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RESEARCH ARTICLE

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THERAPEUTIC POTENTIAL OF PEPPERMINT (MENTHA PIPERITA) ESSENTIAL OIL: INTEGRATIVE LITERATURE REVIEW

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ABSTRACT

Objective: To analyze the knowledge produced about the use of peppermint essential oil for human health. **Method:** This is an integrative literature review study, having as source of research the VHL, SciELO and Google Scholar. Primary studies published in English, Spanish or Portuguese, from 2015 to 2021, that addressed the use of peppermint essential oil in humans were included. **Results:** 1777 studies were identified, 1774 that did not meet the proposed objective were excluded, and 3 studies were included. The results of the studies showed the therapeutic potential of peppermint essential oil in the treatment of migraine, nausea, vomiting, and in the improvement of cognitive functions and mood. **Conclusions:** Peppermint essential oil constitutes a therapeutic possibility in aromatherapy. However, more studies are necessary involving different clinical situations, varied populations, and with robust methodology so as to expand knowledge and strengthen evidence for the indications and safe use.

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INTRODUCTION

The use of natural products for the treatment of different health problems follows the evolution of man since antiquity, with descriptions and historical findings evidencing this practice. The Holy Scriptures and the Ebers papyrus present the first descriptions of the use of medicinal plants (Pinto, 2002). In the Holy Scriptures, in the book of Luke chapter 10, verses 25 to 37, the parable of the Good Samaritan is presented, in which the Samaritan uses wine and oil to treat the wounds of an unknown man who had been attacked by robbers (Bíblia Sagrada). This report reflects a wound care practice common to the period in which the record was produced. At the beginning of the colonization of Brazil, the first Portuguese physicians had contact with the indigenous culture of health care, and they needed to appropriate these practices due to the lack of traditional Portuguese resources in Brazil. Since then, many scientific expeditions have been carried out with the aim of studying Brazilian medicinal resources, with a focus on phytochemistry. In addition to the use in health care, several natural resources from Brazil were extracted and exported for use in different commercial areas, such as gastronomy, hygiene and beauty (Pinto, 2002).

In the last decade, there has been an increase in the use of essential oils in the industry, with special attention to the pharmaceutical industry, and many people have sought this resource as an alternative treatment instead of more invasive pharmacological treatments (Ramsey, 2020). Essential oils (EOs) are complex substances, composed of multiple chemical components, such as saturated and unsaturated hydrocarbons, alcohol, aldehydes, esters, ethers, ketones, phenol oxides and terpenes, and can contain more than 400 different compounds in a single oil (Ramsey, 2020; Ali, 2015). They are extracted from flowers, bark, stems, leaves, roots, fruits, and other plant parts by various methods, including steam distillation, solvent extraction, or supercritical fluid extraction (Ali, 2015; Vostinaru, 2020). Essential oils have a liquid presentation, generally colorless, and a characteristic odor of the raw material from which they are extracted (Ali, 2015). They can be used topically, by inhalation, by diffusion in the environment, ingestion in direct liquid form or in capsules, and mouthwash, depending on the type and indication of use (Borchhardt, 2017). The complexity of the chemical composition of EOs allows their interaction with many pharmacological targets, such as receptors, ion channels and enzymes, contributing to the increased interest in the study of the therapeutic potential of EOs.

