

Efficacy of Ginger Use for Chemotherapy Induced Nausea and Vomiting in Cancer Patients: Scoping Review

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ABSTRACT

Background: Chemotherapy induced nausea and vomiting are the main undesired side effect that distress around 70 % to 80% of cancer patients. Ginger is often advocated as beneficial for nausea and vomiting, whether the herb is truly efficacious for this condition or not it is still a matter of debate. **Objective:** This scoping review is conducted to assess the effect of ginger usage on nausea and vomiting induced by chemotherapy amongst adult patients with cancer.

Methodology: Databases searched include MEDLINE, CINHALE, PubMed and Google scholar for related articles between 2012 to 2019 was performed. After extensive review, 188 studies were retrieved from the databases and only 15 studies found eligible according to applied inclusion and exclusion criteria. (14 randomized controlled trails, 1 pilot study) with a total of 1974 patients with different cancer types receiving emetogenic chemotherapy.

Results: The majority of available evidence demonstrates that ginger is an effective, inexpensive and safe treatment for nausea and vomiting.

Conclusion: Ginger supplementation can be potentially efficient effects on the patients who receives chemotherapy-induced nausea and vomiting. The results of this scoping review provide significant suggestions for further research using standardized ginger products and reflective larger sample sizes to confirm the efficacy of ginger extract supplement and optimal dosing regimens.

KEYWORDS: Cancer patients; Chemotherapy induced nausea, Vomiting; Ginger; Ginger extract

INTRODUCTION

Due to of the intrinsic emetogenicity of chemotherapeutic agents Chemotherapy related induced nausea and vomiting is a major issue distressful for cancer patients undergoing treatment Bossi et al. [1]. Its prevalence is reported between 54% and 96% Sheikhi [2]. Chemotherapy-induced nausea and vomiting (CINV) among patients with cancer impacts treatment outcomes and quality of life Adel [3]. As a result, nausea and vomiting caused by chemotherapy are due to 50% to 60% of the symptoms of chemotherapy patients suffering from protein food deprivation

as a result of failure to meet nutritional requirements, which further jeopardizes medication results Rapoport [4]. In addition to having a destructive experience, CINV may cause consequently affect the immune system, performance status and electrolyte imbalance Ansari et al. [5]. Despite the decrease in CINV by using various classes of antiemetic agents, CINV occurs in 60-80% of chemotherapy patients Ansari et al. [5].

In addition, different approaches, including pharmaceutical or complementary treatments, are used to monitor CINV. Herbal

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therapy is the most commonly complementary therapies used among the people Sanaati [6]. Based on a World Health Organization (WHO) report, about 80% of the world population stratify herbal compounds now Sanaati [6]. Ginger (*Zingiber officinale*) is a conventional remedy in many cultures for nausea and vomiting and has been investigated for use in motion sickness, morning sickness and postoperative nausea Palatty [7].

Ginger on the U.S. Food and Drug Administration classified in the safe list of herb and included it in many pharmacopeias Western countries Lete [8]. The exact mechanism remains indistinct; however, the effects of “gingerol and shogaol” compounds on various chemotherapy-induced nausea and vomiting processes are known to have beneficial effects Marx et al. [9]. Ginger has beneficial effects on muscarinic and histaminergic receptors through its antagonistic effect; its capacity to control gastric emptying and gastrointestinal motility; and its function in reducing oxidative stress and inflammation Marx et al. [9].

Table 1: PICOT question.

Picot	Content	Picot Question
P	Cancer patient, received chemotherapy induce nausea and vomiting	In patients with cancer treated by chemotherapy, how does the use ginger compared with no use ginger affect experience of nausea and vomit induced by chemotherapy?
I	Ginger use	
C	No intervention	
O	Reduction of nausea and vomiting	
T	No time	
Type	Interventional PICOT question	

SEARCH STRATEGIES

This literature guided by Arksey and O'Malley stated of five stages methodology Arksey H 2005. First, the PICOT question was identified “In patients with cancer treated by chemotherapy, how does the used ginger, compared with no use ginger, affect the experience of nausea and vomit induced by chemotherapy?” To guide the search process in the database. Then, to identify articles relevant to this scoping review, which focus on the effect of ginger use on reducing nausea and emesis, searching was initiated in an electronic database between October and November 2019. Recent articles were collected between 2012-2019 to identify the recent studies conducted under the same objective under specific inclusion and exclusion criteria. Finally, a thematic framework sated to guide and sorting of existing literature and review matrix was completed to collating, summarizing, and reporting the results (Appendix 1).

KEYWORDS

Combination of key ward was used which include: ‘ginger or ginger extract’, ‘chemotherapy induced nausea and vomiting’ and ‘cancer patients’.

