Effect of Peppermint as One of Carminatives on Relieving Gastroesophageal Reflux Disease (GERD) During Pregnancy

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Abstract: This is an intervention study **aimed** at studying the effectiveness of peppermint on relieving gastroesophageal reflux disease "GERD" during pregnancy .It was conducted at out patient antenatal clinic of Ain Shams Maternity University Hospital after obtaining faculty ethical committee approval. The **sample** was consisted of 221 pregnant women. **Tools** used for data collection consisted of woman's knowledge structured interviewing questionnaire regard peppermint; woman's diary regard GERD symptoms improvement with peppermint use, gastroesophageal reflux disease symptom assessment scale (GSAS) and supportive material in the form of an Arabic leaflet was used. **Results** revealed improvement in pregnant women knowledge regard GERD & peppermint, before and after intervention. As regard analysis and variation in women's GERD symptoms, mean number of symptoms and mean distress score before and after using peppermint a highly statistically significant difference was detected before and after intervention which indicated marked improvement in GERD symptoms after using peppermint. Also strong positive correlation was proved between pregnant women compliance regard peppermint use instructions & GERD relieve measures and means GERD distress score at pre and post intervention. **The study concluded** that use of carminatives as peppermint tea, beside compliance to lifestyle measures are effective on relieving GERD Grade 1 (NERD) during pregnancy. The study **recommended** using of peppermint tea in-between meals for relieving of GERD during early stages of pregnancy. Further studies are still needed to determine the effect of using peppermint in different forms on relieving GERD during pregnancy.

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1. Introduction

Gastroesophageal Reflux Disease, Heartburn, Acid Reflux Disease and GERD are all terms used to define acid reflux disease. This condition is defined as the production of reflux (stomach acids) in the back of the throat or mouth. The disease can be extremely painful and make breathing difficult. Symptoms of acid reflux disease can strike anyone at any age, even babies can become stricken. Pregnancy, heavy meals, excessive weight, lack of sleep, and not getting enough sleep can all contribute gastroesophageal Reflux Disease "GERD" **(Ali & Egan, 2007)** . Symptoms of GERD include heartburn and acid regurgitation, nausea, vomiting and additional symptoms may include epigastric discomfort, dysphagia, chest pain, flatulence, chronic cough, hoarseness **(Budhiraja *et al.*, 2010)**.

GERD commonly known as heartburn, is common in pregnancy and is experienced by 45-80% of pregnant women. Fifty-two percent of pregnant women first experience heartburn in the first trimester; 24-40% experience it in the second trimester, and 9% experience it in the third trimester. Both mechanical and intrinsic factors are involved. Abnormal esophageal motility, decreased lower esophageal sphincter (LES) pressure, and increased gastric pressure contribute to GERD in pregnancy. Increased intra-abdominal pressure from the gravid uterus and displacement of the LES also play roles **(Ali & Egan, 2007).**

During pregnancy the hormones progesterone and estrogen are produced in much larger quantities than normal. These hormones have a number of functions, one of which is to relax the muscles of the uterus enough to allow it to stretch to accommodate the growing fetus. However, the uterus is not the only part of the body which is relaxed by the up tick in hormone production. The increase in progesterone and estrogen can also relax the muscles in the gastrointestinal tract (GIT), making bowel movements more frequent. They also relax the muscles of the esophagus, making it easier for the lower esophageal sphincter to open, resulting in acid reflux. Also, during pregnancy, the uterus can push the stomach upward, putting pressure on the esophagus, also causing a weakening of the lower esophageal sphincter, thus contributing to GERD symptoms. In some severe cases, the pressure can cause a hiatus hernia which can contribute to GERD **(Green , 2011).**

GERD occurs as three basic types or grades: First grade is non-erosive esophageal reflux disease **(NERD)**, which may account for up to 70 percent of

patients with GERD. Second is erosive oesophagitis and its more severe complications, it include **NERD** and the additional pathologies that result as GERD progresses, including esophageal ulcer, esophageal stricture and Final third degree is Barretts oesophagus **(Aan & Lekes , 2008)**. **NERD** is the mildest form of GERD and is a functional disease, which means that there are no changes to the body tissues. With erosive oesophagitis there are organic changes, such as erosion of the lining of the oesophagus or even ulceration. In the case of Barretts oesophagus, the cells lining the oesophageal wall change into what are thought to be precancerous cells & esophageal adenocarcinoma **(Vakil, *et al.*, 2006**).

Carminative is a herb or preparation that either prevents formation of gas in the gastrointestinal tract or facilitates the expulsion of gas, thereby combating flatulence. Carminatives have been shown to decrease lower esophageal pressure, which on the other hand increases the risk of GERD or 'heartburn. They are volatile oils usually of vegetable extraction and their names have an old-world ring: cardamon, dill, ginger, peppermint, cinnamon, and cloves **(Lyn, 2011**).

Peppermint has been traditionally considered to have carminative effects, generally used as tea or digestive tablet or candy. The exact mechanism is not known, but it is proposed that one way is the essential oils relax the esophageal sphincter, which then releases the gas. Essential oils used directly in the stomach, however, give many people heartburn, especially if hiatus hernia is present **(Holtmann *et al.*, 1999**).

