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The Safety of Herbal Used for Health Complaints during Pregnancy – A Systematic Review

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ABSTRACT

During pregnancy, a variety of symptoms can cause severe discomfort. Herbal therapy is one of the most widely used by pregnant woman to resolve their health complaints. This study aims to determine the health complaints as indications of herbal use, the types of herbs used, and the safety status of the herbs used during pregnancy. A literature search for cross-sectional studies from 2010 to 2020 was conducted on ScienceDirect, BMC, MedCrave, and JACM using predefined keywords. The literature's quality assessment in this study uses the JBI (Joanna Briggs Institute) Quality Assessment Tool for qualitative studies. The safety status of herbs was carried out based on 3 available sources. This study includes 6 cross-sectional studies (2189 participants) from Europe, Asia, and Africa with a total of 1176 (53.7%) pregnant woman used herbal medicine. Various health complaints were reported, especially common cold (28%); nausea-vomiting (21%); and UTI (10%). Of the 25 types of herbs found, 7 herbs species were classified safe, 5 herbs species classified as potentially harmful, and the remaining 13 types has unknown safety status. Thus, 649 (64.7%) pregnant women using safe herbal, 59 (5.8%) using potentially harmful herbs, and 294 (29.3%) using herbs with unknown safety status. Based on further studies, it was found that the herbs with unknown safety status contain various substances that might cause side effects in pregnancy. Many pregnant women use herbal for health complaints during pregnancy, and some consumed herbal that might risk their pregnancy.

Keywords: Health complaints, herbs, pregnancy, safety

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INTRODUCTION

During pregnancy, many physiological changes occur in the mother's body to support fetal development and prepare the mother for labor.^[1] These physiological changes also cause a variety of symptoms that are common during pregnancy. However, in some pregnant women, these symptoms can cause severe discomfort that affects their quality of life physically, emotionally, and socially.^[2] In order to resolve these health complaints, various pharmacological to non-pharmacological approaches are carried out. CAM (Complementary and Alternative Medicine) is one of the non-pharmacological therapies chosen by pregnant women, and one of the most widely used CAM therapies is herbal therapy.^[3] The worldwide prevalence of herbal use during pregnancy ranges from 12 to 82.3%.^[4] Pregnant women widely choose herbal therapy because they have the perception that pharmacological therapy may be harmful to the fetus.^[5] During pregnancy, some commonly resolved complaints using CAM therapy, especially herbs, include morning sickness, constipation, insomnia, and urinary tract infections (UTI).^[6] Ginger (*Z. officinale Roscoe*) and chamomile (*C. recutita*) are non-pharmacological therapies that are recommended to relieve nausea in early pregnancy.^[2] Rhubarb (*R. emodi*), Fenugreek (*T. foenum graecum*), Flaxseed (*L. usitatissimum*), and Senna (*C. occidentalis*) are herbs that pregnant women widely used to treat constipation.^[7] Chamomile (*C. recutita*), lavender (*L. Augustifolia*), valerian (*V. officinalis*), and ylang-ylang (*C. odorata*) are herbs commonly used to treat insomnia during pregnancy, either in the form of aromatherapy, herbal teas, or supplements.^[8] Cranberry (*Vaccinium*

macrocarpon L.) and Rosemary (*Rosmarinus officinalis L.*) are some herbs used by pregnant women to treat UTIs.^[9] Despite the widespread use of herbs during pregnancy and pregnant women's assumption that herbs are safer for pregnancy, only a few data on herbal use's efficacy and safety during pregnancy are known.^[10] Some herbs proved beneficial in pregnancy, but some have detrimental effects on the fetus and are even contraindicated during pregnancy.^[3] Therefore, herbs' unregulated use during pregnancy poses a high risk for pregnant women and the developing fetus.^[11] Mothers can experience uterine bleeding, abortion or premature labor, and also physical and mental retardation on the fetus.^[12] The study aims to determine the health complaints as indications of herbal use, herbs's types, and the herbs's safety status during pregnancy.

MATERIALS AND METHODS

Search strategy

This study's literature search was carried out through the electronic database Science Direct, BMC (Bio-Medical Center), MedCrave, and JACM (The Journal of Alternative and Complementary Medicine). The search was conducted using Boolean operators and different keywords alone and in combinations were used.

Inclusion and exclusion criteria

The inclusion criteria in this study were: (1) literature published in the last 10 years (2010-2020), (2) literature published in english, (3) cross-sectional study in pregnant women, and (4) study results mention the type of herbal remedies and indications for use during pregnancy. Sources originating from non-research studies, literature

studies, studies that do not describe types of herbal medicines specifically, studies that describe the types of herbal medicines but do not mention specific indications for use or describe types of herbal medicines and indications for use during pregnancy separately, are excluded from literature selection.

