REVIEW ARTICLE

A Systematic Review of the Evidence for Topical Use of Ginger

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Background: The use of ginger as a topical intervention is widely advocated in the popular media. However, there has been no attempt to date to synthesize the evidence for topically administered ginger.

Objective: To systematically review and synthesize the best available evidence of effectiveness for topical ginger in any condition.

Data Sources: CAM on PubMed, CINAHL, Google Scholar, MEDLINE, National Library of Australia, The Cochrane Library, TRIP, pertinent texts, and bibliographies of relevant papers.

Study Selection: Data sources were systematically searched for studies investigating the clinical effectiveness of topical ginger, in any form and for any condition, regardless of study design. Studies were limited to those published between 1980 and 2010, and published in English, Mandarin, Cantonese, or Taiwanese.

Data Extraction: Data were extracted by two authors, independently, using standardized templates.

Data Synthesis: Four studies met the inclusion criteria, including three randomized controlled trials and one non-randomized controlled trial. All studies differed in terms of study population, outcome measures, comparative interventions, and dose and form of ginger used, and thus, were not amenable to meta-analysis. Findings from all trials favored usage of ginger for most outcomes. However, the small sample sizes and inadequate methodological reporting indicate a high risk of bias and the need for caution when interpreting these results.

Conclusions: Few studies have investigated the effectiveness of topically administered ginger for any condition. Until the findings of these studies are corroborated by more robust research, and the safety of ginger is adequately established, clinicians should remain cautious about using topical ginger in clinical practice.

Key words: Ginger, herbal medicine, systematic review, topical, zingiber

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INTRODUCTION

The rhizome of ginger (*Zingiber officinale* L.) is widely used for culinary purposes, though its use extends beyond the realm of cooking. In China, the herb has been used as a traditional medicine for over 25 centuries. There are also recordings of ginger being used similarly in medieval Asia and Europe.[1]

Many clinical trials and systematic reviews have examined the clinical effectiveness of ginger for conditions such as osteoarthritis,[2] asthma,[3] dyslipidaemia,[4] and nausea and vomiting.[5,6] In most of these studies, ginger has been shown to be superior to placebo. However, all of these studies/reviews have been limited to oral preparations of ginger. There has been little attempt to synthesize the evidence for other preparations of ginger (e.g., topical preparations).

The use of ginger as a topical intervention is widely advocated in the popular media, with claims of effectiveness for conditions such as burns, muscle pain, menstrual cramps, joint stiffness and inflammation, and toothache.[1,7,12–17] Claiming such success may charge consumers for an outcome for which there is little available evidence. Thus, there is a need to systematically review the literature to understand better the effectiveness of ginger as a topically administered agent, so as to better inform consumers and health professions about the evidence for its use and safety, the outcome of which has both clinical and economic implications.

METHODS

Search Strategy

A search of the literature was conducted using seven electronic databases, including the Cumulative Index of Nursing and Allied Health Literature (CINAHL), The Cochrane library, MEDLINE, Translating Research into Practice (TRIP), CAM on PubMed and Google Scholar, and the National Library of Australia (NLA), to gain access to publications in Chinese. Keywords for the search were the following: (external OR topical) AND (ginger OR *Zingiber officinale*).

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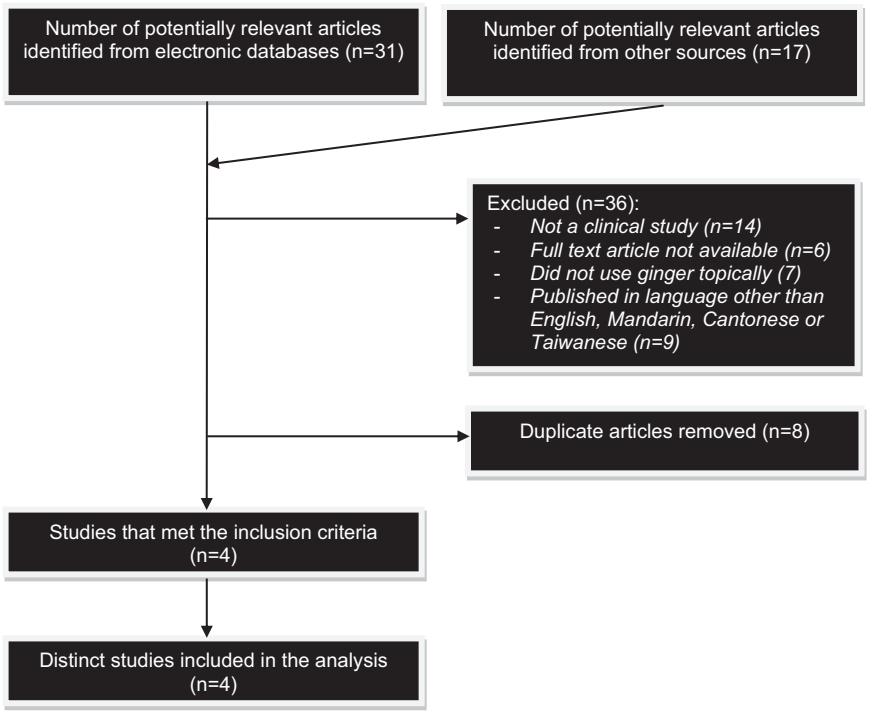


Figure 1. Flowchart of study-selection process.

