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(RESEARCH ARTICLE)

Anti-motion sickness properties of ginger capsules, peppermint oil inhalation, acupressure wristbands and Vitamin B6: A survey of pharmacy students

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Abstract

Motion sickness, a prevalent condition affecting 46-67% of individuals, presents discomfort and challenges for frequent travelers. This paper explores two main topics: first, it reviews the effectiveness of herbal remedies in managing motion sickness, revealing varied outcomes across different studies. Studies on ginger present inconsistent findings regarding its anti-motion sickness activity, though it is considered a safe option for managing nausea during pregnancy. Peppermint oil aromatherapy, especially when combined with other oils, effectively reduces postoperative nausea, though not significantly on its own compared to saline. Acupressure wristbands have yielded variable outcomes, showing benefits in some studies for reducing nausea during pregnancy. Vitamin B6 supplementation has demonstrated benefits for nausea and vomiting, particularly during pregnancy, improving symptoms effectively. The second topic was to explore the knowledge and opinions of pharmacy students on the topic. The survey data presents demographic and professional backgrounds of 39 Howard University pharmacy students, showing a majority of females (74.36%), with the age group being primarily between 18-30 years. Most participants reside in Maryland and other states outside the local D.C. area. Over half have worked in pharmacy-related jobs, and a majority hold a bachelor's degree. The knowledge section of the survey indicates a-72.5% average correct response rate, with the highest correctness in understanding motion sickness's physiological causes. Opinion-based questions reveal strong support for further research on non-pharmacological remedies for motion sickness, although there is some disagreement among healthcare professionals about endorsing herbal remedies.

Keywords: Motion sickness; Ginger capsules; Peppermint oil; Acupressure wristbands; Vitamin B6

1. Introduction

Motion sickness is a widespread condition, affecting a significant portion of the population, particularly those who travel frequently. An international survey involving 4,479 participants revealed about 46% experienced carsickness in the previous 5 years, and the rate rose to 59% when childhood experiences were included. The survey estimated motion sickness affects about 2/3rd (66.7%) of car passengers [1]. When all types of motion sickness are considered, the estimate can be as high as 90% [2]. The impact of motion sickness can be quite distressing, as it can lead to discomfort, anxiety, and the inability to enjoy travel. It can also be a significant concern for individuals who rely on regular transportation for work or leisure.

Motion sickness, otherwise known as travel sickness or kinetosis, starts when the vestibular, visual, and proprioceptive systems fail to control a balance in spatial orientation. The risk factors include age, medical history, gender, mode of transportation and medications [2]. Women are more susceptible than men and the incidence generally declines with age, with elderly people being the least susceptible. People with vertigo and vestibular pathology, Meniere's disease,

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and migraines are more prone to motion sickness. Hormonal fluctuations during pregnancy and the menstrual cycle increase susceptibility [3]. Various natural remedies, including peppermint oil inhalation and ginger, have been used for treating motion sickness [4]. In addition, acupressure and vitamin B6 have been used for nausea and vomiting [5].

2. Literature Gap

The literature review revealed a significant gap in research related to peppermint oil inhalation and vitamin B6 as treatments for motion sickness. These two remedies have not been extensively studied in the context of motion sickness, indicating the need for additional research to assess their effectiveness.

2.1 Natural Remedies Used for Motion Sickness

2.1.1 Ginger Capsules

The effects of ginger on motion sickness, nausea and vomiting appear to be inconsistent. A study by Stewart et al. failed to show an anti-motion sickness activity of ginger root (*Zingiber officinale*). Motion sickness was induced in 28 human volunteers in a rotating chair. A dose of ginger at 500 mg or 1,000 mg (whole root), or fresh ginger root at 1,000 mg provided no protection against motion sickness. It also did not significantly alter gastric function during motion sickness. In contrast, scopolamine at 0.6 mg oral dose showed a significant anti-motion effect in the study subjects versus placebo ($p < 0.01$) and gastric motility was also changed during motion sickness. Although powdered ginger (500 mg) partially inhibited tachygastria in motion sickness, it did not enhance the electrogastrogram amplitude. The authors of the study concluded that ginger does not possess anti-motion sickness activity, nor did it significantly alter gastric function during motion sickness [6].

A study by Nikkhah, et al. [7] indicated that ginger could be possibly an effective alternative option for women suffering from the symptoms of nausea and vomiting in pregnancy. The effect is based on a low divided daily dosage of 1,500 mg as capsules or powder. Ginger did not pose a risk during pregnancy. Ginger and its polyphenol constituents target multiple signaling molecules that provide a basis for its use against multifactorial human diseases such as cancer. Most of the known activities of ginger components were studied in vitro and in vivo models; however, a few clinical studies were done in a few gastrointestinal disorders such as nausea and vomiting in human subjects and some were not statistically powered to draw convincing conclusions.

