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The effects of Chamomile tea on antioxidative biomarkers in operating room staff

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ABSTRACT

Introduction: Chamomile tea (CT) is an herbal tea and is served as a beneficial herbal infusion all over the world. Its major polyphenols constituents and tea-catechins have been shown to have health benefits. Operating room staff are commonly exposed to damaging factors, such as radiation, waste anesthetic gases and psychological stress. One of the most important qualities of CT is its antioxidant property. The aim of this study was to evaluate the effects of CT in reducing the oxidative stress of operative room staff that are chronically exposed to damaging factors.

Methods: In this study we approached to 20 operating room personnel. The subjects drank 2 cups of CT (every cup contained 1.8730 g of chamomile and 300 ml of water) daily, one cup in the morning and another in the afternoon for 21 days. A questionnaire that contained personal information was filled by each subject. Oxidative stress parameters such as total antioxidant capacity (TAC), catalase (CAT) and total thiol molecules (TTG) were measured 2 times: first before drinking CT at the first day and the next time after the 21st day.

Results: Consumption of CT by subjects caused a significant induction in TAC (6.62 ±0.77 vs 4.81± 0.39 µmol/ml, $P<.05$) of saliva. There was not any statistically significant change in saliva TTG and CAT after 21 days of drinking CT.

Conclusion: In the end we came to conclusion that CT can be a useful additional food to remove the oxidative damage that happens to operating room staff.

Implication for health policy/practice/research/medical education:
Chamomile tea can be served as a herbal tea with beneficial effects as antioxidant. It can reduce oxidative injuries in situations including in operating room staff.

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Introduction

Operating room staff are commonly exposed to many damaging factors such as radiation, waste anesthetic gases and psychological stress in their work environment. So far several attempts have been done to reduce these agents, but they are still inescapable (1,2). The most harmful effects of these agents are their effects on nervous and immunological systems, liver, kidneys and other vital systems, and the most common effect of anesthetic gases is increasing the risk of getting cancer (1,3,4). Although there is not any distinct reason for the effects of these agents on the main systems of human body, there is a hypothesis that anesthetic gases cause oxidative stress in the vital organs and bring about harmful changes to bodily functions (5,6). Long contact with reactive oxidative stress (ROS) can cause damage to the vital organs, which leads to unavoidable diseases (7,8).

The Camellia sinensis tea (Theaceae) has long been promoted for having a variety of positive health benefits (9-11). For centuries, people around the world have turned to Chamomile tea (CT) as a cure-all for a multitude of physical and emotional health concerns (12). CT is

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derived from *Matricaria chamomilla* L. (13)

Current scientific studies have shown that CT has stress relieving and nerve relaxant properties and has been used to remove inflammations, pain and to cure rheumatic disease (12,14). Exposure to occupational and environmental contaminants is a major contributor to human health problems. Inhalation of anesthesia gases can cause a wide range of adverse health effects (15). Many of these chemicals are beneficial, but others have the potential to cause damage to human health (16). Accordingly, since chronic exposure to some chemicals such as the substances used for anesthesia, and also mental and physical stress of the operating room cause oxidative stress. The present study was undertaken to explore the possible protective effects of CT in reducing the oxidative stress of operative room staff that are chronically exposed to damaging factors.

Materials and Methods

Subjects

In this study, the first sampling of each person was done before consumption of CT and the second time of sampling was after 21 days of consecutive consumption of the tea. This means the control and the treatment groups are in fact the same. All the samples were also analyzed by a third party because we think studies performed by only one group of researchers are not conclusive.

In the location of this study, the number of operating room personnel was 20 and all of them were enrolled, so each person had equal chance to participate in the study. In this clinical trial we randomly assigned our 20 subjects that were in the age range of 35-75 years and worked 15 years in average in that work environment. These subjects were usually active in operating rooms for 6 hours a day. A questionnaire that contained personal information including age, sex, history of suffering from a specific disease, job history, smoking behavior, was filled by each subject. After this control period, operating room personnel drank 2 cups (each cup contained 1.873 g of chamomile in 300 ml of water) of CT prepared with 6.24 mg of dried leaves for every milliliter of hot water (80°C) at two points in time: one cup in the morning and the other one in the afternoon for 21 days.

The saliva sample of each subject was collected between 9 AM and 10 AM using sterile culture tubes after a single mouth rinse with 15.0 ml of distilled water to wash out exfoliated cells (17).

The saliva samples of the control group were collected in the morning of the first day of the experiment before intervention and the saliva samples of the treatment group were collected in the morning of the day 21 after drinking CT for 21 days. About 2 ml of saliva was placed on ice immediately, then centrifuged at 3.000 rpm and the supernatant was used for analysis of catalase (CAT), total thiol molecules (TTG) and total antioxidant capacity (TAC).

This trial's protocol and procedures were approved by Ethics Committee of Hamadan University of Medical Sciences, Iran. Then, this trial was registered at http://www.irct.ir website. The registration number of this trial is IRCT2013050113194N1. This trial was performed in 2013 in Hamadan, Iran.

Examination of total antioxidant capacity

Ferric reducing ability of plasma (FRAP) is an antioxidant capacity assay. The FRAP assay is often used to measure the antioxidant capacity of foods, beverages and nutritional supplements containing polyphenols. FRAP is based on the ability of saliva to reduce Fe^{3+} to Fe^{+2} in the presence of TPTZ. The reaction of Fe^{+2} with TPTZ creates a blue color complex which has the maximum absorbance at the wavelength of 593 nm in spectrophotometer (18).