But, despite being promising for health, there is still little research on the safety of the therapeutic use of EOs (3,5). The lack of knowledge about the safety profile of EOs contributes to the mistaken belief of the general population and health professionals that their consumption is always safe and risk free. However, EOs can induce adverse effects such as hypersensitivity, dermatitis, neurotoxicity (Ramseya, 2020; Ali, 2015; Vostinaru et al. 2020). Thus, EOs should be used, preferably with the guidance of a qualified professional. In Brazil, the use of integrative and complementary practices (PICS) in comprehensive care for human beings is supported by Ordinance GM/MS n. 971, of May 3, 2006, which established the National Policy on Integrative and Complementary Practices in Health (PNPIC). Ordinance n° 702 of March 21, 2018, amends the Consolidation Ordinance n° 2/GM/MS of September 28, 2017, including new practices in the PNPIC, among which is aromatherapy (Ministério da Saúde do Brasil, 2017; Ministério da Saúde do Brasil, 2018). Aromatherapy is part of aromatology, a science that deals with the study of EOs and aromatic materials in terms of therapeutic use. It consists of one of the PICS regulated by the aforementioned ordinance, and which can be adopted by professionals from different areas, such as nursing. Aromatherapy, then, represents an auxiliary therapeutic resource that can be used in order to cooperate for the physical and/or mental (re)balance of the individual (Ministério da Saúde do Brasil, 2017; Ministério da Saúde do Brasil, 2018). Supported by the PNPIC and by legislation that regulates the nursing profession in Brazil (Law number 7498/86 and Decree number 94406/87), and the Resolution of the Collegiate Board of Directors (number) which deals with good practices for handling drugs for human use in pharmacies, the Federal Nursing Council (COFEN) presents a favorable opinion (number 34/2020/CTLN/COFEN) to the inclusion of aromatherapy in the professional practice of nurses (Conselho Federal de Enfermagem). Therefore, it is essential that nurses gain scientific knowledge to support their work in the field of aromatherapy.

The literature describes that there are more than 3,000 known EOs, of which about 150 have commercial importance in the world market (Barbieri, 2018). Peppermint EO is recognized as one of the most popularly used (Costa, 2012). Peppermint is an aromatic perennial herb belonging to the *Lamiaceae* family (Pushpangadan, 2006) used since ancient times in European and Asian medicine in the prevention and treatment of diseases, either in the presentation of its dried leaves or as EO (Vostinaru, 2020). Peppermint leaves are one of the most popular tea ingredients, with descriptions of use for clinical conditions of biliary disorders, dyspepsia, enteritis, flatulence and intestinal spasms (Costa, 2012). Also used in the treatment of nausea, vomiting, morning sickness, respiratory infections, menstrual disorders such as dysmenorrhea (Alghamdi, 2019; Sultan, 2020). Peppermint EO is extracted from the semi-dried leaves by steam distillation. Its use has been described for various applications in the food, cosmetic and pharmaceutical industries. Studies have demonstrated its antiseptic, antioxidant, analgesic properties, and stimulant effect of the Central Nervous System (CNS) and also of the peripheral circulation (Neuwirth, 2015), and it is useful in the treatment of functional dyspepsia or irritable bowel syndrome. It is known that the composition of peppermint EO can be influenced by the geographical location in which the plant is grown and by the maturity of its leaves at harvest. A study demonstrated the presence of 43 different substances in peppermint EO, with a higher concentration of menthol, menthone 1,8-cineole and neo-menthol, representing about 70% of its compounds, followed by menthyl acetate, germacrene D, isomenthone, beta-caryophyllene, menthofuran and limonene (Wu, 2019). Scientific knowledge about the proper use of peppermint EO is fundamental in the clinical decision process regarding its indication for specific health needs. In this sense, literature review studies can contribute to the search for evidence, by synthesizing important findings on the same clinical issue of interest in a single document. Thus, this study aimed to analyze the knowledge produced about the use of peppermint EO for human health, verify the indications for the use of peppermint EO, and know the different ways of use of peppermint EO in humans.

METHODS

This is a literature review study carried out to answer the following research question: what are the indications for the use of peppermint essential oil for human health? To answer this question, the following virtual libraries and databases were consulted: 1. Virtual Health Library (VHL) – including the following indexed databases: LILACS (Latin American and Caribbean Literature), BDNF (Nursing Databases), and MEDLINE (Medical Literature Analysis and Retrieval System Online); 2. SciELO (Scientific Electronic Library Online); and 3. Google Scholar. In the search process, the following descriptors were used: “*Mentha piperita*”, “volatile oils”; and the alternative terms: “essential oil”, “essential oils”, “hortelã-pimenta” and “peppermint”. The Boolean operators “OR” and “AND” were used, crossing the descriptors, with the following strategy: *mentha piperita* OR hortelã-pimenta OR peppermint AND volatile oils OR essential oil OR essential oils. The selection of documents respected the inclusion criteria used as filters during the search and, later, in the evaluation of the documents: it is a primary study in the format of a full article; articles that have been published from 2015 to 2021, in Portuguese, English or Spanish; and to address the use of peppermint essential oil in humans for therapeutic purposes. The following were excluded: documents in formats other than article format; literature review studies, in vitro studies, and studies that addressed the use of peppermint in other non-essential oil presentations or formulations, for example tea. For a better visualization of information about the use of peppermint essential oil for human health, the results will be presented as a summary of the studies included in this review.