A systematic review of 43 randomized clinical trials (RCTs) revealed positive effects of ginger in several human health conditions such as nausea and vomiting in pregnancy, inflammation, metabolic syndromes, digestive function, and colorectal cancer. The clinical effects were in favor of ginger in the majority of the studies, including those for the alleviation of nausea and vomiting in pregnancy, digestive function, improvement in the expression level of markers for colorectal cancer risk, and anti-inflammatory functions [8].

2.1.2 Peppermint Oil Inhalation

Peppermint is a perennial flowering plant that grows throughout Europe and North America. Peppermint (*Mentha* × *piperita*) usually appears to be a cross between Water mint (*Mentha aquatica*) and Spearmint (*Mentha spicata*). Peppermint oil aromatherapy when blended with ginger, spearmint, and cardamom oil was found to be superior versus saline for postoperative nausea. However, randomized double-blind trials did not show peppermint oil aromatherapy by itself to be superior to saline. [9].

A study by Maghami et al showed that aromatherapy using the peppermint essential oil could significantly decrease the frequency, duration, and severity of nausea, and the frequency of vomiting in the first four hours after endotracheal tube removal in patients who underwent open-heart surgery. Sixty cardiac patients who were candidates for open-heart surgery were included in the study. They were divided into an intervention and a control group, with 30 patients in each group. The authors concluded that inhalation of peppermint essential oil reduced the frequency, duration, and severity of nausea, and the frequency of vomiting after open-heart surgery [10].

2.1.3 Acupressure Wristbands

An investigation carried out in 25 healthy subjects, who wore wrist or forearm bands, showed a decrease in the symptoms of motion sickness and the gastric activity that usually accompanies motion sickness. The subjects reported significantly fewer symptoms of motion sickness on days when wearing the Acuband on the wrist or the arm than they did on control days when they wore no Acuband [11]. On the other hand, a study by Miller and Muth [12] involving 77

study subjects showed neither band nor placebo prevented the development of motion sickness, regardless of whether the bands were used correctly or incorrectly.

Sea-Bands with acupressure buttons were shown to be a noninvasive, inexpensive, safe, and effective treatment for the nausea and vomiting of pregnancy. Self-report daily diaries of the number of times per day that participants experienced nausea, the severity of nausea, the number of vomiting episodes per day, and the severity of vomiting were recorded. The treatment group had significantly less frequency and severity of nausea and vomiting of pregnancy while wearing the Sea-Bands than did the placebo group. The treatment group also had significantly less frequency and severity of nausea and vomiting during pregnancy while wearing the SeaBands than when not wearing them [13].

2.1.4 Vitamin B6

A review of a database of 548 potentially eligible articles selected 18 studies satisfying the inclusion criteria, of which eight studies showed beneficial effects with pyridoxine alone as the supplementation, while six others found that the supplementation of pyridoxine in combination with another active substance had favorable effects on nausea and vomiting during pregnancy (NVP). Supplementation of pyridoxine alone as well as combined treatment of pyridoxine with an active ingredient as the intervention significantly improved the symptoms of nausea according to Rhode's nausea and vomiting score ($p = 0.003$). The study concluded that supplemental pyridoxine alone and combined with an active ingredient demonstrated beneficial effects for women suffering from NVP [14].

3. Methods

This survey was initiated as part of a Drug Information course, a 2-credit-hour class for first-year professional pharmacy students. The students received comprehensive instruction on research methodology and survey administration. A Likert scale was used to score responses for the four opinion-based statements: 4=strongly agree; 3=agree; 2=disagree; 1=strongly disagree. The knowledge-based data was derived from answers to five questions. Mean, standard deviation, and variance were computed for each of the responses and for the cumulative response. The findings were shared with the students. Subsequently, they were required to integrate these results into their research papers, contributing specifically to the discussion, conclusion, and abstract sections.

4. Results

4.1 Demographics

The data in Table 1 contains information on the gender, age distribution, and geographical backgrounds of the survey participants. There was a total of 39 respondents, with approximately one-third (25.6%) identifying as male and 74.36% as female. When considering age, a range of age groups is represented, with the majority falling into the 18-24 (51.3%) and 24-30 (38.5%) categories. Smaller percentages include those in the 30-34 age range (7.7%) and those above 40 (2.6%). The residency locations of respondents prior to enrolling in the Howard Pharmacy Program reveal a varied distribution. 15.8% indicated residency in Washington, D.C., 39.5% in Maryland, 2.6% in Virginia, and with the largest contingent, accounting for 42.1%, coming from various other states.