Quality assessment and data extraction

The JBI (Joanna Briggs Institute) Quality Assessment Tool for qualitative studies was used for quality assessment of the literature in this study.^[13] This quality assessment consists of 10 question points with three kinds of answers: yes (if available), no (if not available), and unclear (needs further study). Furthermore, from the answers it is determined whether the article can be applied or not applicable. The final result is obtained from the overall conclusion of the answer whether the journal can be included, excluded, or needs to be studied further (Seek further info).

The data reviewed from the article found including author, article title, year of publication, research location background, research objectives, research methods, samples, number of samples, prevalence of use of herbal medicines, types of herbal medicines, and their indications for use. Furthermore, the data is extracted and collected into a spreadsheet according to predetermined criteria.

Data synthesis and analysis

The collected data described by the meta-synthesis method and types of herbs found in data extraction analyzed for its safety status during pregnancy based on classifications from "The Botanical Safety Handbook" and "Mills and Bone Safety Classification".^[6] In the classification of "The Botanical Safety Handbook" there are 2 categories: category 2B and category 2C, which category 2B is an herb that should not be used during pregnancy

unless it is recommended by a qualified expert on the proper use of this substance and category 2C is also similar but may not be used while breastfeeding. "Mills and Bone Safety Classification" is a modified classification from The Australian TGA Classification for Drugs in Pregnancy, which has 7 types of herbal categories: Category A, Category B1, Category B2, Category B3, Category C, Category D, and Category E ^[6].

If the herbal is not included in these 2 classifications, we used the classification from the study by Ahmed (2017) to determine the safety status of the herbs in question. The safety classification for herbs used during pregnancy has 4 categories: Safe to use in pregnancy; Use with Caution; Potential Harmful; Information Unavailable.^[14]

RESULTS

Selection of studies

A total of 2542 potential articles both from database searches and those identified through other sources were found. Researchers screened based on titles and abstracts that matched the topic and excluded 2518 less relevant articles. From 24 articles that were reviewed by accessing the full text of the literature, 1 study focused on alternative medicine besides herbal medicine, 10 studies did not show indications for the use of herbal medicines in pregnant women, 4 studies described the types of herbal medicines and indications for pregnant women separately, and 3 studies did not clearly present the prevalence of health complaints, so a total of 15 articles were excluded. According to the inclusion and exclusion criteria to be reviewed in this systematic review, the final results were 6 articles. The PRISMA diagram from the literature search can be seen in Figure 1.

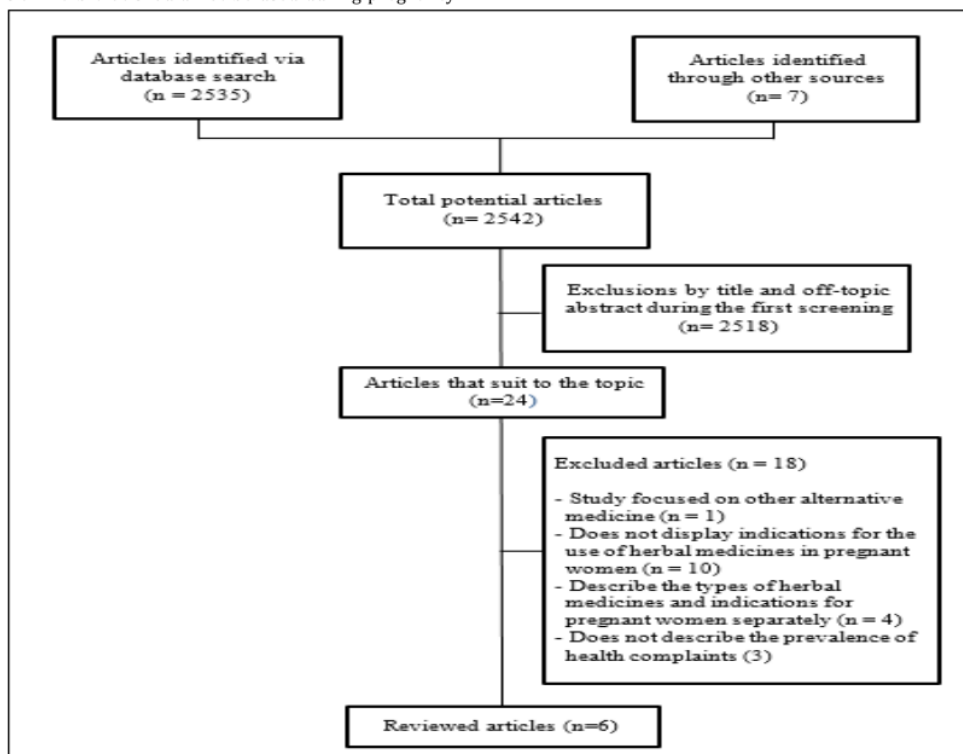


Figure 1: The PRISMA diagram from the literature search

Characteristics of studies included.