Peppermint is a plant. The leaf and oil are used as medicine. Peppermint is one of the most popular flavoring agents used for the common cold, cough, inflammation of the mouth and throat, sinus infections, and respiratory infections. It is also used for digestive problems including heartburn, nausea, vomiting, morning sickness, irritable bowel syndrome (IBS), cramps of the upper GIT and bile ducts, upset stomach, diarrhea, bacterial overgrowth of the small intestine, and gas. When peppermint is taken after a meal, its effects will reduce gas and help the digestion of food by reducing the amount of time the food is in the stomach. This is one reason after-dinner mints are so popular (**Sagduyu, 2002**).

The compounds of the essential oil have antispasmodic properties that reduce spasms of the colon and intestinal tract and relax the stomach muscles. Peppermint has a soothing effect on the lining and muscles of the colon, which helps to relieve diarrhea and spastic colon. Peppermint oil is popular in the treatment of motion and sea sickness and nausea associated with pregnancy. It acts as an anesthetic to the stomach wall and eases vomiting and nausea **(May *et al.*, 2000**).

Treating pregnant women with GERD can be a challenge for medical team because many of the medications used to treat GERD in other patients cannot be used, or must be used in reduced doses because of the potential for harmful effects on the developing fetus. In some cases, overuse of antacids can inhibit iron absorption by the fetus, but dietary supplements containing iron that the mother can take will mitigate this effect. Management of GERD is based on multidisciplinary approaches as lifestyle modification, herbal medicine and dietary changes as part of the normal course of treatment for GERD, but because weight gain is important to the development of the fetus, pregnant women can not make all of the dietary changes suggested to other patients. Pregnant women can change the types of foods they eat however, consuming less food likely to result in the overproduction of stomach acid. Other common therapies for GERD such as changing sleep position and refraining from eating close to bed time can also be safely undertaken by pregnant women. Maternity nurse is the most important aspect in medical team and play key role in GERD prevention and management **(Brandt *et al.*, 2002).**

Herbal medicine becomes more prevalent, a review of 300 nonmedical sources of advice about herbal remedies in pregnancy (books, magazines, and Web sites) found that ginger, chamomile, peppermint, and red raspberry leaf tea were the most commonly cited herbal remedies for GERD, One study demonstrated that 2 dried peppermint spoon leaves in 1 cup boiling water for 10 minutes with tea four to five times per day between meals was more effective than placebo in reducing the symptoms of GERD **(Wilson, 2004)**. Nurses need to be aware of potentially beneficial as well as harmful effects related to herbal use. Nurses should educate themselves sufficiently to guide their patients in the safe use of herbs. It is essential that nurses teach their patients about possible interactions between herbs & prescription or over-the-counter medications. The nurse should also familiarize herself with how specific herbs are used, because the same key concepts underlying the administration of medications apply to herbal medicines as well: right medication, right route, right dose & right time **(Diane & Mary , 2005).**

Maternity nurses and other health professionals have a responsibility to provide women's holistic health care. GERD prevention is a very important aspect of holistic health care, which needs to be promoted. The specialized nurse in particular can play a crucial role as educator and counselor as regards GERD prevention and management to meet the individualized women needs with the emphasis placed on the holistic approach to the care of the individual in health and illness *(***Campbell *et al.*, 2005).**

Aim:

To study the effectiveness of peppermint as one of carminatives on relieving GERD during pregnancy through:

Assessing pregnant women's knowledge regard peppermint as one of carminative and GERD during pregnancy course.

Evaluating the effectiveness of peppermint on relieving GERD during pregnancy

Evaluating the effectiveness of compliance to lifestyle measures on relieving GERD during pregnancy

Study Questions:

Is peppermint effective on relieving GERD during pregnancy?

Is compliance to lifestyle measures effective on relieving GERD during pregnancy?

Justification of the Problem:

GERD is a serious problem occurs in up to 80% or more of pregnant women, affecting women quality of life and may lead to hospitalization to treat the very painful symptoms of this illness. GERD can also be extremely dangerous to the unborn child, because if it causes the mother excessive vomiting or weight loss, the resulting loss of nutrients to the developing child can be detrimental to his or her growth. Treating GERD in pregnant women can be tricky, because some of the dietary and lifestyle changes that are recommended for other GERD patients simply aren't advisable for pregnant women, and because some of the medications recommended for other patients may be dangerous for the fetus **(Poursharif *et al.*, 2008)**. The use of herbs is a time-honored approach to strengthening the body and treating disease, therefore using herbal medicine is most common safe for management of GERD . So the researchers suggested the present study to study effect of peppermint on relieving this disorder as one of the cheapest carminative herb useful, pleasant, appear to be without side-effect and present in the Egyptian community and commonly used from our society.

2. Subject and Methods:

Study Design, Site, and Sampling:

An intervention study had been conducted in outpatient antenatal clinic at Ain Shams Maternity University hospital. It started in October 2010 and was completed by November 2011. Purposive sample technique were used through taking all available pregnant women (**254**) admitted in the study period and fulfilling the following inclusion criteria: normal pregnancy (during 1st & 2nd trimester), suffering from GERD (1st grade; non-erosive reflux disease "NERD"), with different age, parity, can read and write and had a telephone were included in the study. The sample had not taken any drugs to relieve these disorders. Exclusion criteria were the subject was under medical treatment during the research period, Documented gastric or duodenal ulcer, had metabolic, renal or endocrine diseases, or suffered from complications of pregnancy. So working sample size was reached **221** as 33 women were dropped out throughout the study due to inability to follow client and women related cause.

