Nursing Practice Today

Nurs Pract Today.2017;4(1):1-10.

Review Article

Could tea consumption decrease the risk of depression: A systematic review and meta-analysis?

Mohammad Farajzadeh[1], Mokhtar Yaghoubi[2], Sahar Dalvand[3], Zahra Khesali[4], Reza Ghanei-Gheshlagh[5*], Sarkawt Ghawsi[1]

[1] Imam Khomeini Hospital of Saqqez, Kurdistan University of Medical Sciences, Sanandaj, Iran
[2] Department of Operating Room, School of Nursing and Midwifery, Kurdistan University of Medical Sciences, Sanandaj, Iran
[3] Social Determinants of Health Research Center, Kurdistan University of Medical Sciences, Sanandaj, Iran
[4] Razi Psychiatry Hospital, Department of Nursing, University of Social Welfare and Rehabilitation Sciences, Tehran, Iran
[5] Clinical Care Research Center, Kurdistan University of Medical Sciences, Sanandaj, Iran

ARTICLE INFO

Received 26 November 2016
Revised 15 December2016
Accepted 3 February 2017
Published 20 March 2017

Available online at:
http://npt.tums.ac.ir

Key words:
tea consumption,
depression,
meta-analysis

ABSTRACT

Background & Aim: Depression is a chronic and overwhelming disorder. One of the factors that could prevent the occurrence of depression is tea consumption. Considering the controversial results of previous studies, the aim of this systematic and meta-analysis review study was to answer this question that whether tea consumption could decrease the risk of depression.

Methods & Materials: By searching the keywords of tea, depressive disorder, depression caffeine, theanine and polyphenols in national and international databases such as SID, MagIran, Google Scholar, IranMedex, Science Direct, Pubmed, ProQuest and Scopus from 2000 to 2016, 12 descriptive and cross-sectional studies about the relation between tea and depression were extracted. Data of the selected studies were analyzed by meta-analysis method and random model effect. Heterogeneity of the studies was evaluated using I2 index. Data were analyzed using STATA 11.2 software.

Results: The sample size of the present study included 629910 participants with an average of 52493 participants for each study. Results of the present study showed a significant relation between tea consumption and symptoms of depression (95%CI:0.50-0.84, OR = 0.65); in a way that the risk of depression among participants who consumed tea was 35% lower than those who did not consume tea.

Conclusion: Results of the present study revealed that tea consumption would decrease the risk of depression. Considering the high consumption of tea all around the world and the high prevalence of depression, balance daily tea consumption is recommended as a method for preventing depression.

Introduction

Depression is one of the most common psychological disorders and the fourth main cause of mortality around the world that has involved about 350 million people globally (1) and soon will become the second cause of disability among people (2). Montazeri et al. (3) in their review study reported the prevalence of depressive disorder to be 19.9% in Thailand, 17.1% in the USA, 15.4% in Netherlands, 4% in South Korea and 3.7% in Hong Kong; while the prevalence of depression in Iran has been reported to be 25%.Depression is associated with physical symptoms, including fatigue, pain, digestive problems, anemia, psychomotor changes, changes in appetite and weight and problem in functioning, loss of sexual desire, and forgetfulness, and also cognitive symptoms including depressed mood, loss of interest, suicidal thoughts, pessimism, feeling of failure and guilt, blame, hatefulness and self-criticism (4, 5). Depression, with its adverse effects on individual's quality of life and functioning, has increased the need for medical services and eventually would lead to disability and death (6, 7). Different factors such as being

* Corresponding Author: Reza Ghanei-Gheshlagh, Postal Address: Clinical Care Research Center, Kurdistan University of Medical Sciences, Sanandaj, Iran. Email: Ghanei@muk.ac.ir

female, divorced or widowed, having low social-economic status, disabling diseases and uncontrollable pains, having functional disorders, history of previous depression and being socially isolated are considered as the risk factors for depression (8, 9). Results of previous studies have shown that depression, by allocating 35% to 45% of the burden of mental diseases to itself, has involved 5% to 20% of the general population (7). Also the level of major depressive disorders among patients who refer to psychiatrist would reach 10% to 15%; while only about half of the patients with major depressive disorders would receive pharmaceutical or cognitive treatment by psychiatrists (10). Although decades have passed since the intervention of antidepressants, but their effectiveness is not definite and indisputable and only about 33% of depressed patients would respond to the first prescribed drug (1). Furthermore, depression treatment, due to the large number of prescribed drugs, the side effects of drugs and poor adherence to treatment by depressed patients would encounter many problems (2). Therefore, preventing and treating depression requires wider perspectives and insights.