Bibliographies of identified articles were searched for eligible studies also. The search of the literature, selection of eligible studies, and extraction of data (using standardized templates) were performed by two authors, independently. If two or more eligible studies were comparable in terms of herb formulation, participant demographics, and disease activity, data would be pooled in a meta-analysis, using a random-effect model; otherwise, data would be synthesized narratively.

Inclusion Criteria

The review included full-text journal articles published between 1980 and 2010 that described studies investigating the clinical effectiveness of topical usage of ginger (in any form), for any condition; regardless of study design. Relevant books published between 1980 and 2010 were also reviewed for pertinent studies. Only books and papers published in English, Mandarin, Cantonese, or Taiwanese were considered.

RESULTS

The search identified 48 potentially relevant articles, from which only four studies met the inclusion criteria (Figure 1). The absence of suitable author contact details for these studies meant that requests for further information were not possible. The heterogeneous study designs, populations, methods, outcome measures, dose and form of ginger, and comparative interventions meant that results were amenable to narrative synthesis only. The Australian National Health and Medical Research Council hierarchy of evidence was used as a framework for the discussion of these studies (Table 1).[8]

Level I Evidence

There was no level I evidence of effectiveness for topically administered ginger.

Level II Evidence

Three well-designed, randomized controlled trials (level II evidence) had investigated the effectiveness of topical usage of

Table 1. Hierarchy of Evidence

I.	Strong evidence from at least one systematic review of multiple well-designed randomized controlled trials.
II.	Strong evidence from at least one properly designed randomized controlled trial of appropriate size.
III.	Evidence from well-designed trials such as pseudo-randomized or non-randomized trials, cohort studies, time series, or matched case-controlled studies.
IV.	Evidence from well-designed non-experimental studies from more than one center or research group or from case reports.
V.	Opinions of respected authorities, based on clinical evidence, descriptive studies, or reports of expert committees.
VI.	Traditional evidence.

Adapted from NHMRC.[8]

ginger. The first trial compared the effectiveness of moxibustion (i.e., the application of heat from the burning of an herb, usually mugwort [*Artemisia vulgaris* L.]) ($n = 31$) to acupuncture ($n = 25$) in 56 Chinese adults with rheumatoid arthritis.[9] The first group was treated with spreading moxibustion along acupoints GV 14 to GV 2 and the bilateral corresponding *Jiaji points,* using dried Notopterygium root (*Notopterygium* spp.), *Angelica pubescens* Maxim. root, *Achyranthes bidentata* Blume root, and fresh mashed ginger. The second group was treated with simple acupuncture at acupoints GV 14 and GV 12. Each group was treated for 50 days. All participants in the moxibustion group demonstrated an improvement in outcomes (outcomes not disclosed), whereas only 84.0% in the acupuncture group improved. The difference between the groups was statistically significant ($P < .05$). These findings suggest that spreading moxibustion (which includes ginger) may have a beneficial therapeutic effect in patients with rheumatoid arthritis, though the efficacy of moxibustion using ginger alone is not yet clear.

The second study, a double-blind, randomized controlled trial from New Zealand, examined the effectiveness of ginger as an essential oil in shortening labor.[10] Twenty-two multiparous women in labor were randomly assigned to two groups. The control group received a bath containing 228 L of water and four drops of lemongrass essential oil. The experimental group received four drops of ginger essential oil in 228 L of water. The trial found no statistically significant difference between groups in relation to contraction frequency, cervical dilation, and length of the first stage of labor. However, a statistically significantly shorter duration of the second stage of labor ($P = .01$) was evident in the ginger group when compared to the lemongrass group. Notwithstanding, the study did not state how the ginger and lemongrass essential oils were prepared. This is relevant because ginger essential oils prepared by different methods display important chemical differences; for instance, steam distilled ginger oil does not contain gingerols, whereas the supercritically extracted oil does. This may have implications for clinical practice.

Another randomized controlled trial explored the effect of topical usage of ginger on chemotherapy-induced nausea and vomiting in 62 patients receiving platinum-based interventional chemotherapy for primary or metastatic liver cancer.[11] Patients in the treatment group had topical ginger powder (20 g) applied to the Shenque acupoint for 4 days, while the control group received potato powder to the same point, over the same period of time. Both groups received in addition an arterial infusion of ondansetron hydrochloride during chemotherapy. Using the index form for evaluating nausea and vomiting (IFNV), the difference between ginger and control groups in the incidence and severity of nausea (0.45 vs. 2.77, respectively), vomiting (0.25 vs. 0.87, respectively), and retching (0.19 vs. 0.97, respectively) up to 72 h post-chemotherapy was shown to be statistically significant ($P < .05$), in favor of topical ginger.