Tools of the study:

Three types of tools were used for data collection and conduction of the study. These consisted of woman's knowledge structured interviewing questionnaire regard peppermint; woman's diary regard GERD symptoms, peppermint use & measures used to relieve GERD , gastroesophageal reflux disease symptom assessment scale (GSAS). They were used pre/post using of peppermint. Also supportive material in the form of an Arabic leaflet was used.

1. **Woman's Knowledge Structured interviewing Questionnaire Regard Peppermint:**

It was designed by the researchers after reviewing of related literature. The tool which included 23 multiple choice questions, as well as open and close-ended questions and was divided into three parts:

Part I:

It covered the general characteristics of the sample as personal identification and demographic data, e.g., age of woman, place of residence, and educational level, etc.

Part II:

This part is concerned with present pregnancy history & complaints.

Part III:

This part was designated to assess pregnant woman’s knowledge related to GERD & herbal medicine, action, uses, recommended dose of peppermint, source of knowledge,….etc.

Knowledge scoring system:

Scores 2, 1, or zero were assigned to each answer representing good, average and poor respectively. Total knowledge scores ranged from zero to 30; from 0-9 were evaluated as poor, from 10-20 as average, and from 21-30 as good knowledge.

2. **Woman's Diary Regard GERD Symptoms , Peppermint Use & Measures Used To Relieve GERD :**

It was designed by the researchers after reviewing of related literature. The tool used by each woman to record the frequency and severity of GERD symptoms, dose, side effects of peppermint if present, measures used to relieve GERD, daily improvements, as well as any problem arise.

Validity and reliability:

These tools were reviewed by jury of 5 expertises in the field of maternity and neonatal nursing & gynecology to test its contents and face validly. Reliability was done by Cronbach's Alpha coefficient test which revealed r = 81.3.

3. **Gastroesophageal Reflux Disease Symptom Assessment Scale "GSAS" (Budhiraja *et al.*,**

2010):

It is a standard self administered valid questionnaire used to evaluate the frequency and severity of 15 GERD-related symptoms. The symptoms evaluated are the following: (1) heartburn or burning pain inside the chest or breast bone, (2) a feeling of pressure or discomfort inside the chest, (3) food coming back into the mouth, (4) an acid or sour taste in the mouth, (5) frequent gurgling in the stomach or belly, (6) a feeling of pressure or lump in the throat, (7) nausea & vomiting, (8) burning pain in the throat, (9) bloating or a feeling like the subjects had to loosen their belt or unbutton their pants/skirt, (10) belching, (11) flatulence or passing gas from below, (12) feeling full after eating a little, (13) bad breath, (14) coughing, and (15) hoarseness.

Women completed the GSAS two times; at the beginning of the study (baseline) and after intervention by four weeks (follow-up).

Scoring system:

Scoring of the GSAS distress subscale is based on the presence of the symptoms and their bother ratings. Specifically, patients first indicate whether they had the symptom in the past week. If they did not have the symptom, then their score for the symptom is 0. If they did have the symptom, they then report how bothered they were by it on a 4-point scale (0 _ not at all, 1 _ somewhat, 2 _ quite a bit, 3 _ very much). The distress scale is scored by summing scores across symptoms and dividing by the total number of non missing symptom scores. The GSAS is computed in this manner as long as 12 or more symptoms are scored. Patients with four or more missing symptom scores are assigned a missing GSAS distress score.

4. Supportive Material Regard Peppermint & Measures Used To Relieve GERD Symptoms In The Form Of An Arabic Leaflet:

Supportive material regard peppermint in the form of an Arabic leaflet was constructed by the research team. The leaflet included action, indications and how to use peppermint, in addition to life style measures used to relieve GERD symptoms.

Measures used to relieve GERD symptoms (Festi *et al.*, 2009):

- Drink 2 glasses of water before eating anything in the morning. This will dilute the acid that builds up in stomach overnight.
- Before you get out of bed in the morning, try eating a few crackers, a handful of dry cereal, a piece of toast or dry bread, or a slice of ginger.
- When feeling good, eat complete meals to help tide you over during periods when nausea may reduce your willingness to eat.
- Eating small-frequent meals (one every 2-3 hours). Start the day with a banana, cereal (cream of wheat, farina, and oatmeal), soft-cooked eggs, toast, or yogurt. For lunch try chicken or tuna salad, cottage cheese and fruit, or broth or clear soup with crackers. For dinner try mashed potatoes, pasta, or rice, with custard, ice cream, gelatin, or pudding for dessert.
- Never go for long periods without food
- Choose meals those are easy and quick to prepare. Sometimes the odor of cooking foods can cause nausea and even vomiting.
- Open windows or use an exhaust fan to minimize food odors when cook.
- Eat slowly and chew food well. Get in the practice of putting down your fork after every bite, and chew each mouthful at least 10 times.
- Avoid eating foods that make it worse especially on an empty stomach. e.g. spicy food
- Rest after meals, but do not lie flat for at least two hours after eating; this may help to prevent an upset stomach.
- Sit upright for 10-20 minutes following eating to prevent gastric reflux.
- Avoid food and drink containing caffeine. Caffeine can speed up gastrointestinal activity, which can lead to dehydration.
- Try drinking peppermint tea instead.
- Avoid brushing your teeth when you wake in the morning and immediately after eating.
- Maintain a normal body weight.
- Stop smoking.
- Avoid tight fitting clothes for around the abdominal cavity.
- Eat a light snack (a small sandwich, bread, or yogurt, and milk or juice) at least 2-3 hours before going to bed.
- Sleep on your left side of the body and while elevating the head, chest higher than the lower part of the body.
- Be sure to have plenty of fresh air in the room in which you sleep.
- If have GERD symptoms at night, raise the head of your bed 6 inch to 8 inch by putting the frame on blocks or placing a foam wedge under the head of your mattress. (Adding extra pillows does not work.)
- Seek medical advise immediately if appear any warning signs signaling serious complications of GERD as persistent nausea, fullness, hoarseness, pain with swallowing can over time lead to erosions in the esophagus.