One of the things that could possibly be effective on improvement of mental health, anxiety and depression is tea consumption (11). Tea, which is produced from a plant leaf with the same name, was discovered about 5000 years ago in China and then was transferred to other parts of the world (12). Tea is one of the most common consumed non-alcoholic beverages after water in the world and has different types which 78% of them are green and black (13). Studies have shown that, by improving the functionality of the brain, tea could decrease the risk of cerebrovascular diseases, death from pneumonia, cardiovascular diseases, diabetes, and osteoporosis (14, 15). Many studies have been conducted with different results about the relation of tea and depression. Results of a study that was conducted in 2009 on the Japanese elderly population showed that people who regularly consumed tea presented less symptoms of depression thanothers (16). However, in another study that was conducted in 2010 in Finland no relation was observed between tea consumption and depression (17). In a meta-analysis that was conducted by Dong et al. (1) also tea consumption decreased the symptoms of depression. But that study reviewed the effect of consuming different types of caffeinated beverages on depression and not just tea. Also in the study of Dong, all of the studies on this subject were not selected for meta-analysis. Considering the high prevalence of depression and its adverse effects on health and also the controversial results of conducted studies about the relation between tea consumption and depression, it seems necessary and important to reach a conclusion by pluralization and analysis of conducted studies; therefore, the aim of the present study was to conduct a systematic and meta-analysis review to evaluate the relation between tea consumption and depression.

Methods

The present study was a systematic review and meta-analysis, which assessed the studies conducted on the relation between tea consumption and depression. Articles were searched in national and international databases such as IranMedex, MagIran, SID, Google Scholar, PubMed, Science Direct, ProQuest and Scopus using the keywords of depressive disorder, depression, caffeine, theanine, polyphenols, tea and their Farsi equivalents. For the present study, published studies from 2000 to 2016 were selected. The flowchart of finding and screening articles is presented in PRISMA flow

diagram (Figure 1). The searched phrases were:

((tea) OR (polyphenols) OR (theanine) OR (caffeine)) AND ((depression) OR (depressive disorder) OR (depressive symptoms)).