Of the 6 articles reviewed, 2 studies are from the European region [15,16], 1 study from the Asian region [17], and 3 studies came from the African region.[18–20] The total participants in these studies were 2189 participants and 1176 people (53.7%) had consumed herbs during their

pregnancy. The literature quality assessment results using the JBI quality assessment shows that all studies can be included in a systematic review. The literature's characteristics included in the systematic review and the literature quality assessment results can be seen in table 1-2.

Table 1: The characteristics of the literature included in the systematic review.

No	Author, Year	Region	Objectives	Study Type	Sample	Sample Amount	Herb user Prevalence
1	Holst, et al., 2011	Norway	To review the literature on safety and efficacy of the most commonly used herbs to enable midwives togiveevidence-based information to pregnant women.	Cross sectional study (survey and review of the scientific literature)	All expectant mothers at least 20 weeks pregnant presenting at the antenatal clinics held within Norfolk and Norwich University Hospital between 26 November 2007 and 15 February 2008	578	334 (57.8%)
2	Koc, et al., 2016	Northern Region of Turkey	This descriptive study aimed to determine the degree of usage of complementary and alter-native medicine (CAM) among pregnant women in the northern region of Turkey.	Cross-sectional survey	Women who were referred to the gynaecology clinic of the Maternity Hospitalin Samsun, Turkey between October 15, 2010 and January 31, 2011	285	104 (36.5%)
3	Al-Riyami, et al., 2011	Oman	to evaluate medication use pattern in a university tertiary hospital in the Sultanate of Oman	Cross-sectional survey	Women attending FAMCO and the standard antenatal clinics at the hospital.	139	33 (23.8%)
4	James, et al., 2017	Sierra Leone	This study was conducted to determine the prevalence and pattern of herbal medicines use among pregnant women attending an antenatal clinic at a tertiary maternal hospital in Sierra Leone	Cross-sectional study	Pregnant women attending the clinic during the study period, who were at least 18 years of age, and who had at least one previous pregnancy.	134	84 (62.7 %)
5	Nega, et al., 2018	Ethiopia	"This study investigated the use of medicinal plants and concomitant use of pharmaceutical drugs among pregnant women in Addis Ababa and Bati, Ethiopia.	Cross-sectional study	All pregnant women attending the four selected antenatal care clinics, who had the ability and willingness to consent to participation	607	364 (60%)
6	El Hajj , et al., 2020	Lusaka Province, Zambia	We aimed to determine the prevalence and patterns of HM use during pregnancy in Lusaka Province, Zambia.	Survey-based (interviewer-administered),cross-sectional, multicentre	Pregnant woman aged at least 18 years, attending the selected antenatal care clinics in Lusaka Province during the data collection period.	446	257 (57.8%)

Table 2: Literature quality assessment

No	Author, year	Critical Appraisal Checklist										Overall results
		A	B	C	D	E	F	G	H	I	J	
1	Holst et al., 2011	Y	Y	Y	Y	Y	Y	U	Y	Y	Y	Included
2	Koc, et al., 2016	Y	Y	Y	Y	U	Y	Y	Y	Y	Y	Included
3	Al-Riyami, et al., 2011	Y	Y	U	Y	Y	Y	Y	Y	Y	N	Included
4	James, et al., 2017	U	Y	Y	Y	Y	U	Y	Y	Y	Y	Included
5	Nega, et al., 2018	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Included
6	El Hajj , et al., 2020	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Included

Y= Yes; N= No; U = Unclear

The health complaints and types of herbs used during pregnancy.

In 1176 pregnant women who used herbs during pregnancy, various indications were reported, especially

for health complaints during pregnancy. The most common health complaints handled using herbs by pregnant women included common cold (28.1%), nausea-vomiting / morning sickness (20.7%), and UTI (10%).

Health complaints during pregnancy that indicate the use of herbs by pregnant women are presented in table 3.

Table 3: Health complaints during pregnancy that indicate the use of herbs by pregnant women.

No	Indication	Total	%
1	Common cold / Cough (1,2,3,4,5,6)	488	28.1%
2	Nausea, vomiting/ morning sickness (1,2,3,4,5,6)	359	20.7%
3	UTI (1,3, 4)	173	10%
4	Anemia	162	9.3%
5	Skin problem (5,6)	115	6.6%
6	Indigestion/ gastralgia/ chest pain, heartburn	96	5.5%
7	Pedal edema (4)	72	4.1%
8	Headache	52	3%
9	Stomach pain	38	2.2%
10	Relax, calming	37	2.1%
11	Constipation	37	2.1%
13	Sleep, Insomnia	30	1.7%
14	Hypertension	29	2.2%
15	Fatigue	15	0.9%
16	Flatulence	10	0.6%
19	Other	22	1.3%

A total of 25 types of herbal medicines used by pregnant women for common cold; nausea-vomiting / morning sickness, and UTI symptoms during pregnancy were found. In general, ginger (*Z. officinale Roscoe*) was the most widely used herb for common cold (27.5%) and nausea-vomiting / morning sickness (56.9%), while cranberry (*V. macrocarpon*) (55.1%) was the most prevalent herb used for UTI complaints during pregnancy.