Administrative Design and Ethical Considerations:

An official approval was obtained from the Maternal & Neonatal Health Nursing department counsels & the Scientific Research Ethical Committee that were approved by the Faculty of Nursing, Ain Shams University Counsel. Also a letter containing the title and aim was directed to the director of Ain Shams Maternity University Hospital then the approval for

data collection was obtained. The aim of the study was explained to each pregnant woman before applying the tools to gain her confidence and trust. An oral consent was obtained from each woman to participate in the study, after ensuring that data collected will be treated confidentially. The study maneuvers do not entail any harmful effects on participating women. Women were informed that they have the right to withdraw from the study at any time without giving a reason. License Agreement for using scale was taken through electronic mail.

Operational Design:

The study to be completed has passed through different phases: The preparatory phase, then the pilot study, and lastly the fieldwork phase.

Preparatory phase:

Review of the current local and international related literature using books, articles and scientific magazines was done by the research team. This helped them to be acquainted with the problem, and guided them in the process of tools' designing. The tools were then presented to experts for review and validation.

Pilot study:

A pilot study was carried out on 25 pregnant women those were excluded in the main study sample. Its aim was to evaluate the simplicity, clarity, validity and reliability of the tools. It also helped in the estimation of the time needed to fill in the forms. According to the results of the pilot study, simple modifications were done as rephrasing two questions and removing one question.

Fieldwork:

The study consumed 12 months, preparation about three months, followed by six months for implementation and three months for data analysis and evaluation. The study started in October 2010 and was completed by November 2011.Data were collected 1 day/ week starting from 10 am to 2 pm. All attended pregnant women fulfilling study criteria were included. Women consented to be included in the study reached (**221**), the interviewing questionnaire sheet was used and the intervention was explained individually in time range 20-25 min, as well as the designed leaflet and a daily diary was given to all women. Women were asked to take peppermint tea (2 dried peppermint spoon leaves in 1 cup boiling water for 10 minutes with tea , this dose was approved by FDA). Drink four to five times per day between meals. Women were asked to record the number of symptoms within the one week previous intervention, and then on each subsequent day of the intervention. The research team asked women to keep the researchers in touch as needed. On subsequent visit, follow up was conducted as the follows 4 weeks post intervention, to assess changes in women knowledge regard peppermint & symptoms improvement using the same pre intervention assessment sheets The researchers compared the subsequent changes in GERD symptoms between pre (baseline score) and post intervention (after 4 weeks score). As well the overall women's scores after 4 weeks of treatment were calculated.

Statistical analysis:

Data entry was done using Epi-Info 6.04 computer software package, while statistical analysis was done using Statistical Packages for Social Science (SPSS) version 18.0. Quality control was done at the stages of coding and data entry. Data were presented using descriptive statistics in the form of frequencies and percentages for qualitative variables, and means and standard deviations for quantitative variables. Qualitative variables were compared using chi-square test, T test and Correlation (r) test. Statistical significance was considered at p-value <0.05, highly significant difference obtained at P < 0.0l and non significant difference obtained at P > 0.05.

3. Results:

Table (1) showed that pregnant women included in the study ranged between 20-38 years, with a mean age of 29.4 ± 1.3 years. Diploma graduate represented the higher percent (55.7 %), followed by those can read and write (23.1 %), while the highly graduate women were limited to 21.2%. Meanwhile, 60.6 % of the studied sample lived in urban areas. Primiparous women represented 19.9 % while multipara represented 80.1 % . The mean gestational age of women represented 15. 3 ±. 2.6 weeks. Women with previous history of GERD during pregnancy represented 64.3 % while the current GERD during pregnancy (incidence) started before pregnancy, first trimester and second trimester represented 10.9 %, 54.7 %, 34.4 %, respectively.

Table (2) revealed improvement in pregnant women knowledge regard GERD & peppermint, there was a highly statistically significant difference was detected between pregnant knowledge regard GERD & peppermint before and after intervention. As initial assessment; good, average & poor score for knowledge represented 2.7%, 7.2 % and 90.2%, respectively. However, in the final assessment; the score improved 25.3 % for good, 52.5 % for average and 22.2% for poor knowledge score.

Figure (1) showed that pregnant women obtain their knowledge regard GERD & peppermint from different resources, it was observed that health care providers were the main source of knowledge regard GERD represented 65 %. On the other hand the pregnant women obtained their knowledge regard peppermint from family, neighbors and colleagues (69.7%, 35.2 & 20.4 %, respectively).