SEARCH ENGINES

The electronic searching included extensive searching in databases from the Database of Cumulative Index of Nursing and Allied Health Literature “CINHAL”, Midline, PubMed, and grey literature also conducted using Google scholar for more evidence. through examined for population, intervention, comparison, the outcome of the study.

INCLUSION AND EXCLUSION CRITERIA

Inclusion and Exclusion Criteria were developed according to

This integration of functions explains the ability of ginger to relieve symptoms of functional gastrointestinal disorders, such as dyspepsia, nausea, and vomiting, which is often associated with decreased gastric motility Lete [8]. For this reason, the investigators conducted the current search based on best evidence-based practice (EBP) for the effect of ginger on CINV addressing different perspectives starting from reduction to no effect. The PICOT question addressed in this paper is: In patients with cancer who are receiving chemotherapy, how does the use of ginger, compared with no of use ginger, affect reports of chemotherapy induced nausea and vomiting?

AIM

The aim of this scoping review is to identify, describe, and evaluate importance of the evidence of ginger usage among cancer patients to relive episodes of chemotherapy induce nausea and vomiting (CINV); (Table 1).

our aim of study to identify the most appropriate articles to answer PICOT question which included the following:

Inclusion Criteria

- Studies that are available in English language only.
- Studies address only cancer who receive chemotherapy.
- Studies was conducted in adult population 18 years or more.
- Published studies conducted in the last 7 years between 2012-2019.
- Only quantitative research included.
- Articles that study ginger or ginger extract with patient treated with chemotherapy induced nausea and vomiting with different types of cancer and measured effect to reduce nausea and vomiting.

Exclusion Criteria

- Studies in other language than English language
- Articles that are not relevant to the topic such as articles address effect in other of chemotherapy as radiation therapy.
- Studies that included infant and children in population.
- Articles was before 2012.

ARTICLES RETRIEVED AND SCREENING PROCESS

To identify literature screen PRISMA was used. (Preferred Reporting Items for Systematic Reviews and Meta-Analysis). PRISMA contain four phase flow diagrams explained in Figure

1. At first, a total of 188 studies were found through search databases. plus, 5 records identified through other sources (gray literature). After duplicates removed 9 articles were eliminated. The search was narrowed to 184 articles according to the inclusion and exclusion criteria were established Then the remaining 29 articles, titles, abstract and full texts were screened manually by

the researchers and only relevant articles were retrieved. Finally, 15 Full-text articles were included, 7 articles not relevant outcome were eliminated. 1 pediatric article excluded. Also, 6 review articles were eliminating. We included in our search published articles only quantitative methods are screens.

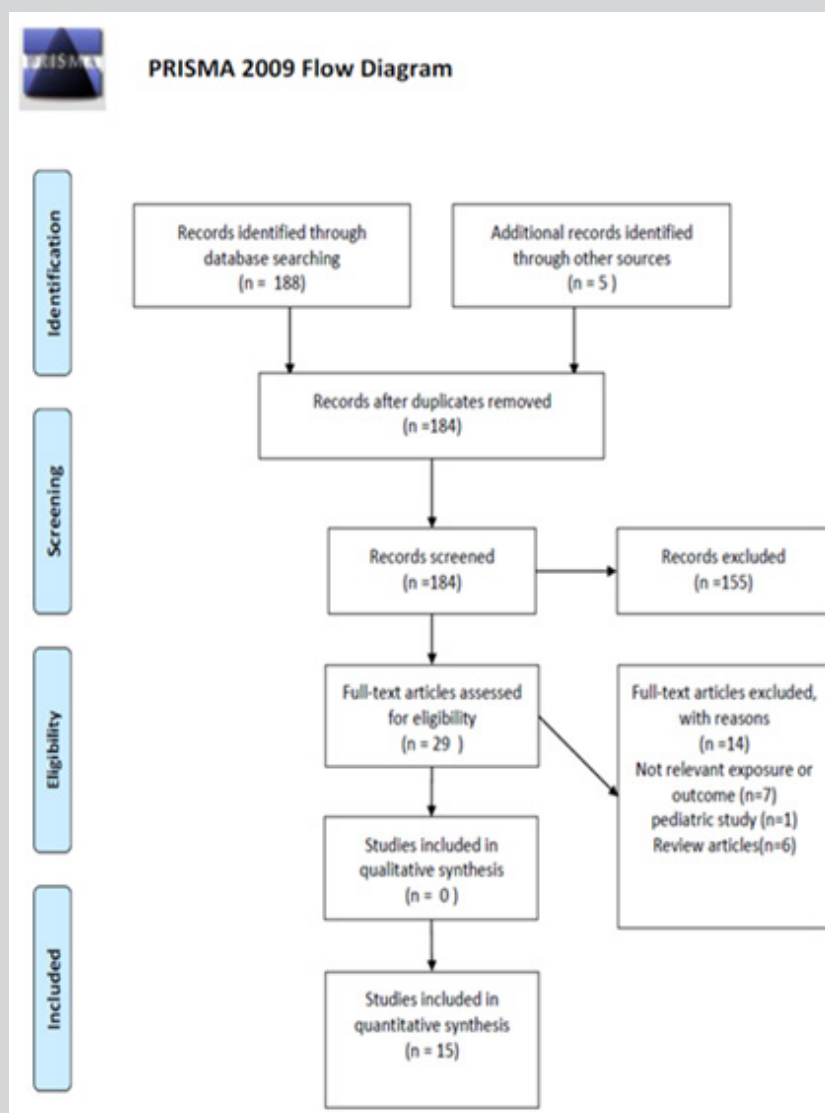


Figure 1.