There are 16 types of herbs that are used for common cold complaints during pregnancy. In the European region, the herbs used include Linden (*Tilia Sp*), rose hip (*Rosa Rugosa*), Chamomile (*Matricaria recutita L.*), Echinacea (*Echinacea sp.*), Peppermint (*Mentha x pipertia*), Carnation (*Dianthus caryophyllus*), Ginger (*Zingiber officinalis*), Chilli pepper (*Capsicum annum L.*), Pepper (*Piper nigrum*). In the Asian region, pregnant women use ginger, thyme (*Thymus vulgaris*), and lemon (*Citrus limon*) to treat common cold symptoms. Ginger (*Zingiber officinalis*), Garlic (*Allium sativum*), Lemon (*Citrus limon (L.)*), Basil (*Ocimum lamiifolium*), Eucalyptus (*Eucalyptus globulus*), Tenaadam (*Ruta chalepensis*), Black cumin (*Nigella sativa*), and Kola nuts (*Garcinia kola*) are herbs used by pregnant women in Africa for common cold symptoms.

There are 13 types of herbs used for complaints of nausea and vomiting during pregnancy. Ginger (*Zingiber officinalis*), Peppermint (*Mentha x pipertia*), Thyme

(*Thymus vulgaris L.*), Dill (*Anethum graveolens*), Melissa (*Melissa L, sp.*), Carnation (*Dianthus caryophyllus*), Parsley (*Petroselinum crispum*), Cinnamon (*Cinnamomum verum*) are herbs used for symptoms of nausea and vomiting during pregnancy by pregnant women in European region. In Asian region, lemon (*Citrus limon*) is also used to treat nausea and vomiting symptoms besides ginger. In African region, besides ginger and lemon, other herbs including Tenaadam (*Ruta chalepensis*), Black Cumin (*Nigella sativa*), Lime Leaves (*Citrus aurantifolia*), Kola Nuts (*Garcinia kola*) are also used by pregnant women for symptoms of nausea and vomiting.

There are 7 types of herbs used for complaints of UTIs during pregnancy. In the European region, pregnant women use cranberries (*V. macrocarpon*) to treat symptoms of UTIs. In the Asian region, the types of herbs used for symptoms of UTI during pregnancy including thyme (*Thymus vulgaris*), garlic (*Allium sativum*), and sage (*Salvia officinalis*). In Africa region, rabena (*Luffa acutangula*), lime leaves (*Citrus aurantifolia*), and guava leaves (*Psidium guajava*) are herbs used by pregnant women to treat UTIs.

The types of herbs used by pregnant women for symptoms of common cold, nausea-vomiting/ morning sickness, and UTIs during pregnancy can be seen in table 4.

Table 4: The types of herbs used for symptoms of common cold, nausea-vomiting, and UTIs during pregnancy.

No	Indication	Herbal Used					
		EUROPE	No	ASIA	No	AFRICA	No
1	Common cold / Cough (1,2,3,4,5,6)	Linden (<i>Tilia Sp</i>)	57	Ginger (<i>Z. officinalis Roscoe</i>)	6	Ginger (<i>Z. officinalis Roscoe</i>)	125
2		rose hip (<i>Rosa Rugosa</i>)	28	Thyme (<i>Thymus vulgaris L</i>)	2	Garlic (<i>Allium sativum</i>)	110
3		Chamomile (<i>Matricaria recutita L</i>)	18	Lemon juice (<i>Citrus limon (L)</i>)	1	Lemon (<i>Citrus limon (L.)</i>)	40
4		Echinacea (<i>Echinacea sp.</i>)	12			Basil (<i>Ocimum lamifolium</i>)	36
5		Peppermint (<i>Mentha x pipertia</i>)	3			Eucalyptus (<i>Eucalyptus globulus</i>)	16
6		Carnation (<i>Dianthus caryophyllus</i>)	2			Tenaadam (<i>Ruta chalepensis</i>)	12
7		Ginger (<i>Z. officinalis Roscoe</i>)	2			Black cummin (<i>Nigella sativa</i>)	9
8		Chilli pepper (<i>Capsicum annum L</i>)	1			Kola nuts(<i>Garcinia kola</i>)	2
9		Pepper (<i>Piper nigrum</i>)	1				
1	Nausea, vomiting, morning sickness (1,2,3,4,5,6)	Ginger (<i>Z. officinalis Roscoe</i>),	188	Ginger (<i>Z. officinalis Roscoe</i>)	4	Lemon (<i>Citrus limon (L.)</i>)	40
2		Peppermint (<i>Mentha x pipertia</i>)	62	Lemon juice (<i>Citrus limon (L.)</i>)	2	Ginger (<i>Z. officinalis Roscoe</i>)	11
3		Thyme (<i>Thymus vulgaris L</i>)	16			Tenaadam (<i>Ruta chalepensis</i>)	5
4		Dill (<i>Anethum graveolens</i>)	7			Black Cummin (<i>Nigella sativa</i>)	4
5		Melissa (<i>Melissa L., sp.</i>)	6			Lime Leaves (<i>Citrus aurantifolia</i>)	3
6		Carnation (<i>Dianthus caryophyllus</i>),	3			Kola Nuts (<i>Garcinia kola</i>)	3
7		Parsley (<i>Petroselinum crispum</i>)	2				
8		Cinnamon (<i>Cinnamomum verum J</i>)	1				
1	UTI (1,3, 4)	Cranberry (<i>V. macrocarpon</i>)	92	Thyme (<i>Thymus vulgaris L</i>)	1	Rabena (<i>Luffa acutangula (L.)</i>)	69
2				Garlic (<i>Allium sativum</i>)	1	Lime Leaves (<i>Citrus aurantifolia</i>)	2
3				Sage (<i>Salvia officinalis L.</i>)	1	Guava Leaves (<i>Psidium guajava</i>)	1