Table (3, 4) illustrated analysis and variation in women's GERD symptoms, mean number of symptoms and mean distress score before and after using peppermint. Average symptom scores, based on women daily diary assessments for the seven days

preceding the baseline visit. A highly statistically significant difference was detected before and after intervention which indicated marked improvement in GERD symptoms after using peppermint.

Table (5) clarified that most of pregnant women were practicing GERD relieve measures, as the mean number of not practiced women represented 27.2 ± 3.6; the irregularly practiced women represented 26.8 ± 3.6 while the regularly practiced was extended to 46 ± 3.7 women.

Also table (6) showed the same result regarding pregnant woman compliance to peppermint use instructions as the mean number of not practiced women represented 29.2 ± 2.4, the irregularly practiced women represented 32 ± 3.3 while the regularly practiced was extended to 36.8 ± 3.1 women

Tables (7 & 8) proved strong positive correlation between pregnant women compliance to peppermint use instructions & GERD relieve measures and means GERD distress score at pre and post intervention as more compliance to peppermint use instructions & measures lead to marked improvement in GERD symptoms during pregnancy.

Table (1): General Characteristics of the Study Sample

General Characteristics	(n =221)	
	No	%
Age: (in years)		
20 – < 25	46	20.8
25 –<30	111	50.2
30 +	64	29
Mean age ± SD	29.43 ± 1.3 (in yrs)	
Residence:		
Urban	134	60.6
Rural	87	39.4
Education:		
Read and write.	51	23.1
Diploma graduate.	123	55.7
University education.	47	21.2
Parity :		
Primiparous women.	44	19.9
Multiparous women.	177	80.1
Previous history of GERD during pregnancy:		
No	79	35.7
Yes	142	64.3
Mean Gestational age (wk)	15. 3 ± 2.6(WK)	
Start of GERD Grade I (NERD) symptoms:		
Pre Pregnancy	24	10.9
1st trimester	121	54.7
2nd trimester	76	34.4

Table (2): Comparison of Women Knowledge Regards GERD and Peppermint Before and After Intervention

Items	Initial assessment baseline Pre intervention		Final assessment Post intervention		X^2	*P*-value
	n = 221		n = 221			
Women Knowledge regard GERD :						
Good	6	2.7	56	25.3	4.420	**0.000
Average	16	7.2	116	52.5		
Poor.	199	90.1	49	22.2		
Women Knowledge regard Peppermint :						
Good	14	6.3	69	31.2	4.420	**0.000
Average	94	42.5	128	57.9		
Poor.	113	51.2	24	10.9		

* Statistically significant difference at $P < 0.05$ ** Highly significant difference obtained at $P < 0.01$

N.B: Poor: < 50% correct answers.
Average: 50%- 70% correct answers. Good: > 70% - 100 % correct answers.

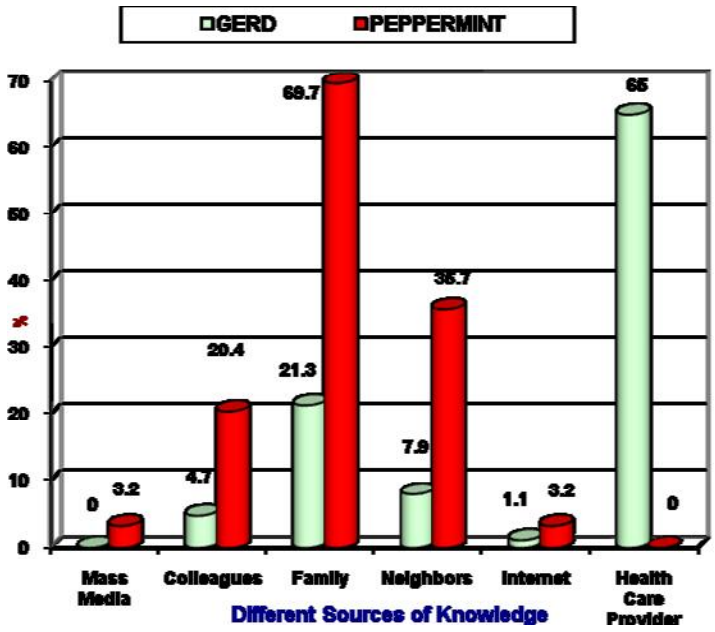

Figure (1): Pregnant Women Sources of Knowledge regard GERD & Peppermint

Table (3) GERD Symptoms Scores during Pregnancy Pre and After intervention

Items	Base line N=221	After 4 weeks N=221	T. Test	*P*
GERD Symptoms Assessment scale	77.2	22.8	28.249	**0.000
Mean number of symptoms (0–15) ± SD	7 ± 3.5	3.1 ± 3.2	15.2	**0.000
Mean distress score (↓) (score range: 0–3) ± SD	2.31 ± 1.49	0.56 ± 0.47	14.6	**0.000

* Statistically significant difference at $P < 0.05$ ** Highly significant difference obtained at $P < 0.0$l

NB: ↓ = lower score is better.