FINDING AND RESULTS

The finding of our Scope Review was identified by thematic analysis into categories in three themes. The first theme is discussing the reduction effect of ginger on chemotherapy-induced nausea and vomiting while the second theme is discussing the conflict effect. The last theme discusses the non-reduction effect. Themes are illustrated in Table 2 below.

Theme 1: Reduction Effect on CINV

Ginger had been used for centuries for gastrointestinal disturbance. Chemotherapy-induced (CINV) can have a negative impact on patients' quality-of-life. There is evidence that suggests taken ginger with standard antiemetic drugs, ginger may add additional reducing or eliminating of nausea and vomiting pre and intra chemotherapy cycles.

Konmun et al. [10]; Alexander [11]; Sanaati [6]; Tahir [12]; Ryan et al. [13]; Yekta et al. [14] conducted similar studies and established the use of ginger along with antiemetic medication to reduce nausea and vomiting experience in a cancer patient who is receiving chemotherapy.

According to Konmun et al. [10] who conducted a randomized double-blind placebo-controlled trial in Thailand. The aim was to study the effect of one of bioactive ginger extract (6-gingerol) on a client who receives chemotherapy-induced nausea (CINV). The effect of ginger was tested in at least 3 cycles of chemotherapy in the multicycle interval that included an eighty-eight patient with different cancer types. Participants were assigned into two groups, the intervention group took ginger extract, referred to as 6-gingerol 10 mg capsules while the control group took placebo capsules to contain microcrystalline cellulose three days prior to the first day of

chemotherapy and continued to 12 weeks of treatment. The result illustrated that as compared to placebo, all patients in interventional groups of ginger experiment experienced significantly reduced

acute and delayed nausea and emesis experiences ($p=0.003$) in addition to ondansetron, metoclopramide, and dexamethasone use in both groups.

Table 2: Scope review theme.

Themes/ sub-themes	Name
Theme (1)	Reduction effect on CINV
Theme (2)	Partial effects on nausea or vomiting
Theme (3)	Non reduction effect on CINV

Another study was conducted by Alexander [11] investigated the effect of Indian ginger tea on nausea and emesis induced by chemotherapy among cancer patients in Bharat Hospital and Institute of Oncology at Mysore India. The sample consisted of 60 patients, 30 patients allocated in each experimental and control group. The experimental group ($n=30$) had oral administration of Indian ginger tea from the 1st day of the chemotherapy cycle, while the control group was not given Indian ginger tea. The result indicated that administration of Indian ginger tea was reducing nausea and vomiting effectively as the independent 't' values were statistically significant at 0.05 level of significance.

Other study was done in turkey that support similar result conducted through a double blind randomized controlled trials study to evaluate the effect of ginger on nausea and vomiting induced by chemotherapy. All sample in the study 60 patients received standard antiemetic drug. Patients in the intervention group consumed powdered ginger added to yogurt, 30 minutes before chemotherapy administration while control group provided standard care. The study tests the mean score of nausea severity, frequency of vomiting and retching episodes. According to the result of this comparison, the study emphasis that nausea severity and the frequency of vomiting episodes were significantly decrease in the group who receive ginger than in the control group ($p > 0.05$). Despite this, the variation in of retching episodes was not statistically significant ($p > 0.05$) between the intervention and control groups Arslan [15].

Furthermore, Alparlan et al. [16] Non- randomized controlled study (NRS). The study was conducted to evaluate the efficacy of ginger on chemotherapy-induced nausea and emesis on cancer patients who received chemotherapy in the hematology clinic. Over time, the study group was consisting of 15 in the intervention group and 30 in the control group. Whereas the intervention group received ginger tablets (800 mg) compared with the control group received antiemetic drugs. The current study proposed that ginger is effective in lowering chemotherapy-induced nausea and emesis.