The safety status of herbs used for health complaints during pregnancy.

Of the 25 types of herbs used for common cold, nausea-vomiting/ morning sickness, and UTIs symptoms during pregnancy, 7 herbs species are classified as safe to use during pregnancy, 5 herbs species are classified as potentially harmful for use during pregnancy, and the safety status of the remaining 13 herbs species is

unknown.^[6,14] Thus, there were 649 (64.7%) pregnant women who used herbs that were safe to use during pregnancy, 59 (5.8%) used herbs that were dangerous to use during pregnancy, and 294 (29.3%) women used herbs whose safety status was unknown for use during pregnancy. The types of herbs used, and their safety status can be seen in table 5.

Table 5: The safety status of herbs used for symptoms of common cold, nausea-vomiting, and UTIs during pregnancy.

No	Herbal Name	Total Users	Herbal Safety Status			Results
			Mills And Bone Classification ^[6]	Botanical Safety Handbook Classification ^[6]	Safety Classification ^[14,68]	
1	Ginger (<i>Zingiber officinalis</i>)	336	A	-	Safe to use	SAFE
2	Garlic (<i>Allium sativum</i>)	110	A	-	Safe to use	SAFE
3	Cranberry (<i>V. Macrocarpon</i>)	92	A	-	Information unavailable	SAFE
4	Peppermint (<i>Mentha x pipertia</i>)	65	B2	-	Safe to use	SAFE

5	Chamomile (<i>M. recutita L.</i>)	18	A	-	Safe to use	SAFE
6	Eucalyptus (<i>Eucalyptus globulus</i>)	16	NC	-	Safe to use	SAFE
7	Echinachea (<i>Echinacea sp.</i>)	12	A	-	Safe to use	SAFE
8	Basil (<i>Ocimum lamiiifolium</i>)	36	NC	2B/2C	Use with caution	POTENTIAL HARMFULL
9	Thyme (<i>Thymus vulgaris L.</i>)	19	B2	-	Potential harmful	POTENTIAL HARMFULL
10	Parsley (<i>Petroselinum crispum</i>)	2	NC	2B	Information unavailable	POTENTIAL HARMFULL
11	Sage (<i>Salvia officinalis L.</i>)	1	C	2B	Potential harmful	POTENTIAL HARMFULL
12	Cinnamon (<i>Cinnamomum verum</i>)	1	NC	-	Potential harmful	POTENTIAL HARMFULL
13	Rabena (<i>Luffa acutangula (L.)</i>)	69	NC	-	Information unavailable	UNKNOWN
14	Linden (<i>Tilia Sp</i>)	57	NC	-	Information unavailable	UNKNOWN
15	Black Cumin (<i>Nigella sativa</i>)	53	NC	-	Information unavailable	UNKNOWN
16	Lemon (<i>Citrus limon (L.)</i>)	41	NC	-	Information unavailable	UNKNOWN
17	Rose Hip (<i>Rosa Rugosa</i>)	28	NC	-	Information unavailable	UNKNOWN
18	Tenaadam (<i>Ruta chalepensis</i>)	17	NC	-	Information unavailable	UNKNOWN
19	Dill (<i>Anethum graveolens</i>)	7	NC	-	Information unavailable	UNKNOWN
20	Melissa (<i>Melissa L., sp.</i>)	6	NC	-	Information unavailable	UNKNOWN
21	Carnation (<i>Dianthus caryophyllus</i>)	5	NC	-	Information unavailable	UNKNOWN
22	Kola Nuts (<i>Garcinia kola</i>)	5	NC	-	Information unavailable	UNKNOWN
23	Lime Leaves (<i>Citrus aurantifolia</i>)	3	NC	-	Information unavailable	UNKNOWN
24	Paprika (<i>Capsicum annum L.</i>)	1	NC	-	Information unavailable	UNKNOWN
25	Guava Leaves (<i>Psidium guajava</i>)	1	NC	-	Information unavailable	UNKNOWN
26	Pepper (<i>Piper nigrum</i>)	1	NC	-	Information unavailable	UNKNOWN