Table (4) Mean GERD Symptoms Using GSAS Distress Scores During Pregnancy Pre And After intervention:

GERD Symptoms	Base line N=221	After 4 weeks N=221	T. Test	*P*-value
(1) Heartburn	1.9 ± 0.6	0.7± 0.3	3.7	* 0. 090
(2) Feeling of pressure	3.1 ± 1.4	1.3 ± 0.4	5.7	** 0.007
(3) Food coming back into the mouth	1.5 ± 0.6	0.5± 0.2	2.9	* 0.187
(4) An acid or sour taste in the mouth	6.1 ± 2.1	3.1 ± 0.3	9.1	** 0.000
(5) Frequent gurgling in the stomach	1.04 ± 0.8	0.8±0.3	5.1	*0.14
(6) Feeling of pressure	6.0 ± 1.3	2.5 ± 1.2	7.7	** 0.000
(7) Nausea & vomiting	0.49 ± 0.6	0.2±0.1	4.1	* 0.054
(8) Nurning pain in the throat	1.6 ± 0.8	0.5± 0.3	2.9	* 0. 257
(9) Bloating	1.4 ± 0.9	1.2 ± 0.7	2.7	* 0. 241
(10) Belching	1.5 ± 0.8	1.3 ± 0. 2	11.9	** 0.012
(11) Flatulence	5.5 ± 2.4	2. 6 ± 1. 8	6.8	**0.001
(12) Feeling full after eating a little,	0.71 ± 0.13	0.3 ± 0.09	4.2	**0.039
(13) Bad breath	7. 4 ± 1.9	3.3 ± 1.1	13.4	**0.000
(14) Coughing	5.5 ± 2.2	2.4 ± 1.3	12.3	**0.000
(15) Hoarseness	4.1 ± 1.2	3.1 ± 1.8	18.5	**0.000

* Statistically significant difference at P < 0. 05 ** Highly significant difference obtained at P < 0.0l

Table (5): Women Compliance to GERD Relieve Measures throughout the study

Preventive measures.	N=221 (100%)		
	Regularly Done %	Irregularly Done %	Not Done %
Drink 2 glasses of water before eating anything in the morning.	31	44.9	24.1
Before you get out of bed in the morning, try eating a few crackers, a handful of dry cereal,	28.7	28.7	42.6
When feeling good, eat complete meals.	77	13.5	9.5
Eating smaller, more-frequent meals.	43.75	25.0	31.25
Never go for long periods without food	31.0	44.7	24.3
Choose meals those are easy and quick to prepare.	49	30	21
Open windows or use an exhaust fan to minimize food odors When cook.	63.0	21.0	16.0
Eat slowly and chew food well.	73.5	19.9	6.6
Avoid eating foods that make it worse especially on an empty stomach.	73.5	19.3	7.2
Rest after meals, but do not lie flat for at least two hours after eating	71.8	25.4	2.8
Sit upright for 10-20 minutes following eating	29.7	38.3	32
Avoid food and drink containing caffeine.	86.7	12.7	0.6
Try drinking herbal tea as peppermint tea	79.0	19.9	1.1
Avoid brushing your teeth when you wake in the morning and immediately after eating.	52.5	22	26.5
Maintain a normal body weight.	52.5	26.5	21.0
Stop smoking	90.1	9.9	0
Avoid tight fitting clothes for around the abdominal cavity	33.7	22.1	44.2
Eat a light snack (a small sandwich, bread, or yogurt, and milk or juice) at least 2-3 hours before going to bed.	26.5	21.0	52.5
Sleep on your left side of the body and while elevating the head, chest higher than the lower part of the body.	16.0	21.0	63.0
Be sure to have plenty of fresh air in the room in which you sleep.	28.7	36.5	34.8
If have GERD symptoms at night, raise the head of your bed 6 - 8 inch	31.2	23.1	45.7
Seek medical advise immediately if appear any warning signs	71.9	20.1	8
Total mean number	**46 ± 3.7**	**26.8 ± 3.6**	**27.2 ± 3.6**

Table (6): Women Compliance to Peppermint Use Instructions throughout the study

Peppermint Use Instructions	N = 221 (100%)		
	Regularly Done %	Irregularly Done %	Not Done %
Put 2 dried peppermint spoon leaves in 1 cup boiling water for 10 minutes	36.5	35.4	28.1
Drink four to five times per day	49.4	41	9.6
Drink peppermint between meals.	32.6	35.4	32
Total mean number	**36.8 ± 3.1**	**32 ± 3.3**	**29.2 ± 2.4**

Table (7): Correlation between Pregnant Women Compliance to Peppermint use Instructions and Mean GERD Distress Score at Pre and Post Intervention

Mean GERD Distress Score	Women compliance to Peppermint Use Instructions N = 221 (100%)		
	Regularly Done	Irregularly Done	Not Done
Initial assessment baseline Pre intervention (N=221)	2.31 ± 1.4	4.4 ± 1. 3	4.9 ± 1. 9
Final assessment Post intervention (After 4 Weeks) (N=221)	0.56 ± 0.47	0.92± 1.2	1.3 ± 1.6
R = 0.879	**Strong Positive Correlation**	****P = 0. 001.**	

NB: ↓ = lower score is better.