According to a randomized cross-over experimental study published by Montazeri et al. [17] aimed to evaluate ginger use among cancerous under chemotherapy-induced nausea and vomiting. The participants of this trial were selected from oncology patients' presence in haematology departments in many university hospitals in Iran. The researcher was allocated participants into two groups A and B with specific interventional or placebo regimes to evaluate the effects of these two regimes on the patients who treated with emetogenic chemotherapy according to inclusion criteria to in role to the plan. The interventional group was a standard antiemetic drug additional to 4 ginger capsules, two of the capsules taken 30 minutes prior to chemotherapy administration, the other two capsules were given after 6 hours chemotherapy session. The placebo group was received a routine antiemetic therapy with 4 placebo capsules. Then, participant of these two

groups was crossed over to receive the other regime. The severity of nausea and vomiting assessed using kortila tools. The result of the study identified that participants who receiving ginger showed a significant reduction in frequency and less severe form of nausea and vomiting compared to the participant who received a placebo.

These results were consistent with the Sanaati [6] randomized, double-blind, and clinical trial research to locate the impact of ginger and chamomile capsules on nausea and vomiting in chemotherapy on 65 women with breast cancer. The women Participating in this experiment were divided into two groups. Ginger and chamomile and one control group, a routine antiemetic regimen consisting of dexamethasone, metoclopramide, and aprepitant (DMA) capsule were consumed. Consequently, the results showed that Ginger and chamomile had a significant effect in reducing the frequency of vomiting, there being no significant difference between the ginger and chamomile groups. Moreover, unlike chamomile, the level of nausea was greatly affected by ginger.

Ryan et al. [13] performed a randomized, double-blinded, placebo-controlled, multicenter trial in the United States to determine the effects of ginger in controlling chemotherapy-induced nausea (CIN). The study included 744 patients (576 patients included in the final analysis) with different cancer who were randomly assigned into four groups the first group given a placebo, while the other three groups received different concentration ginger doses 0.5 g, 1.0 g, 1.5 g of capsules ginger beside received the standard antiemetic a 5-hydroxytryptamine (3) receptor antagonist plus dexamethasone. Patients started to take 3 ginger capsules or placebo, three days prior to chemotherapy cycles for 6 days. The result illustrated that the different ginger doses (0.5 g, 1.0 g, or 1.5 g) reduced the severity of acute nausea ($p = 0.003$) compared to the placebo. The researchers reported that the largest reduction in the intensity of nausea was taking place with 0.5 g and 1.0 g of the ginger capsule ($p = 0.017$ and $p = 0.036$, respectively).

Recent research has been published by Tahir [12]. Who conduct a randomized control trial to find out the effect of using ginger as a prophylactic antiemetic in reducing the delayed chemotherapy-induced vomiting, additionally to standard antiemetic therapy for patients who receiving emetogenic chemotherapy? The study was conducted in Jinnah Hospital, Lahore, Pakistan, with a total study sample of 90 patient, who divided into two groups, intervention group how received a cap of 500 mg ginger orally TID, 3 days prior to chemotherapy and 3 days after chemotherapy and olanzapine as a based standard antiemetic regimen. The other group consists of 45 patients who received only olanzapine as standard antiemetic therapy. The results of the study did respond significantly to the addition of ginger capsules. Only 35.6% of patients had vomiting after chemotherapy as compared to 62% of patients in the standard therapy group, (p -value 0.006).

Yekta et al. [14] conducted a related study under similar

concern by using double-blind randomized experiment trial, study was accomplished on eighty female who diagnosed with breast carcinoma and on single-day chemotherapy cycle in Imam Khomeini Hospital in Iran, the patients were selected through convenience sampling and allocated randomly into two groups intervention and placebo-control groups.

The intervention members received capsules of ginger powder 250 mg called (Zintoma) that contained (250 mg dry powdered ginger root that was prepared with 10:1 ratio of ethanol 50% and ginger root and included 5.38 mg (2.15%) 6-gingerol, 1.8 mg (0.72%) 8-gingerol, 4.19 mg (1.78%) 10-gingerol, and 0.92 mg (0.37%) 6-shogaol), all of these components are active form of ginger extract. the placebo group received 250 mg starch-filled capsules, both of these groups received four times a day with a six-hour interval, the total dose was (1000 grams per day) for six contiguous days, 3 days prior initiate chemotherapy sessions in addition to antiemetic including granisetron hydrochloride, and dexamethasone use in each group. A daily self-report assessment tool was used to evaluate the ginger effect. The result shows that there is a significantly lower vomiting rate in the ginger group and placebo-control groups throughout of chemotherapy session, Also, the only reported adverse event was heartburn effect experience notice.

Theme 2: Partial Effects on Nausea or Vomiting

One study conducted to measure the efficacy of ginger in the controlling of nausea and vomiting induced by chemotherapy among cancer patients shown conflicting results, means that there is a ginger effect on one symptom and nothing on another symptom.