RESULTS

The search in the databases and virtual library carried out on September 29, 2021, with the application of filters by language and year of publication resulted in a total of 1777 studies. The analysis of the documents resulted in the exclusion of 1774 studies and the inclusion of 3 studies that were part of the final analysis. The summary of the study selection path can be seen in Figure 1.

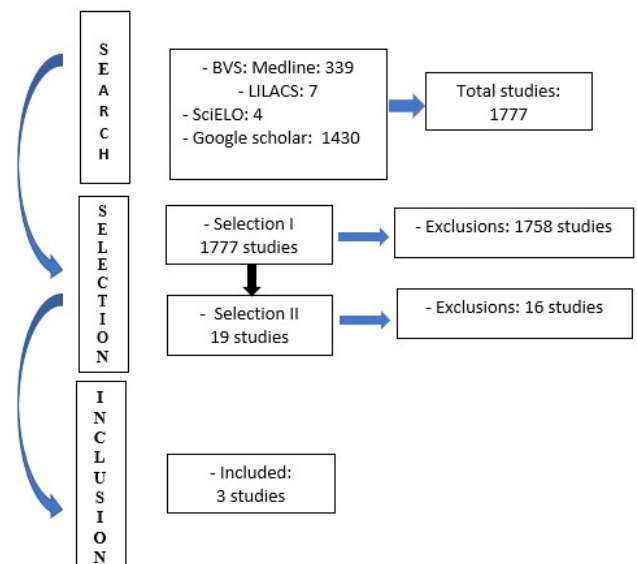


Figure 1. Flowchart of the study inclusion process

The analysis of the studies focused on the identification of the clinical indication for the therapeutic use of peppermint essential oil by humans. We opted for the synthetic presentation of the data in a dissertational way, considering the main categories: type of study, objective, method used and main results. For ethical reasons, the source of each study is mentioned in the statement of presentation of the study.

Use of peppermint essential oil to improve cognitive function and mood (Kennedy, 2018): A randomized, double-blind clinical trial investigated the effects of oral administration of peppermint (*M. piperita*) EO on the cognitive status and mood of healthy young adults. Preliminary *in vitro* analysis was performed to evaluate the physicochemical properties and biological activities of a variety of EO from *M. spicata* and *M. piperita*, as well as to select the treatment likely to exert effects on the central nervous system (CNS), specifically on the cognitive function and mood. The intervention group received two 500 µL capsules containing one of the following treatments: 100 µL of *Mentha piperita* EO (in vegetable oil), and 50 µL of *Mentha piperita* essential oil (in vegetable oil). The placebo group received vegetable oil in a capsule. For all groups, the capsules were consumed with 200 mL of milk. The participants were evaluated using a cognitive and mood assessment instrument, also through an anxiety inventory and a mood scale in four moments with an interval of 7 days between them. At the first meeting, an initial assessment from alcohol for 24 h and from products containing mint for 48 h. The participants were assessed for baseline mood and cognitive function at 8:15 am and then received the treatment capsules and training was carried out to carry out the activities required by the study.

In the following three moments, the participants came at 8:00 am, abstaining from food for 12 h, from caffeine for 18 h. Assessments were repeated at 1h, 3h, and 6h postdose. They received lunch after the 3h post-dose assessment, and during the waiting period they had a comfortable room. The results showed that there was a significant reduction in mental fatigue in the treatment group at the 3h post-dose assessment, compared to the placebo group. Also, there was better performance in tasks of rapid processing of visual information after 1h and 3h post-dose, and better performance in subtraction tasks 3h post-dose.