Level III Evidence

One level III study had investigated the effectiveness of topically administered ginger. In this poorly described study, 24 male subjects with orchitis were assigned either ginger treatment (i.e., application of six–ten fresh ginger slices, 0.2-mm thick, over the affected testes) ($n = 20$) or no treatment ($n = 4$), until the condition had resolved. Resolution of symptoms occurred within three days in the ginger group, compared to 8.5 days in the control group.[12] However, it is not clear if the difference between the groups was statistically significant.

Level IV Evidence

There was no level IV evidence of effectiveness for topically administered ginger.

Level V and VI Evidence

The opinions of experts (level V), as well as traditional evidence (level VI), suggest that topically administered ginger may have much broader application than that investigated in trials to date. For instance, ginger compresses are reportedly used by the Japanese macrobiotic community to increase the circulation of blood and body fluids in areas of pain, inflammation, swelling, or stiffness.[13,14] Similarly, these compresses have been purported to reduce mastitis.[1] Ginger footbaths are also claimed to be useful for invigorating the entire body and treating fungal infections, such as athletes' foot, possibly due to an antifungal effect.[1]

Given the local action of ginger essential oil on the lining of the respiratory tract during exhalation, and the subsequent expectorant effect,[15] authorities argue that the oil may be useful for catarrh, sinusitis, colds, influenza, and chest infections. Other conditions believed to benefit from the oil include poor circulation, weak digestion, colic, nausea, stomach cramps, period pain, muscle pain and tension, sprains, tiredness, depression, low libido, nervous exhaustion, mental debility, frigidity, poor memory, impotence, migraine, rashes, food allergies, and scalp complaints.[15–17] Similar claims are reported for the use of ginger juice.[7] Nevertheless, none of these level V and level VI claims have been supported by level I, II, III, or IV evidence.

DISCUSSION

This review has found limited evidence for the use of ginger as a topical treatment. Three randomized controlled trials (level II evidence) suggest a possible therapeutic effect of topical ginger for the symptoms of rheumatoid arthritis,[9] chemotherapy-induced nausea and vomiting,[11] and for reducing the duration of the second stage of labor.[10] There is less robust (level III) evidence for the use of topical ginger for orchitis.[12] Notwithstanding, given the methodological shortcomings of these four studies, no firm conclusions can yet be made regarding the effectiveness of topical ginger for any disorder.

While there is level II and level III evidence of effectiveness for topical ginger for some conditions, most of these studies demonstrate high risk of bias in one or more areas. Blinding was considered inadequate in all studies, with the control intervention clearly distinguishable from the active intervention. The use of lemongrass essential oil as a control intervention in the study by Calvert[10] was unsatisfactory for the reason that lemongrass (*Cymbopogon citratus* [DC. ex

Nees] Stapf.) has a direct analgesic effect similar to that of peripherally acting opiates.[18] As such, the absolute effect size of ginger essential oil remains unclear. The inadequate reporting of study methods in three of the four studies,[9,11,12] such as the reporting of sequence generation, allocation concealment, and participant withdrawals, indicates the possible presence of selection, allocation, and reporting bias.

While there is growing information regarding drug interactions and pharmacological actions of orally administered natural supplements, little information is available about the safety of topically administered alternative therapies, such as topical ginger. For instance, ginger is reported to inhibit prostaglandin synthesis[19]; given that prostaglandins play an important role in cervical dilation, it is possible that ginger may be contraindicated in labor. While systematic reviews of RCTs indicate that the use of oral ginger for pregnancy-induced nausea and vomiting has no known adverse effects on pregnancy outcomes,[5,20] the role topical ginger plays in cervical dilatation and throughout pregnancy requires further investigation.

As the use of herbal medicines becomes more prevalent, clinicians need to be aware of the potential benefits,[14] as well as the potential harmful effects related to their use. The use of ginger as a non-invasive topical treatment to alleviate pain, as well as nausea and vomiting, might be particularly attractive to many consumers as it negates the use of potentially harmful drugs. However, quality evidence of safety and effectiveness for topical ginger is currently lacking.

CONCLUSION

Literature exists on the use of ginger as an external application, but there is scant high-level evidence of effectiveness to support its use as a topical treatment. Limited level II and level III evidence and expert opinion indicate that topically administered ginger may be useful for some conditions, such as rheumatoid arthritis and orchitis, shortening the duration of labor, and alleviating chemotherapy-induced nausea and vomiting. However, the best available evidence is insufficient to draw any conclusions about the safety and effectiveness of topical ginger at this point in time. Nonetheless, there is adequate justification for conducting further research in this area.

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