According to a pilot, randomized clinical trial study carried out by Panahi et al. purposed to assess the efficacy of ginger for acute and delayed CINV. Among 100 women newly diagnosed with advanced stages breast cancer who received chemotherapy treatment, including docetaxel, epirubicin, and cyclophosphamide, and those patients who randomly assigned to ginger group (1.5 g/d in 3 separated doses every 8 hours intended for 4 days) in addition to standard antiemetic regimen, while control group received standard antiemetic regimen alone. The result display that taking ginger with antiemetic drugs helped to reduce chemotherapy-induced nausea. However, there is no significant effect of ginger on the frequency of vomiting 2013.

Theme 3: Non-Reduction Effect on CINV

Based on our findings through literature reviewing of relevant issue, there are four recent studies that evaluated participant experiences who received ginger extract through the cycles of chemotherapy, the result revealed that using of ginger did not add any significant effect on nausea and vomiting reduction.

Bossi et al. [1] conducted a randomized, double-blind, placebo-controlled, multicenter study in patients in six Italian oncology centers, planned to receive two cycles or more of nightly emetogenic chemotherapy with a high dose of cisplatin (>50 mg/m²), in treatment duration range from 42-56 days. Patients were randomly distributed into two groups, the intervention group received ginger capsules extract 160 mg/day (Gingerols: 16 mg and Shogaol 1.12 mg combined dose of bioactive compounds) or placebo in addition to the prophylactic antiemetic medication for CINV, starting from the first day and fifth day of cisplatin administration. It was conducted on 251 patients, 121 patients received ginger extract capsule and while the control group was 123. Lung and head and

neck cancer were the most represented tumors types. The result shows that there are no significant differences between two groups throughout the two cycles of chemotherapy, no difference was a notice in emesis nausea assessment scores between the ginger and placebo group Bossi et al. [1].

In contrast, Thamlikitkul et al. [18], A double-blind, crossover study RCT in Thailand to investigate the effects of ginger for chemotherapy-induced nausea and vomiting (CINV) prophylaxis in female patient with cancer patients who received adriamycin and cyclophosphamide (AC) chemotherapy. The study suggests that ginger capsule, was safe, at a dose of 1 g/day for 5 days, starting on the first day of chemotherapy, but indicate that no significant difference compared with control group in word of reducing nausea and vomiting severity in female patients with breast cancer who receiving AC chemotherapy.

Li [19] conducted randomized, double-blind, placebo-controlled clinical trial of 140 patients with lung cancer receiving cisplatin-based regimens was enrolled and devoted to receiving either ginger root powder or a placebo. However, the result showed no the difference is obvious was spotted between the ginger and control groups in the lowering of the incidence and severity of nausea and vomiting ($P > .05$).

A Prospective study conducted in Namazi Hospital affiliated with Shiraz University of Medical Sciences, Shiraz, Iran aimed to assess the efficacy of ginger in control of nausea and vomiting induced by chemotherapy in female patients who were newly diagnosed with breast cancer for the first 3 chemotherapy cycles, 119 females were randomized to intervention group who receive 500 mg ginger powder, twice a day for 3 days and control group who received placebo. In all sessions, the result illustrates that no significant differences between the ginger group and the control group Ansari et al. [5].

Lua [20] studied the effects of ginger inhalation as aromatherapy on chemotherapy-induced nausea and vomiting for breast cancer women. A 100 mm visual analog assessment scale (VAS) was used. They conduct this study through single-blind, randomized, controlled, cross-over study at two clinics of oncology in the East Coast of Peninsular in Malaysia. Sixty patients divided into two equal groups, group 1 inhaled "ginger fragrance oil" on their first cycle of therapy as (placebo) group, then they inhaled "essential oil" on the fallowed chemotherapy cycle. While Group 2 were initially inhaled "essential oil" on their first cycle of chemotherapy, then were given "ginger fragrance oil" for the fallowed treatment cycle. The result showed that there was no significant difference in the mean of VAS nausea scores between the two groups ($P=0.183$). Likewise, ginger aromatherapy treatment not significantly has an effect on the reduction of vomiting ($P=0.59$). The only study was found ginger were not ingested. it was used as inhaled aromatherapy.

LIMITATIONS

In this scope review, most of the recent studies show insufficient evidence to support ginger usage in a patient were treated with CINV. Discrepancies in the result of studies reflect varies of emetogenicity of chemotherapy used through the studies and antiemetic regimens as well as cancer stage or types and participant condition in study duration. In addition, substantial clinical heterogeneity was introduced through different ginger active substance composition, dose frequency regimens, and administration techniques as well as using different assessment tools. Furthermore, this review was limited by the small recent numbers of available studies that

reported the outcomes of interest. Most of our literature found internationally while no studies were conducted in the Middle East or in Saudi Arabia [21,22].

STUDY IMPLICATION

Nursing Practice

Cancer and its treatment often cause physical and psychological problems that impact the quality of patient life's. administration of ginger tea is a simple and less expensive intervention can be adopted to decrease nausea and emesis induced by chemotherapy.