Table (8) Correlation between Pregnant Women Compliance to GERD Relieve Measures and Mean GERD Distress Score at Pre and Post Intervention

Mean GERD Distress Score	Women compliance to GERD relieve measures N = 221 (100%)		
	Regularly Done	Irregularly Done	Not Done
Initial assessment baseline Pre intervention (N=221)	2.22 ± 1.2	4.3 ± 1. 1	4.9 ± 1. 9
Final assessment Post intervention (After 4 Weeks) (N=221)	0.56 ± 0.47	0.91± 1.1	1.1 ± 1.3
R = 0.881	Strong Positive Correlation	**P = 0. 001.	

NB: ↓ = lower score is better.

4. Discussion:

GERD during pregnancy is a serious disease. Prevention and education efforts are keys major nursing responsibility to ending this serious health disease by encouraging women to change lifestyle as well orienting them about different simple, cheep and effective methods to relieve it quickly .An herbal remedy for acid reflux is an ideal solution in many ways. Over the past three centuries herbalists have begun to use peppermint in many of the same ways that herbalists in ancient Egypt and China used other types of mints. Peppermint is sometimes regarded as 'the world's oldest medicine', with archaeological evidence placing its use at least as far back as ten thousand years ago. That is, as a digestive remedy to treat heartburn, diarrhea, flatulence, and intestinal cramps. Peppermint is now widely recognized as an effective remedy to regulate digestion (Braun & Cohen, 2007*)*. In support to the previous concepts the research team designed the present study which was aiming to evaluate the efficacy of peppermint on relieving of pregnancy related GERD grade 1 (NERD) or in another commonly used term heartburn.

Pregnancy is one of the best times in a woman's life but can sometimes bring on acid reflux that makes them uncomfortable. Acid reflux during pregnancy is not at all uncommon. The present study showed the incidence of GERD symptoms among the studied women is higher with pregnancy than the pre pregnancy period. In similar to other studies **(Dent**. *et al.,* 2005) that have shown 8 out of 10 pregnant women experience mild to severe heartburn and acid reflux due to hormonal changes during pregnancy. The hormonal changes in the body and the weight gain leads to acid reflux. The hormones released during pregnancy reduce the rate of digestion and even the movement of esophagus to push down food into the stomach also slows down.

The present study revealed improvement in pregnant women knowledge regard GERD & peppermint, there was a highly statistically significant difference was detected between pregnant knowledge regard GERD & peppermint before and after intervention. This concluded that the educational leaflet increased the samples' knowledge. This reinforced the fact that reading books and magazines is very beneficial and powerful way to disseminate information among population at large. The instructions done at the present study and distributed leaflet showed direct positive effect on women knowledge.

As regards the sources of knowledge about GERD & peppermint, it was observed that health care providers were the main source of knowledge regard GERD, This may be explained by the fact that GERD is medical disease makes people worry about their health or with a greater tendency to seek information on their own health. Compared with source of knowledge about peppermint, about two third of women obtained knowledge regard peppermint from family. It may be due to that the peppermint is popular herb and commonly used in our society.

As regard efficacy of peppermint, the current study illustrated variation in women's GERD symptoms and detected a highly statistically significant difference before and after intervention which indicated marked improvement in GERD symptoms after using peppermint tea (2 dried peppermint spoon leaves in 1 cup boiling water for 10 minutes with tea) in between meals for 4 weeks. Also presented strong positive correlation between pregnant women compliance to peppermint use instructions and means GERD distress score at pre and post intervention as more compliance lead to marked improvement in GERD symptoms during pregnancy.

According to (Tieraona, 2001), the Arizona Center for Integrative Medicine's director of botanical medicine, peppermint tea is safe to drink in moderate amounts during the early stages of pregnancy to relieve heartburn & other digestive problems. In Support to this point **(Bonis et al**.,2005) found that Peppermint tea may be used to relieve digestive ailments, and morning sickness, as well as many other conditions. Taken after a meal, the tea acts to settle the stomach and improve digestion. Peppermint itself is well known for curing a number of digestive problems, so just by drinking a peppermint tea after each meal, especially a large meal, can help prevent heartburn.

Others (McKay & Blumberg, 2006) added that carminatives such as peppermint, chamomile, fennel,

ginger and sage can work to sooth stomach muscles, increase the secretions of digestive juices as well as promote bile flow. The herbal tea as peppermint tea provides soothing effect during pregnancy. It has a calming effect on the smooth muscle of the digestive tract and can promote the flow of bile from the gallbladder into the small intestine, thus aiding the digestion of fats.

Also other studies (Inamori *et al.,* 2007) try another form of peppermint in relieving digestive problems or dyspepsia (heartburn). Peppermint oil, which is extracted from the stem, leaves, and flowers of the plant, has become popular as a treatment for a variety of conditions, including irritable bowel syndrome (IBS), headache, and non-ulcer dyspepsia. Peppermint oil (*Menthe piperita*) has been used for hundreds of years as a digestive aid and carminative, meaning that it relaxes the tone of gastrointestinal tract sphincters and aids the passage of flatus. Combinations of peppermint oil and other botanical medicines also have been studied as treatments for non-ulcer dyspepsia.

This finding supported by Micklefield *et al.* (2000) who found that taking peppermint oil orally in combination with caraway oil seems to reduce feelings of fullness and mild gastrointestinal (GI) spasms. A specific combination product containing peppermint leaf (Iberogast®, Medical Futures, Inc) also seems to improve symptoms of heartburn. The combination includes peppermint leaf plus clown's mustard plant, German chamomile, caraway, licorice, milk thistle, angelica, celandine, and lemon balm. It seems to significantly reduce severity of acid reflux, stomach pain, cramping, nausea, and vomiting.