Use of peppermint essential oil for migraine attacks (Rafieian-Kopaei, 2019): A randomized, double-blind clinical study evaluated the efficacy of peppermint EO 1.5% compared to the use of lidocaine 4% and placebo in the treatment of headache. Participants were instructed to complete a questionnaire regarding the severity of the headache, before using the medication. Then apply 1 drop of the product via the nose, and lie down for at least 30 seconds. Between 5-15 minutes, they should answer the pain assessment questionnaire again. In case of persistent pain, they could use another dose of medication and, after 15 minutes, fill in a new pain assessment questionnaire. Compared to the placebo group, the treatment groups had a significant impact on reducing the intensity and duration of pain, with the majority of patients experiencing a decrease in pain within 5 minutes of using the treatment.

Use of peppermint essential oil in the prevention and control of nausea and vomiting (Maghami, 2020): A single-blind randomized clinical study was carried out with cardiac patients undergoing open heart surgery at a university hospital in Kashan, Iran, with the aim of evaluating the effectiveness of inhaling peppermint essential oil in the postoperative period for the control of nausea and vomiting, common after this type of surgery. The intervention group received three consecutive phases of aromatherapy with peppermint essential oil, the first intervention being 30 minutes before tracheal extubation, and the other interventions 4 hours and 8 hours after the removal of the endotracheal tube. In each of the interventions, aromatherapy consisted of 0.1 ml of peppermint essential oil at 10% plus 10 ml of distilled water, for 10 minutes, the first intervention being administered by the nebulizer of the ventilator, connected to the tracheal tube, and the following interventions administered via nasal cannula. Thirty minutes after the last intervention, the patients were fed 20 ml of distilled water. The control group received routine care for pain management and post-extubation oxygen therapy; assessments for the occurrence of nausea and vomiting followed the same protocol as the intervention group, up to 12 hours after surgery. In the moment of occurrence of nausea and vomiting, patients in both groups followed the same routine of antiemetic medication prescribed by the responsible physician.

Between the intervention and control groups, significant differences were found when referring to the frequency of nausea, severity and duration, and in the frequency of vomiting episodes referring to the first four hours of extubation. In order to facilitate the visualization of information regarding the indication and mode of use of the peppermint EO used in the studies, a synoptic table of the findings in the present review is presented below (Box 1).

Box 1. Indication for the use of peppermint essential oil and form of use. Synthesis of literature review studies – 2021

Recommendation	Form of use
Migraine	Nasal application
Improved cognitive function	Oral ingestion
Mood improvement	Oral ingestion
Nausea and vomiting	Inhalation

SOURCE: The authors (2021).

DISCUSSION

This study made it possible to present a review of the production of knowledge about the benefits of peppermint essential oil and its application in humans. During the evaluation of the selected journals, many studies were excluded and these exclusions were due to the use as teas, the works were review studies, and *in vitro* research. Among the three articles included in the study, which sought to evaluate the effects of using peppermint essential oil, two were carried out in Iran, one in the United Kingdom. A study carried out in Brazil was identified in which the use of peppermint EO was identified for the management of symptoms of anxiety and stress. In addition, the study was developed with only one person, and involved the use of different therapeutic modalities, such as diet therapy, yoga, and aromatherapy, which was carried out by the use of an EO mix in which the peppermint EO was included. The use of synergies and other therapeutic modalities contributed to limiting the study results regarding the therapeutic potential of peppermint EO. Although the Federal Nursing Council is favorable to the activity of aromatherapy in the professional practice of nurses, this demand for care still requires further studies in Brazil, where the use of plant resources for health care is very common.

In fact, comprehensive care for human beings in meeting their basic needs involves psychobiological, psychosocial and psychospiritual dimensions (Horta, 2021). In this sense, the results of the studies identified in the present review show the effects of the use of peppermint EO in meeting needs in the psychobiological and psychosocial fields, as observed in Box 1. It is important to note that this box represents only the synthesis of the findings regarding the use of peppermint EO in the studies that were part of the present review, not being an absolute indication for prescription. Therefore, such findings can help in the process of clinical reasoning and decision-making, which should be the responsibility of health professionals with expertise in aromatherapy, and based on a careful clinical evaluation of their patients. The action of peppermint EO on cognitive function and mood identified in a study that was part of the present review (17), was verified in older studies. One study showed that participants who received peppermint EO showed improved memory and increased information processing speed, and although they increased alertness, they were significantly calmer (Moss, 2008). Another study found that participants who received peppermint EO performed better on the activity and concentration attribute (Göbel, 1995). Furthermore, it was found that the participants who received peppermint EO had better performance in the emotional irritation dimension, with a reduction in the characteristics arousal, sensitivity and noise. The effectiveness of using peppermint EO in the control of migraine (Rafieian-Kopaei, 2019) was also verified in another randomized, double-blind clinical trial, but in migraine caused by tension.