Nursing Research

Ginger has been used for a long time as a traditional herbal antiemetic. We recommended for future studies on the efficacy of ginger as an antiemetic in chemotherapy-induced nausea and vomiting to advance nursing practice this includes examining the effects of the ginger administer more than once, for an extended period, bigger sample sizes, which include different cancer types.

Nursing Education

we recommend training sessions on complementary alternative therapies to improve the knowledge and skills of nurses and make them more competent to provide high standard quality care for cancer patients who are receiving chemotherapy. Furthermore, we suggest adding the alternative and complementary therapy to the curriculum of the nursing university to prepare the nursing student to research, analyse and integrate the evidence-based practice in their practice.

CONCLUSION

Ginger supplementation can potentially efficiently effect on the patient who receives chemotherapy-induced vomiting. In this scoping review literature, there were a variation of ginger dose used in experiment, different form of ginger extract, sample size and different assessment tool used through the experiment reflect the variation in the result.

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Appendix 1: Data extraction table/review matrix.

Author/s, Year of Publication Country of Study	Study Objective	Study Design	Total Sample and Type of Participants	Intervention Group	Control/ Placebo/ Comparison Group	Main Finding
Tahir M, Ilyas S, Qamar S (2019) Pakistan	To determine the effect of prophylactic use of ginger in decreasing the delayed chemotherapy induced vomiting, when added as an add on therapy to the standard antiemetic treatment in patients receiving highly emetogenic chemotherapy.	Randomized control trial.	90 Cancer patients receiving highly emetogenic chemotherapy.	Group A received olanzapine based standard antiemetic regimen and cap ginger 500 mg per oral TID 3 days prior to chemotherapy and 3 days after chemotherapy.	Group B received olanzapine based standard antiemetic regimen only.	<p>Percentage of patients in the intervention group compared to the standard therapy who did not have even a single episode of vomiting (64.4% versus 37.7%, p value 0.006). Mild vomiting was experienced in 6 (13.3%) patients in the intervention group compared to 7 (15.5%) patients in the standard arm.</p> <p>-Almost double the number of patients in the standard arm had grade 2 vomiting compared with the intervention arm 15.5% vs 28.9% in group A and Group B respectively. There was also significant reduction in the severe vomiting that is grade 3 and 4, grade 3 vomiting was observed in only 6.6% versus 15.5% patients, while none had grade 4 vomiting in group A compared to one patient (2.2%) in group B.</p>
Li X, Qin Y, Liu W, Zhou XY, Li YN, Wang LY (2018) China	To examine the efficacy of ginger, as an adjuvant drug to standard antiemetic therapy, in ameliorating acute and delayed CINV in patients with lung cancer receiving cisplatin-based regimens.	Randomized, double-blind, placebo-controlled clinical trial.	140 patients with lung cancer receiving cisplatin-based regimens.	Group A received the first dose of the study medication 30 minutes before chemotherapy on the first day of treatment. Ginger capsules administered orally (0.5 g, 2 capsules per day, 0.25 g per capsule, every 12 hours) for 5 days beginning on the first day of chemotherapy.	Group B received the first dose of the study medication 30 minutes before chemotherapy on the first day of treatment. placebo capsules administered orally (0.5 g, 2 capsules per day, 0.25 g per capsule, every 12 hours) for 5 days beginning on the first day of chemotherapy.	<p>No significant difference was observed between the ginger and control groups in the reduction of the incidence and severity of nausea and vomiting ($P > .05$). No significant difference in adverse events was observed between the 2 groups ($P > .05$). No studytreatment-related adverse events were observed in this study. As an adjuvant drug to standard antiemetic therapy, ginger had no additional efficacy in ameliorating CINV in patients with lung cancer receiving cisplatin-based regimens.</p>