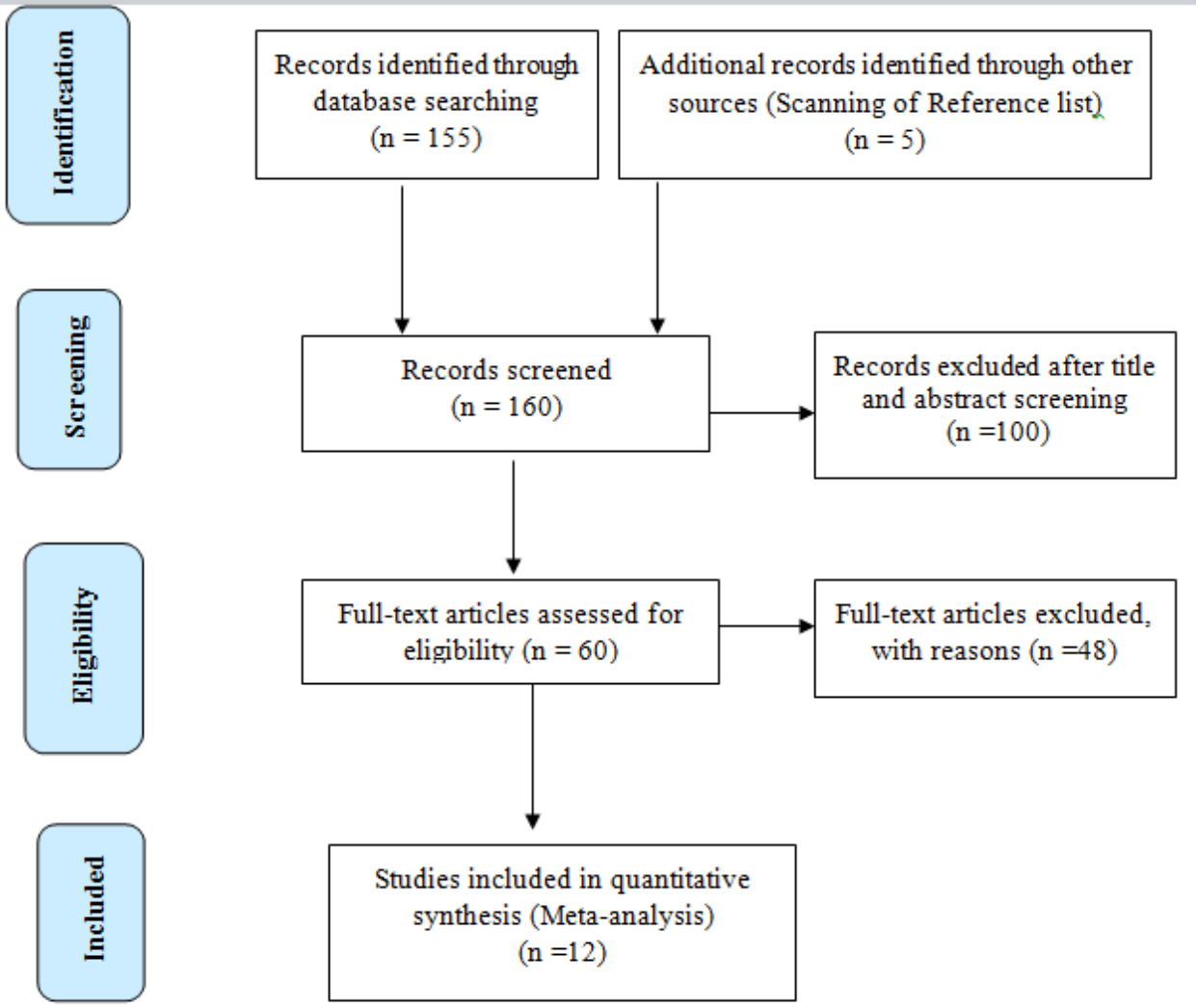

Figure 1. PRISMA flow diagram describing the study design process

At first, a list of the titles and abstracts of all the existing articles on the mentioned databases were developed by the researchers. After the primary search, the abstract of the studies was reviewed and related articles to the subject of the present study were selected. A checklist including all the necessary information for the study, including the name of the study's first author, year and the place of the study, type of the study, frequency of patients with depression and frequency of depression among two groups of high tea consumers and low tea consumers was developed. On this basis, related articles to the title of the study were selected by two independent

researchers and after their agreement, studies were enrolled in the meta-analysis and irrelevant studies were excluded. In case of a disagreement, a third expert researcher who had a wide experience in the field of meta-analysis would review the study and their opinion would be considered as the final decision. At the end, the references of all the searched articles were also reviewed for including any other possible related articles. The inclusion criteria for the meta-analysis were being an observational study (cross-sectional, case-control and cohort), being published in Farsi or English, evaluating the relation between tea consumption and depression, and accessibility of study's full text. The exclusion criteria were being conducted on animals and having vague and unknown types.

To analyze the selected studies, the random effect model was used for shared estimation of odds ratio (OR) with a confidence interval of 95% and for the visual presentation of the results of combined studies with a confidence interval of 95%, forest plot was used. Results are presented in Forest Plot 1. To evaluate the heterogeneity and inconsistency of the results of the selected studies, Cochran's Q and I2 indexes were used. To evaluated the publishing error and the effect of small studies in the meta-analysis, Egger and Begg's tests and for its graphical presentation funnel plot were used. Data analysis was performed through STATA 11.2 software.

Results

In the present meta-analysis 12 studies with a sample size of 629910 and a mean sample size of 52493 for each study were enrolled. The greatest sample size belonged to the study of Guo (2014) with 566398 participants and the smallest sample size was in the study of Benko (2011) with 51 participants. General characteristics and information of the selected studies are shown in table 1. In the Begg's funnel plot, despite no dispersion error in the Begg's test, no symmetry was observed either.

