort include metoclopramide, meperidine hydrochloride, morphine sulfate, codeine, aspirin, acetaminophen and simethicone or dimethicone (Hanauer et al., 2007). However, most of these pain relievers have various potential adverse effects, including dyspepsia, nausea, diarrhoea, allergy and fatigue (Parkman et al., 2012). There is also the risk that these medications may be transmitted to the infant of a nursing mother via the breast milk (Bar-Oz et al., 2003; Hagemann, 1998; Soussan et al., 2014). Clearly, there is a place for natural treatments that could manage these abdominal complaints whilst avoiding the untoward effects of the currently prescribed medications on both mother and infant.

One herb with the potential to be effective in the treatment and prevention of flatulence after C-section is *Anethum graveolens* (dill). Dill essential oil has a long history of use in the treatment of gastrointestinal disorders such as gastritis, abdominal distension, flatulence and intestinal spasm (Gautam et al., 2013). Dill is a native plant of the Mediterranean and Asia (Yazdanparast and Bahramikia, 2008). Nowadays, it is cultivated for export in most parts of the world, especially Germany, the Netherlands, India, China and the United States (Pathaki et al., 2014). The constituents of dill essential oil include d-carvone, limonene, alpha flandren, carveol, dihydrocarveol, dihydrocarvon, carvacrol and thymol (Naseri and Heidari, 2007).

The majority of the effects of dill essential oil have been empirically observed rather than through rigorous scientific investigations, something which is reflected in the paucity of clinical trials in the medical literature. Previous animal and a limited number of human studies have shown the consumption of dill essential oil to improve appetite and relieve digestive complaints and intestinal gas retention. Researchers believe dill to have an antispasmodic and carminative action on the intestine (Gautam et al., 2013), as well as anti-inflammatory and sedative effects that help alleviate pain (Al-Snafi, 2014). Given these reported actions, and the need to verify the effectiveness of the reported benefits of traditional medicines, the present study sought to investigate the effect of *Anethum graveolens* essential oil on the intensity of flatulence and pain after C-section.

2. Materials and methods

2.1. Study participants

Women aged 18–40 years, who had given birth via C-section were recruited into the study from Mobini Hospital in Sabzevar, Iran. Inclusion criteria included (1) full term delivery, i.e. a gestational age of 38–42 weeks; (2) having undergone transverse C-section; (3) a singleton, live birth; and (4) having received intramuscular anaesthetics and intravenous fluids during the post-operative period. Participants with a Body Mass Index (BMI) > 28 kg/m² and those with a prior history of allergic reaction to herbal medicines, especially dill, were excluded from the study. All subjects signed a written informed consent form in order to participate in the study.

2.2. Study design

The study was a randomized, double-blind, parallel-group, placebo-controlled trial. The study protocol was approved by the Ethics Committee of Sabzevar University of Medical Sciences, Iran (Registration No.122/1915) and the trial was also registered with the Iranian Registry of Clinical Trials (IRCT2013061212438N3).

Sample size was calculated using OpenEpi, Version 3. Assuming a 17–20% reduction in post intervention score, a type I error of 5% and a type II error of 10%, the minimum sample size was calculated to be 55 subjects in each group. In order to allow for possible dropouts, 10 extra subjects were added to each group for a final sample size of 65 per group.

130 eligible women were enrolled into the study. Computer-generated random numbers were used for the randomization, and participants were randomly assigned to either the dill or control group with a 1:1 ratio such that there were 65 subjects in each group. The dill essential oil and placebo drops were both encoded by the pharmaceutical company that prepared them, meaning that the randomization and allocation were concealed from both the researchers and participants until the statistical analysis was completed.

Dried dill plant was obtained from Kashan, Iran, and was identified as *Anethum graveolens* L. by Dr. Valiollah Mozafarian from Tarbiat Modares University, Tehran, Iran. A voucher specimen

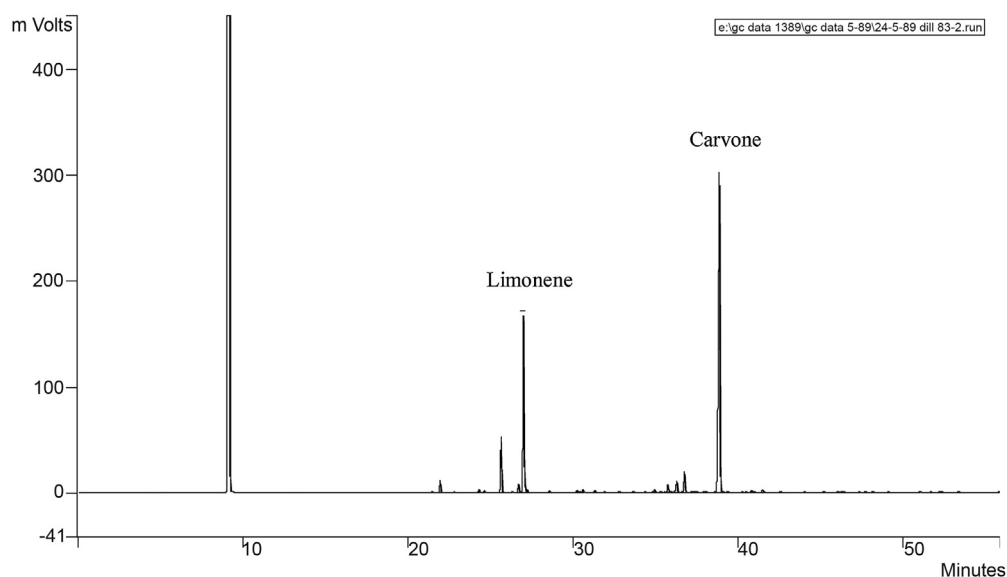


Fig. 1. Component analysis of dill essential oil obtained by gas chromatography.

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