<p>Thamlikitku L, Srimuninnimit V, Akewanlop C, et al. (2017) Thailand</p>	<p>The purpose of this study is to determine the efficacy of ginger for reducing chemotherapy-induced nausea and vomiting (CINV) in breast cancer patients receiving adriamycin and cyclophosphamide (AC) regimens.</p>	<p>Double-blind crossover placebo RCT.</p>	<p>34 patients were women aged 18 years or older with documented breast cancer who had received a first cycle of AC chemotherapy and who experienced vomiting or moderate to severe nausea. Their treatment plan included at least two more cycles of AC.</p>	<p>Capsule (powdered ginger root extract) 1 g (0.5 g BD).</p>	<p>Placebo</p>	<p>No significant difference between intervention and control groups in breast cancer patients receiving AC chemotherapy.</p>
<p>Konmun J, Danwilai K, Ngamphaiboon N, Sripanidkulchai B, Sookprasert, Subongkot S (2017) Thailand</p>	<p>This randomized, controlled trial was done to assess the effect of ginger in solid tumor patients receiving chemotherapy-related nausea and vomiting.</p>	<p>Double -blind, placebo-controlled RCT.</p>	<p>88 patients Moderate or High emetogenicity chemotherapy General wound.</p>	<p>42 Capsule(6-gingerol) dose: 5mg x2 capsule x2 BID from 3rd day before CT day 1 until last day of 3 cycles (at least 3 cycles).</p>	<p>56 placebo</p>	<p>6-Gingerol in addition to ondansetron, metoclopramide, and dexamethasone significantly reduced CR rate in both acute and delayed phases CINV.</p>
<p>Bossi, Cortinovic, Fatigoni, Cossu, Rocca, Fabi, Seminara, Ripamonti, Alfieri, Granata, Bergamini, Seminara, Ripamonti, Agustoni, Bidoli, Nole (2017) Italy</p>	<p>The aim of study evaluates the efficacy of ginger in reducing the incidence and intensity of delayed nausea in patients on high-dose cisplatin and standard antiemetic therapy for high emetogenic chemotherapy.</p>	<p>Double-blind Placebo-controlled RCT.</p>	<p>251patients, High emetogenicity chemotherapy.</p>	<p>125 patients Capsule (Gingerols: 16 mg + Shogaol 1.12 mg).dose: 160mg /day (2 x 40mg x BD).</p>	<p>123 patient, placebo</p>	<p>No difference was evident in reduction impact of nausea & vomiting due to cisplatin throughout the two cycles of chemotherapy, without any benefit in delayed, anticipatory and intercycle assessments between the ginger and placebo group.</p>

Alexander, Williams (2016) India	The aim of the study was to assess the effect of Indian ginger tea to subside chemotherapy induced nausea and vomiting among cancer patients which is simple and less expensive intervention.	Quasi-experimental nonequivalent pretest - posttest control group design.	60 patients who having chemotherapy induced nausea and vomiting	Oral administration of Indian ginger tea	Not given	The administration of Indian ginger tea was effective in reducing the chemotherapy induced nausea and vomiting among cancer patients receiving chemotherapy.
Sanaati, Najafi, Kashaninia, Sadeghi M (2016) Iran	To determine the effect of ginger and chamomile capsules on nausea and vomiting in cases undergoing chemotherapy for breast cancer (BC).	A randomized, double-blind and clinical trial study.	65 women with BC undergoing chemotherapy.	<p>A. Ginger group for 5 days before and 5 days after chemotherapy was: 2 times a day and 500 mg capsules of powdered ginger root in addition to a routine antiemetic regimen consisting of dexamethasone, metoclopramide and aprepitant (DMA) capsule was consumed.</p> <p>B. Chamomile group for 5 days before and 5 days after chemotherapy was: 2 times a day and 500 mg capsules of Matricaria Chamomilla extract in addition to a routine antiemetic regimen consisting of DMA capsule was consumed.</p>	C. Control group, routine antiemetic regimen consisting of DMA capsule was consumed.	Ginger and chamomile were both significantly effective for reducing the frequency of vomiting, there being no significant difference between the ginger and chamomile groups. Moreover, unlike the chamomile, ginger significantly influenced the frequency of nausea.
Ansari et al. (2016) Iran	To evaluate the effect of Ginger powder on N/V after chemotherapy in breast cancer patients.	Phase II-III clinical trial.	One hundred and fifty female patients newly diagnosed breast cancer patients who were going to receive doxorubicin based chemotherapy were included in the study.	Seventy five patients received Ginger capsules.	75 patients received placebo	<p>-No statistically significant difference, in decrease of nausea and vomiting severity was reported between the 2 groups.</p> <p>-After 1st chemotherapy session (no statistically significant differences)</p> <p>-After 2nd chemotherapy session (difference was not significant)</p> <p>-After 3rd chemotherapy session(not statistically significant.)</p>