The study participants were divided into three groups: a treatment group was instructed to apply 10% peppermint EO in ethanol solution on the frontal and temporal regions, with repetition at 15 and 30 minutes; the other treatment group received a 1000 mg paracetamol tablet; and the participants in the control group received placebo. The results showed that the use of acetaminophen and peppermint EO significantly reduced pain compared to the placebo group, and there was no significant difference between the use of acetaminophen and peppermint OE in pain reduction. However, it was notable that the dosage of 10% of peppermint EO achieved similar results to the dosage of 1000 mg of acetaminophen. Furthermore, no adverse events associated with the use of peppermint EO were reported by the participants, showing good tolerance. These results evidence the effectiveness of topical use of peppermint EO in the treatment of tension-type headache (Göbel, 1996). People who have chronic migraine commonly have symptoms that precede the pain and symptoms that accompany the pain process, such as nausea, vomiting, photosensitivity. The results of the study on the effects of peppermint OE in preventing nausea and vomiting contribute to the inference that peppermint OE may have benefits for people with chronic migraine, not only in relieving pain, but also minimizing associated symptoms (19). None of the studies discussed the adverse effects of peppermint EO use, or potential risks arising from overdose, sensitivity to the product, or sensitivity arising from synergies, so this presents itself as a field to be explored in order to increase safety for use for therapeutic purposes. Finally, many gaps in the process of building knowledge about the use of peppermint EO require answers, and only from robust studies can we make progress in this perspective of expanding knowledge in the area. Regarding the practice of complementary health, in which there is technical support for the nurses' performance, it is expected that this study can encourage reflections, and motivate the realization of other studies. The results of the studies included in the present review contribute to the inference that peppermint EO has the potential to meet the demands in the field of basic human needs when used by nursing as a complementary integrative practice with patients under the nurses' care. Among the modes of use of the EO, there was mention of topical application, inhalation, and oral ingestion through capsules. However, the EO is also used by diffusion in the environment. Thus, it is essential that the professional knows how to use each EO for an adequate and safe recommendation, minimizing the risk of adverse reactions.

CONCLUSION

Peppermint EO showed therapeutic potential in the treatment of migraine, nausea and vomiting; as well as improving cognitive function and mood. These results can be generalized, contributing to the clinical reasoning process regarding the use of peppermint EO in other similar clinical conditions. For example, the postoperative use of peppermint EO in other surgical procedures with the potential for nausea and vomiting is possible, provided the patient has no history of previous reaction to the use of this substance. Thus, a range of possibilities of studies about the use of peppermint EO in other fields of nursing practice are open, in addition to the scenarios described in the studies. The results of the studies included in the present review contribute to the inference that peppermint EO has the potential to meet the demands in the field of basic human needs when used by nursing as a complementary integrative practice with patients under the nurses' care. Among the modes of use of the EO, there was mention of topical application, inhalation, and oral ingestion through capsules. However, the EO is also used by diffusion in the environment. Thus, it is essential that the professional knows how to use each EO for an adequate and safe recommendation, minimizing the risk of adverse reactions. The use of peppermint EO should preferably be recommended by a qualified professional as a result of an evaluation process, diagnostic clinical reasoning, and individualized therapeutic approach with a clearly defined purpose, with follow-up of results. In nursing, this model of evaluation of results and care is called the nursing process, and should be used by nurses in all care scenarios. Peppermint EO represents a possible

alternative in the field of PICS, in the care of patients under nursing care who experience clinical situations similar to those described in the studies presented in this review. However, there is a need for further studies to investigate the therapeutic potential in humans, aiming to expand knowledge and strengthen evidence for the indication and safe use of the EO.

Conflicts of Interest: The authors declare no conflicts of interest.

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