Table 1 Demographic data of participants *(n* =39; *n*=38 for states lived in)

Demographics		***n* (%)**
Gender	Male	10 (25.64)
	Female	29 (74.36)
Age (Years)	18-24	20 (51.28)
	24-30	15 (38.46)
	30-40	3 (7.69)
	Above 40	1 (2.56)
State lived in prior to starting Howard University College of Pharmacy	Washington, D.C.	6 (15.79)
	Maryland	15 (39.47)
	Virginia	1 (26.3)
	Other States	16 (42.11)

4.2 Participant's work and educational background

Among the 39 respondents, the data provides insight into their professional and educational backgrounds prior to enrolling in the pharmacy program at Howard University. In terms of work experience, more than half of the respondents (54.1%) had employment directly related to pharmacy, while 24.3% were engaged in non-pharmacy health-related fields, and 21.6% held jobs unrelated to health. Concerning their highest educational levels, a substantial majority (66.7%) held a Bachelor of Science (BSc) or Bachelor of Arts (BA) degree. Additionally, 17.9% held a Master of Science (MSc) degree, 10.3% completed some pre-pharmacy or college coursework, and only 2 respondents (5.1%) had an Associate degree. These findings provide a snapshot of the professional and academic backgrounds of the surveyed individuals, contributing valuable context for their decision to pursue pharmacy education (Table 2).

Table 2 Work and educational background of the participants

Questions	**Responses**	***n* (%)**
How many years have you had a paying job before joining the Pharmacy program at Howard University?	Never worked	2 (5.1)
	1-2 years	12 (30.8)
	3-4 years	9 (23.1)
	5 or more	16 (41.0)
What kind of work have you had?	Pharmacy Related work	20 (54.1)
	Non-Pharmacy but other health related work	9 (24.3)
	Non-Health Related	8 (21.6)
What is the highest educational level you have achieved before joining the pharmacy program at Howard University?	Pre-Pharmacy or some college work	4 (10.3)
	Associate degree	2 (5.1)
	BSc or BA	26 (66.7)
	MSc	7 (17.9)
	PhD or another Doctoral Degree	0 (0.0)

4.3 Knowledge-Based Questions

Table 3 gives a breakdown of scores on the knowledge part of the survey. Overall, about 72.5% of the respondents answered the questions correctly on average. Over ninety percent (94.3%) of the participants answered question 2 correctly; it mentioned motion sickness results from conflicting sensory signals sent to the brain, leading to an imbalance in equilibrium.

The question that received the least percentage (8.57%) of correct answers claimed approximately 10-20% of individuals may experience motion sickness at some point in their lives. The rest of the questions received correct answers ranging from 82.35% to 88.57%.

Table 3 Results of Knowledge-Based Questions (n =35 for all except for question 4; n=34)

Question	**Correct Answer**	**True (*n*)**	**False (*n*)**	**Participants with correct answers: *n* (%)**	**Mean correct answer rate, out of 1 (± SD)**	**Variance**
Approximately 10-20% of individuals may experience motion sickness at some point in their lives.	False	32	3	3 (8.57)	0.0857±0.2799	0.0784
Motion sickness is believed to result from conflicting sensory signals sent to the brain, leading to an imbalance in equilibrium.	True	33	2	33 (94.29)	0.9429±0.2321	0.0539

The primary active compound in ginger responsible for its anti-nausea properties is gingerol.	True	31	4	11 (88.57)	0.8857±0.3182	0.1012
Acupressure wristbands apply pressure to specific acupressure points on the wrist, which are believed to relieve nausea and vomiting.	True	28	6	8 (82.35)	0.8235±0.3812	0.1453
The main limitation is the lack of extensive clinical research specifically evaluating the efficacy of these remedies for motion sickness.	True	31	4	29 (88.57)	0.8857±0.3182	0.1012
Average				72.47	0.7247±0.3059	0.0960

4.4 Opinion-based Questions

Table 4 depicts a high average agreement rate of 81.4%. The highest disagreement rate of 28.6% was noted for the statement that healthcare professionals generally endorse the use of herbal remedies for motion sickness. This was followed by a rate of disagreement at 11.5% on the statement that factors to consider include the severity of symptoms, personal preferences, and the available scientific evidence supporting the efficacy of the chosen remedy.