Assay of catalase

The primary principles of the reaction consist of the breakdown of the substrate (hydrogen peroxide) by catalase and measuring the decrease in absorbance at 240 nm. This reaction took place with the lowest amount of H2O2 (10mM) and sodium phosphate buffer (50mM, pH = 7.0). Changes in the rate of absorbance in the unit of time are an index of the activity of catalase. The activity of catalase is measured as the amount of substrate (H2O2) that is disintegrated by catalase in 1 minute which is reported as the unit of the enzyme in ml of saliva (units/ml saliva) (19).

Examination of total thiol molecules

To evaluate the TTG of saliva, DTNB was used as the reagent. DTNB reacted with thiol molecules and created a yellow complex with them which had the maximum absorbance at the wavelength of 421 nm in spectrophotometer (20).

Statistical analysis

Results are expressed as mean ± SE, 95% CI .The differences between subjects were assessed by Paired *t* test. The significance was assumed as $P \leq .05$.

Results

Table 1 shows the demographic basic characteristics of the subjects in this study. As shown in Table 2, the mean levels of salivary antioxidants showed that the mean concentrations of salivary TAC were 4.81 ± 0.39 vs 6.62 ± 0.77 μmol/ml, $P < .05$. The mean TTG concentration was not different before and after using CT ($P > .05$, 0.14 ± 0.02 vs 0.28 ± 0.001 49). Also the mean CAT activity in these subjects was not different before and after usage of CT ($P > .05$, 1.39 ± 0.25 vs 0.98 ± 0.20 U/ml).

Anesthetic gases are one of the most important agents that are able to induce oxidative stress. In this analysis, oxidative stress was investigated in operating room staff at risk of contact with anesthetic gases such as halothane.

Table 1. Demographic basic characteristics of study subjects

Age mean (y)	35.75
No. of subjects	20
Chronic using drug	
No	17
Yes	3
Smoking	
No	17
Yes	3
Sex	
Female	8
Male	12

Table 2. Antioxidative biomarkers before and after treatment by CT

Biomarker	Before Mean ± SE (95% CI)	After Mean ± SE (95% CI)	*P* value
TAC (μmol mL^{-1})	4.81 ± 0.39	6.62 ± 0.77	*P* = .02
TTG (mmol mL^{-1})	0.14 ± 0.02	0.28 ± 0.09	*P* > .05
CAT (UmL^{-1})	1.39 ± 0.25	0.98 ± 0.20	*P* > .05

Abbreviation: CT, Chamomile tea.

These results showed that CT decreased oxidative stress in operating room employees. In contrast, TAC was markedly increased in these subjects after consumption of CT.

Discussion

Chamomile as a supplement contains numerous bioactive compounds such as antioxidants. A recent investigation exhibited that there are three different chemical subtypes: sesquiterpenes, coumarins, and flavonoids that make the main components of *M. chamomilla* (12). The main components of flavonoid are apigenin, luteolin, and quercetin, with 16.8%, 1.9%, and 9.9%, respectively (21). The components of tea such as coumarins and flavonoids are soluble in hot water, and the amounts obtained from usual consumption of tea are significant (22). There is strong evidence that these compounds prevent the harmful oxidative effects of oxidant chemicals from damaging skin, membranes, proteins, and DNA by inhibiting free radicals scavenging activity and protect human body against chronic health disorders such as atherosclerosis, hypertension and some chronic illnesses (23).

Recently, the role of ROS in mediating apoptosis in various cancer cells has been established quite well (24). Release of cytochrome c appears to be the central event, since it is critical for aggregation of the adapter molecule (Apaf1). The pro-apoptotic member of the Bcl-2 family Bax can directly cause mitochondria to release cytochrome c. In addition, chamomile can indirectly regulate the anti-apoptotic effects (25).

Extensive laboratory and epidemiological studies have suggested that black and green tea polyphenols have preventive effects against chronic diseases. The antioxidant activity of CT polyphenols effects of these compounds, have also been suggested as potential mechanisms for cancer prevention (25).

It is believed that medicinal plants are a potential source of antioxidants and ROS scavenger molecules. Previous studies that indicated the anti-oxidative property of medicinal plants have shown the trapping effect of ROS as well as inhibitory effects of their antioxidant enzymes on oxidants and induction of TAC by them (26). However, in this study after consumption of CT by these subjects TTG changed significantly. Although in these places there are many pollutants that we were not able to measure their effects.

In conclusion, this study provides evidence that CT protects the body against ROS/RNS-mediated damage that occurs due to chronic exposure to anesthetic gases. Regarding the harmful chemical substances and oxidants present in different workplaces and the environment, and proved beneficial properties of antioxidants, further studies are required in this topic to obtain more evidence-based results and to put these substances into our diet.

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Authors' contributions

GS Design of the study and doing labratory methods. EK: Preparation of the paper and sampling. THS: Help in labratory methods and statistical analysis. AR: Help in design of the study and English editing of the paper.

Conflict of interests

There is no conflict of interests.

Ethical considerations

Ethical issues (including plagiarism, misconduct, data fabrication, falsification, double publication or submission, redundancy) have been completely observed by the authors.

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