NC = Not Categorized; 2B = Not be used during pregnancy; 2C = Not be used during lactation

DISCUSSION

In this study, it was found that common cold is the most common health complaint in pregnancy, which is most often handled using herbal medicine by pregnant women. Similar results were also found in a study by Ahmed (2017) that common cold symptom is one of the most common indications of health complaints being treated using herbs by pregnant women. Due to immunological changes during pregnancy, pregnant women are susceptible to infections, both viral and bacterial, including common cold. Symptoms of flu and fever include coughing, nasal congestion, nasal discharge, sneezing, and sore throat. These complaints can disappear on their own, but sometimes the infection spreads to other nearby organs or disrupts the quality of life of the pregnant woman herself.^[21]

Ginger (*Z. officinalis*) is the herb most widely used for this complaint. Ginger may be more commonly used for nausea and vomiting, but ginger can also be used to relieve common cold symptoms because of its anti-inflammatory properties.^[22] Gingerol is one of the active ingredients in ginger, which has various pharmacological properties, including anti-inflammatory activity.^[23] In the European region, besides ginger, other herbs that have been used that found in this study for common cold symptoms include Linden (*Tilia Sp*), rose hip (*Rosa Rugosa*),

Chamomile (*Matricaria recutita L.*), Echinachea (*Echinacea sp.*), Peppermint (*Mentha x pipertia*), Carnation (*Dianthus caryophyllus*), Chilli pepper (*Capsicum annum L.*), and Pepper (*Piper nigrum*). Chamomile, mint, echinacea, and linden are known to be used traditionally to treat flu, fever, and symptoms of acute respiratory infections in general because it also contains active anti-inflammatory ingredients.^[24-27] As a medicine for respiratory tract inflammation, including common cold, chamomile is usually drunk as a tea or for external use.^[28] Mint essential oil contains the main ingredients of menthol, menthone, and menthyl acetate. The content of menthol has been widely extracted in various topical common cold treatments. Recent study found that the efficacy of steam inhaled from boiling chamomile gave positive results on existing symptoms. However, the quality of the study was not sufficient to reach definite conclusions.^[29] Echinacea consumption orally can help reduce the severity of symptoms and the duration of the common cold in adults by about 10% to 30%.^[30] The gingerol content in ginger is also found in plants of the genus *Afromomum* including paprika.^[23] Pepper is known to have strong anti-inflammatory properties, so it can also be used for flu-fever symptoms.^[31]

Ginger is also used for the same indications by pregnant women in Asia. Besides ginger, thyme (*Thymus vulgaris*)

and lemon (*Citrus limon*) are also used for common colds during pregnancy. Since a long time ago, thyme has been widely used as a herbal treatment for common cold symptoms.^[32] In addition to its anti-inflammatory properties, vitamin C that also contained in lemon can help overcome common cold.^[33]

Besides ginger and lemon, Garlic (*Allium sativum*), Basil (*Ocimum lamifolium*), Eucalyptus (*Eucalyptus globulus*), Tenaadam (*Ruta chalepensis*), Black cumin (*Nigella sativa*), and Kola nuts (*Garcinia kola*) are herbs used by pregnant women in Africa for common cold complaints. In West Africa, basil leaf decoction is widely used to treat coughs.^[23] The allucin in garlic is one of the main ingredients that has anti-inflammatory properties. In preclinical tests (*in-vitro* and *in-vivo*) garlic extract shows antiviral activity against various viral infections including flu and respiratory tract infections.^[34] Tenaadam contains various active secondary metabolites such as furanocoumarines and alkaloids which have anti-inflammatory properties.^[35] Black cumin contains thymoquinone, a quinine derivative that has anti-inflammatory properties.^[36] Thymoquinone activity is known to affect several inflammatory mediators.^[37] The use of eucalyptus for common cold symptoms can be in the form of essential oils added when bathing, in the form of capsules and taken orally, or in the form of ointments or oils and then applied.^[38] In Nigeria, kola nuts are among the herbs in traditional medicine to treat inflammation. The seeds contain kolaviron and garcinoic acid compounds, two substances that have anti-inflammatory activity.^[39]