<p>Lua, Salihah, Mazlan (2015) Malaysia</p>	<p>To assess the efficacy of inhaled ginger aromatherapy on nausea, vomiting and health-related quality of life(HRQoL) in chemotherapy breast cancer patients.</p>	<p>Single-blind, controlled, randomized cross-over study.</p>	<p>Sixty female patients with breast cancer on Chemotherapy.</p>	<p>Patients in Group 1 was provided with ginger fragrance oil (placebo) on their first chemotherapy course, followed by ginger essential oil on the next chemotherapy course.</p>	<p>Group 2 were first supplied with ginger essential oil on their first chemotherapy course ,and then were given placebo (ginger fragrance oil) for the next treatment course.</p>	<p>-There was no significant mean difference of VAS nausea scores between ginger essential oil and ginger fragrance oil [F(1, 58) = 1.82, P = 0.183] indicating that there was no significant effect of aromatherapy on nausea severity.</p> <p>-Similarly, there was no significant effect of aromatherapy treatment on vomiting [F(1,58) = 0.29, P = 0.594].</p>
<p>Arslan M, Ozdemir L (2015) Turkey</p>	<p>This experimental randomized, controlled trial was done to assess the effect of ginger on chemotherapy-related nausea and vomiting.</p>	<p>RCT</p>	<p>60 females with breast cancer, currently receiving chemotherapy with adjuvant anthracycline, Receiving palonosetron-aprepitant antiemetic treatment, being at least in the second cycle of chemotherapy and having experienced chemotherapy-induced nausea.</p>	<p>Sachet (powdered ginger root on yogurt).</p>	<p>Standard care.</p>	<p>The current study demonstrated that ginger administration was effective in decreasing the severity of acute and delayed nausea in women with breast cancer receiving anthracycline-based chemotherapy.</p>
<p>Montazeri, Raei, Ghanbari, Dadgari, Montazeri AS, Hamidzadeh A (2013) Iran</p>	<p>The objective of this study was to evaluate the efficacy of complimentary ginger among cancer patients experiencing nausea and vomiting.</p>	<p>Randomized cross-over clinical trial.</p>	<p>During the first cycle was 44. In the second cycle, were 31 patients.</p>	<p>Group A regime was a routine antiemetic drugs along with 4 ginger capsules. Then, subjects of the study were crossed over to receive the other regime.</p>	<p>Group B regime was a routine antiemetic along with 4 placebo capsules. Then, subjects of the study were crossed over to receive the other regime.</p>	<p>-The severity of the nausea at end of 24 hours in people who received regime A rather than placebo reduced by %27.3 in the first cycle and the severity of the nausea at end of 24 hours in people who received regime B rather than placebo reduced by %24.1. in the second cycle. The severity of the vomiting at end of 24 hours, in the first cycle of measurement for group A is 4.7 less than (placebo).</p> <p>- The severity of vomiting at end of 24 hours, in the second cycle of measurement for group B reduced by % 8.3 in comparison to the placebo.</p>

Zohreh Parsa Yekta, Seyyed Meisam Ebrahimi, Mostafa Hosseini, Alireza Nikbakht Nasrabadi, Sanambar Sedighi, Mohammad-Hosein Salehi Surmaghi, Hossein Madani (2013) Iran	The aim of this study was to evaluate the effect of ginger plant on chemotherapy-induced vomiting.	Randomized double-blind placebo-controlled clinical trial.	80 patients of breast cancer who receive any emetogenicity chemotherapy.	40 patients, 250 mg, Ginger root powder Capsule (zintoma) Dose: 1000 mg /day (1 x 250mg x QID) 6 days , from 3 days before chemotherapy.	40 patients 250 mg Starch capsules QID (placebo).	Vomiting cases were significantly lower in ginger group at anticipatory , acute and delayed phases.
Ryan et al. (2012) United States	The aim to determine if ginger was more effective than placebo in controlling acute CIN in cancer patients receiving 5-HT3 receptor antagonist antiemetics.	Double-blind placebo multicenter trial RCT.	Total sample was 744 while 576 patients included in the final analysis patients experienced chemotherapy induced nausea receiving 5-HT3 receptor antagonist antiemetics.	Three arms: 1)0.5 g ginger 2)1.0 g ginger 3) 1.5 g ginger.	Placebo	Ginger was significantly effective in reducing CIN. Ginger at dose of 0.5g to 1.0g daily significantly (P<0.05) aids in reducing acute CIN in patients receiving standard antiemetics and the lack of effect on quality of life.
Alparslan et al. (2012) Turkey	The present study was conducted to investigate the effects of ginger on chemotherapy-induced nausea and/or vomiting.	Non-RCT	-45 Patients were aged 18 years or older - They had no oral or gastrointestinal abnormalities -They were not experiencing other illnesses that might induce nausea and/or vomiting. No changes were no additional interventions for nausea and/or vomiting.	Tablet (ginger Type unspecified) 1.6 g/d (2x 0.4 g BD)	IV antiemetic	The main finding show that ginger is effective for reducing chemotherapy-induced nausea and/or vomiting.
Panahi et al. (2012) Iran	To evaluate the antiemetic activity of ginger against both acute and delayed types of CINV in patients with advanced breast cancer who were undergoing their first experience of chemotherapy.	A Pilot, Randomized, Open-Label Clinical Trial.	100 women who had cancer (mainly new cases of advanced breast cancer diagnosed by the oncologist and thus undergoing their first experience of chemotherapy). Most of these patients were initially assigned to the components of TEC regimen, including docetaxel, epirubicin, and cyclophosphamide.	Ginger (1.5 g/d in 3 divided doses every 8 hours) plus standard antiemetic regimen (granisetron plus dexamethasone; ginger group; n = 50)	Standard antiemetic regimen alone (control group; n = 50).	Addition of ginger to the standard antiemetic therapy was found to be associated with a significant reduction in the prevalence of nausea, but not vomiting, at 6 to 24 hours postchemotherapy in the ginger group compared with the control group.