Table 4 Opinion-based Questions (*n* =35)

Statement	**SA (*n*, %)**	**A (*n*, %)**	**DA (*n*, %)**	**SDA (*n*. %)**	**Mean LK ±SD**	**Variance**
Healthcare professionals generally endorse the use of herbal remedies for motion sickness	13 (37.1)	12 (34.3)	10 (28.6)	0 (0.0)	3.0857±0.8061	0.6498
It is okay for individuals to rely on non-pharmacological remedies like ginger capsules or acupressure wristbands for motion sickness or are pharmaceutical options preferable?	9 (25.7)	17 (48.6)	9 (25.7)	0 (0.0)	3.000±0.7171	0.5143
There is a literature gap indicating a clear need for additional research to assess the effectiveness of these remedies in managing motion sickness symptoms.	11 (31.4)	21 (60.0)	3 (8.6)	0 (0.0)	3.2286±0.5897	0.3478
Factors to consider include the severity of symptoms, personal preferences, and the available scientific evidence supporting the efficacy of the chosen remedy.	11 (31.4)	20 (57.1)	3 (8.6)	1 (2.9)	3.1714±0.6963	0.4849
Average	31.4%	50.0%	17.9%	0.73%	3.1214±0.7023	0.4992

*SA= Strongly agree; A=Agree; DA=Disagree; SDA=Strongly disagree; LK=Likert Score; SD=Standard deviation

5. Discussion

Ginger capsules, with their anti-nausea properties, show promise in reducing motion sickness symptoms. Peppermint oil inhalation lacks extensive research, while acupressure wristbands yield mixed results. Vitamin B6, though essential for health, lacks specific studies on motion sickness. Healthcare professionals endorse pharmacological options, generally emphasizing individualized treatment plans.

The present investigation sought to assess Howard University first pharmacy students' knowledge and opinions regarding various aspects of motion sickness and the utilization of herbal remedies for its management. A cohort of survey participants was subjected to a set of knowledge-based questions, and their responses were meticulously analyzed to elucidate trends and disparities in comprehension.

For the knowledge-based questions, the survey participants provided a mean correct answer rate of 72.46% for the five knowledge-based questions. Only one question 1 (Table 3) which stated 10-20% of individuals may experience motion sickness at some point received a high wrong response rate of 91.43%. The question pertaining to the etiology of motion sickness, positing that it results from conflicting sensory signals leading to an imbalance in equilibrium, achieved the highest accuracy rate at 94.29%, reflecting a substantial grasp of this fundamental concept. Conversely, question 4, addressing the primary source of knowledge about acupressure and positing that acupressure wristbands relieve nausea and vomiting, elicited the highest rate of incorrect responses at 17.65%. This incongruity suggests a potential area of ambiguity or misinformation regarding acupressure among the surveyed participants. The remaining three questions (3,4 &5), exploring the primary active compound in ginger (gingerol), the mechanism of acupressure wristbands, and the limitations associated with clinical research on motion sickness remedies, garnered high correctness rates of 88.57%, 82.35%, and 88.57%, respectively. The results highlight a correct understanding of these specific facets of motion sickness among the survey participants. Statistical analysis, indicated by a standard deviation (SD) of 0.3059 and a variance of 0.0960, summed over the five questions, underscores the consistency of correctness percentages around the mean. The low variance implies a limited dispersion of data points, signifying a general cohesive and uniform response pattern across the knowledge-based questions.

In the opinion-based inquiries, participants expressed varied perspectives on the endorsement of herbal remedies by health professionals, the acceptability of non-pharmacological remedies, and the need for additional research. Notably, 71.34% concurred with the endorsement by health professionals, while about 74% found it acceptable for individuals to rely on non-pharmacological remedies. A considerable majority (91.43%) acknowledged the existence of a literature gap necessitating further research on the efficacy of these remedies. Opinions on factors influencing remedy choice revealed an 88.57% agreement rate on considerations such as symptom severity, personal preferences, and scientific evidence, while only 11.43% disagreed. Analysis of the Likert score of 3.1214 (averaged over the four statements) showed a closeness to the agreement scale of 3 to 4. This agreement is also reflected in the average 81.4% rate (Table 4).

6. Conclusion

Motion sickness is a common condition that can significantly impact individuals' travel experiences. This paper reviewed four potential remedies for motion sickness: ginger capsules, peppermint oil inhalation, acupressure wristbands, and vitamin B6. While ginger capsules have shown promise in clinical studies, peppermint oil inhalation and vitamin B6 require further investigation to establish their efficacy. Acupressure wristbands are a widely used nonpharmacological option, but their effectiveness varies among individuals. Healthcare professionals generally recommend individualized treatment plans, and the choice between non-pharmacological and pharmaceutical remedies should be based on personal preferences and symptom severity. The potential impact of a prospective study on peppermint oil inhalation and vitamin B6 is significant, as it could provide more options for individuals seeking relief from motion sickness. A survey conducted among 35 Howard University first-year pharmacy students revealed that about 73% of the knowledge-based questions were answered correctly, and an average 81.43% of the respondents agreed with opinion statements at the rate of 81.43%. The survey's major limitation is the small size of the sample; hence cannot be generalized to all first-year pharmacy students in other institutions.

Compliance with ethical standards

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Disclosure of conflict of interest

The authors declare no conflict of interest.

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