Symptoms of nausea vomiting are the second most common health complaint in pregnancy as an indication for herb use by pregnant women in this study. These results are similar to studies conducted by Ahmed (2017) and Ahmed (2018). Studies in the Asian region show that nausea and vomiting are one of the common indications of herbal use in pregnant women.^[14] Furthermore, in the African region, it was found that more than 25% of pregnant women use herbs to treat these symptoms, making them the most commonly treated symptoms using herbs.^[40]

Ginger (*Z. officinalis* Rosc) was the herbal type most widely used for nausea and vomiting in this study. Based on evidence from systematic reviews, ginger can be considered a harmless and possibly effective alternative to treating nausea and vomiting during pregnancy.^[41] However, a study showed little or no difference in ginger and metoclopramide effect on nausea symptom scores or vomiting symptoms scores on the 3rd day after the intervention.^[42] In the European region, other herbs that are used for symptoms of nausea and vomiting found in this study include Peppermint (*Mentha x pipertia*), Thyme (*Thymus vulgaris* L.), Dill (*Anethum graveolens*), Melissa (*Melissa L., sp.*), Carnation (*Dianthus caryophyllus*), Parsley (*Petroselinum crispum*), and Cinnamon (*Cinnamomum verum*). Like ginger, mint, cinnamon, parsley, and melissa are also known to have anti-nausea and antiemetic effects.^[43-45] Mint aromatherapy is presumed to inhibit serotonin-induced muscle contraction, resulting in antiemetic and antispasmodic effects on the gastrointestinal system.^[43]

Lemon (*C.limon*) is another herb used by pregnant women in Asia to treat nausea and vomiting, besides ginger.^[43] The abundant flavonoid content in lemon increases bile production that can neutralize the digestive reducing nausea.^[46]

Apart from Asia, ginger and lemon are also used by pregnant women in Africa to treat nausea and vomiting. Other herbs that have been used for symptoms of nausea and vomiting in this study include Tenaadam (*Ruta chalepensis*), Black Cumin (*Nigella sativa*), Lime Leaves (*Citrus aurantifolia*), and Kola Nuts (*Garcinia kola*). Like lemon, black cumin, tenaadam, and lime leaves also contain flavonoids, which have antiemetic effects.^[42,47,48] Kola nuts are also widely used to control nausea and vomiting.^[49]

In this study, it was found that UTI is the third most frequent complaint of pregnancy by using herbs by pregnant women. Similar results were also found in a study by Illamola (2019) that UTI is one of the most common complaints as an indication of herbal use during pregnancy. Cranberry (*V. macrocarpon*) is the herb most widely used for UTI complaints during pregnancy in this study. Traditionally, especially in the European region, pregnant women have used cranberries to treat UTIs. However, based on recent research, cranberry juice does not have a significant benefit in preventing UTIs and may not be consumed in the long term. Furthermore, cranberry products (such as tablets or capsules) are also ineffective in preventing UTIs (although they have the same effect as antibiotics).^[50]

The types of herbs used by pregnant women in the Asian region for complaints of UTIs during pregnancy that were found in this study included others that also had antimicrobial effects, including thyme (*Thymus vulgaris*), garlic (*Allium sativum*), and sage (*Salvia officinalis*). Thyme contains phenolic compounds (thymol and carvacrol) which have an antimicrobial effect.^[51] Thyme also being the most effective herb to treat infections caused by *E. coli* bacteria which are the most frequent cause of urinary tract infections, besides ginger.^[52] Garlic has a broad spectrum of antimicrobial activity, including effects on *Escherichia*, *Salmonella*, *Staphylococcus*, *Streptococcus*, *Klebsiella*, *Proteus*, *Mycobacterium*, and *Helicobacter* species.^[53] In one study, it was found that garlic can be an alternative treatment for UTIs and as prophylaxis, especially for patients with antibiotic resistance.^[54] Apart from having anti-inflammatory effects and antioxidant potential, sage also has antimicrobial effects.^[55]

Rabena (*Luffa acutangula*), lime leaves (*Citrus aurantifolia*), and guava leaves (*Psidium guajava*) are herbs used by pregnant women in Africa to treat UTI during pregnancy. The methanol extract of all parts of the rabena plant was known to have strong inhibitory power against *E. coli* and *S. aureus*, while the methanol extract of the fruit and leaves showed significant inhibition against *K. pneumonia*.^[56] Traditionally, in Africa, guava leaves have been used as an antimicrobial. In a study conducted by Sharma (2017), guava leaf extract was found to have antibacterial effects. Antibacterial studies on lime leaves also found antibacterial activity on *K. pneumoniae*, *Pseudomonas*, *S. aureus*, and several species of fungi.^[57]