This finding was assured by Madisch *et al.*(2004) who noted that the combination of 90 mg of peppermint oil plus 50 mg of caraway oil has been demonstrated to reduce symptoms of non-ulcer dyspepsia, including fullness, bloating, and spasm. This combination should be used cautiously for patients with dyspepsia, as peppermint oil may promote gastroesophageal reflux.

Similar to the finding of the study done by Holtmann *et al.* (2003) they observed a combination of enteric-coated peppermint oil and caraway oil reduce symptoms of non-ulcer dyspepsia (e.g., fullness, bloating, gastrointestinal spasm). A meta-analysis of several trials of a preparation containing peppermint and caraway oils plus other herbal extracts (Iberogast) found it to be effective in the treatment of functional dyspepsia (Melzer *et al.,* 2004).This benefit may be the result of the preparation's relaxing effect on the lower esophageal sphincter, with concomitant equalization of pressure between stomach and esophagus and reduced sensation of bloating and abdominal pressure. However, this effect theoretically could result in reflux symptoms in patients predisposed to gastroesophageal reflux. Because multiple herbs were used in these trials, it is difficult to draw definitive conclusions about the specific effects of peppermint in this condition.

In contrary (Brenton, 2010) stated that during the later stages, particularly the third trimester, peppermint tea can pose health problems such as increased heartburn, although evidence is lacking.

One of the best ways to treat acid reflux disorder is by making lifestyle and behavioral changes. There are a number of alternative health methods help reduce heartburn and acid reflux naturally. Doctors often recommend lifestyle changes as the first-line treatment for acid reflux. These measures can include elevating the head of the bed during sleep, not eating late at night, and avoiding alcohol or spicy foods (DeVault & Castell., 2005).

The present results confirmed strong positive correlation between pregnant women compliance to practices of GERD relieve measures (as changing dietary habits, avoiding obesity and positioning after meals/during sleep) & GERD symptoms relieve as more compliance lead to marked improvement in GERD symptoms during pregnancy. Compared with results of **Piesman** *et al.* **(2007) & Festi** *et al.***(2009)** reported that a 2006 review suggested that evidence for most dietary interventions is unreliable; only weight loss and elevating the head of the bed were supported by evidence. A randomized crossover study showed benefit by avoiding eating two hours before bedtime **(Piesman** *et al.,* **2007)**. A meta-analysis suggested that elevating the head of the bed is an effective therapy, although this conclusion was only supported by nonrandomized studies **(Festi** *et al.,* **2009)**

These results agree with researchers (**Kahrilas** *et al.,* **2008)** looked at the results of 100 studies conducted on various lifestyle measures for GERD. **Ayazi *et al.* (2007)** mentioned that only losing weight and changing positions as elevating the head of the bed showed a clear benefit in well-designed studies on relieving GERD. A similar finding was represented by **Khoury** *et al.* **(1999)** who confirmed that sleeping on left side or avoiding food late at night.

Changing in dietary habits was assured by Kaltenbach *et al.* (2006) who stated that dietary habit changes may benefit from avoiding foods that trigger their symptoms. These commonly include acidic fruit or juices, fatty foods, coffee, tea, onions, chocolate, especially shortly before bedtime. This result agreed with **Hirano & Richter (2007)** who documented little evidence to support avoiding many suspected GERD triggers, such as alcohol, caffeine, chocolate, spicy foods, citrus, carbonated beverages, and fatty foods may had a positive effect on relieving GERD.

Published GERD trials provide evidence that smoking, alcohol, carbonated beverages, coffee, and chocolate ingestion lead to decreased LES pressures, there is disagreement regarding whether dietary and

lifestyle changes can result in actual clinical improvement in GERD. A review of the literature included 2,039 studies on lifestyle factors, including weight loss, timing of meals, elevation of head during sleep, and avoidance of alcohol, smoking, coffee, citrus, and chocolate. Of the 100 relevant studies, no evidence was found for the efficacy of dietary measures or smoking or alcohol cessation in improving symptomology, LES pressure, or esophageal pH profiles. The only efficacious factors were elevation of the head of the bed and lifestyle interventions that led to weight loss (mean loss of 12.4 kg in 13 weeks) (Kaltenbach *et al.,* 2006)

Conclusion:

Finally, the present study drew attention to a critical point that use of carminatives as peppermint tea beside compliance to lifestyle relieve measures are effective on relieving GERD Grade 1 (NERD) during pregnancy.

Recommendations:

In the light of the study findings, the following recommendations are suggested:

- Using of peppermint tea in-between meals for relieving of NERD during early stages of pregnancy.
- Integrating carminative types on relieving gastroesophageal reflux disease GERD during pregnancy in maternal & neonatal health medical and nursing curriculums.
- Performing awareness programs about prevention and management of GERD during pregnancy during antenatal follow up classes for pregnant women including those with learning disabilities.
- Further studies are still needed to determine the effect of using peppermint in different forms on relieving GERD during pregnancy.

Limitation of the study:

The limited regional references and data regard effect of peppermint on GERD during pregnancy, small sample size due to ignoring some women the follow up visits and inaccurately register their phone numbers, as well as dairies loss and irregular compliance to instructions by others.

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