In this study, 7 types of herbs found are safe during pregnancy and were used by 649 (64.7%) pregnant women; including ginger (*Z. officinalis* Rosc), garlic (*A. sativum*), chamomile (*M. recutita* L.), cranberry (*V. macrocarpon*), mint (*M. pipertia*), eucalyptus (*E. globulus labill*), and echinacea (*Echinacea sp.*). WHO recommends ginger and chamomile as alternative interventions for nausea and vomiting during pregnancy because studies have been shown these herbal are safe.^[2] Garlic is safe for use during pregnancy and breastfeeding, even for long-term use.^[58] However, further studies show some of the herbs above have side effects that can be dangerous for

pregnant women, especially oral use, long-term use, or interactions with conventional drug use/ the herb-drug interaction.

Eucalyptus may only safe by topical use because the content of 1,8-cineole in eucalyptus has been reported to penetrate the placenta in studies in rodents.^[59] Cranberries must be considered if pregnant women use warfarin because there were case reports of the interaction between cranberry and warfarin in 33 patients and 1 of them was a fatal case.^[60] Thus, the safety status of herbs used during pregnancy can be influenced by various factors. Safe status in these herbs does not necessarily mean that pregnant women can use them in all conditions. However, the multitude of mixed research results suggests that further studies are needed to determine the herbs's safety status during pregnancy.

In this study, it was also found that pregnant women still consume bacilli (*O. lamifolium*), parsley (*P. crispum*), thyme (*T. vulgaris*), cinnamon (*C. verum*), or sage (*S. officinalis*), all of which are classified as potentially harmful herbs to consume during pregnancy. Parsley was known to have a stimulating effect on the uterus, so pregnant women are advised to avoid using parsley.^[61] All herbal species in the genus Cinnamomum, including cinnamon, contain coumarins which are anticoagulants.^[62] This type of anticoagulant is not too dangerous, but consumption in large amounts is reported to cause methemoglobinemia, hematuria, albuminuria, and cylindruria in pregnant women.^[63] Based on a study conducted by Ahmed (2017), there have not been many human or animal studies of thyme herbs in the current literature. However, thyme has an abortifacient activity/stimulates uterine contractions, so it is potentially dangerous to use. Sage essential oil contains a high proportion of α - and β - thujones known to have abortifacient and emmenagogic effects / stimulate menstruation.^[64] This shows that although these herbs are proven to be efficacious for complaints experienced in the general population and may provide the same benefits to pregnant women, these herbs have side effects that can harm both the mother and the fetus because its active ingredients.

More than half of the types of herbs used by pregnant women in this study had unknown safety status in their use during pregnancy because there was no information regarding their safety in either The Botanical Safety Handbook, Mills and Bone Safety Classification, or the safety classification of herbs during pregnancy in the study conducted by Ahmed (2017). Based on further studies, it was found that several herbs have substances that stimulate uterine contractions, including tenaadam (*R. chalepensis*), rabena (*L. acutangula*), and dill (*A. graveolens*). Tenaadam contains furanocumarins known to be embryotoxic, causing implantation failure and early abortion.^[40] Pregnant women in Africa widely consume Rabena, but there have been reports of cases of abortion in ruminants ingesting this fruit by farmers in northeastern Brazil. In another study, it was explained that women also used the tea made from rabena fruit to induce abortion.

Furthermore, studies on pregnant mice showed less weight and a single cleft palate in born mice fetuses.^[65] Studies regarding dill's safety during pregnancy are still not many, but studies in mice have shown that dill causes contraction of the uterus.^[66] This effect may be due to the presence of anethole and tannins in the dill, which usually comes from polyphenols and has a contractionary nature in the uterus.^[67] Meanwhile, using excessive doses of herbs

can be dangerous because they cause side effects in pregnancy. Kola nuts may be classified as safe for use during pregnancy, but the recommended dose is only a small cup a day because of their strong caffeine content.^[4] Side effects include weight loss, long sleep duration, and increased libido.^[2] Thus, many herbs that have not been studied for their safety to be used during pregnancy are at risk because of the contained substances found, especially substances that stimulate uterine contractions that can endanger the pregnant women and the fetus, based on further studies. Moreover, the safety of the herbs in this study during pregnancy has not been much studied.

CONCLUSION

Pregnant women use many herbs for health complaints during pregnancy, especially for symptoms of common cold, nausea-vomiting, and UTI, and a total of 25 types of herbs used to treat these health complaints were found. Based on studies regarding the safety of their use in pregnancy, only a small proportion of herbs are safe, while the rest as potentially harmful or unknown safety status during pregnancy. Furthermore, it was found that some herbs with unknown safety status contained various substances that could cause side effects on pregnancy. If there is no adequate data that is in accordance with general medical practice, it is recommended not to use these herbal products during pregnancy and breastfeeding.

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