Table 1. Characteristics of the selected studies for the meta-analysis

First Author	Type of study	Country	Year	Sample Size	Age	Frequency of Depression	Frequency of Tea consumers	Odds Ratio	Lower Limit	Upper Limit
Guo[18]	Cohort	US	2014	566398	61.30	11311	252612	1.10	0.92	1.32
Lucas [19]	Cohort	US	2011	50739	63	2607	14673	0.80	0.64	0.99
Ruusunen[17]	Cohort	Finland	2010	2232	52.70	49	2150	-	-	-
Chen [20]	Cohort	China	2010	1399	53.70	364	152	0.39	0.19	0.84
Pham [21]	Cross-sectional	Japan	2013	537	75.90	157	268	0.57	0.30	1.05
NG [13]	Cross-sectional	Singapore	2013	2398	65.9	327	1490	-	-	-
Feng [22]	Cross-sectional	China	2013	1368	68.60	285	573	0.59	0.43	0.81
Benko[23]	Cross-sectional	Brazil	2011	51	9.90	34	34	-	-	-
Feng [12]	Cross-sectional	Singapore	2010	716	64.50	110	439	-	-	-
Niu[16]	Cross-sectional	Japan	2009	1058	75.90	361	776	0.56	0.39	0.81
Kuriyama[24]	Cross-sectional	Japan	2006	1003	74.50	331	725	0.60	0.35	1.02
Hintikka[25]	Cross-sectional	Finland	2005	2011	44.10	225	436	0.47	0.27	0.83

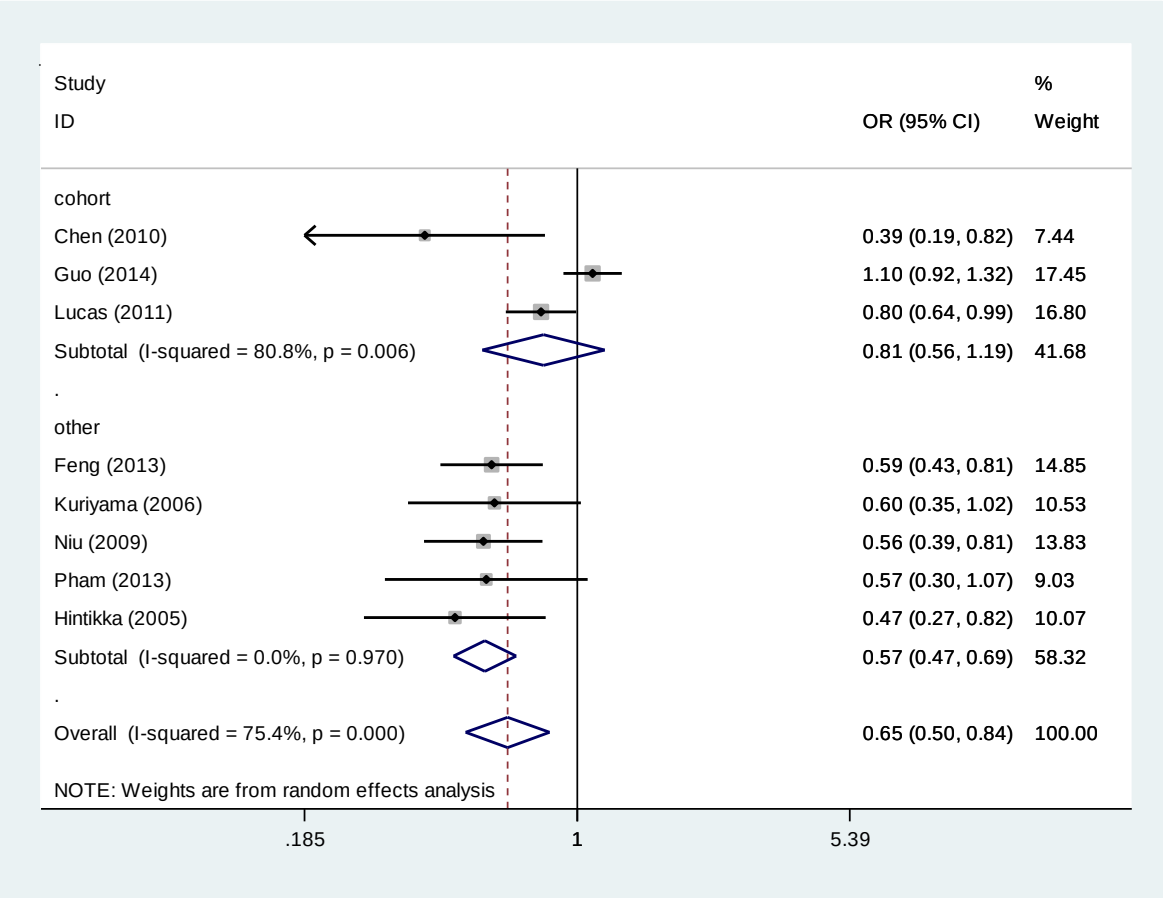

Figure 2. Distribution of the studies based on their design. The 95% confidence interval is illustrated as horizontal lines around the mean. The diamond mark is the results of combining the studies with a 95% confidence interval.

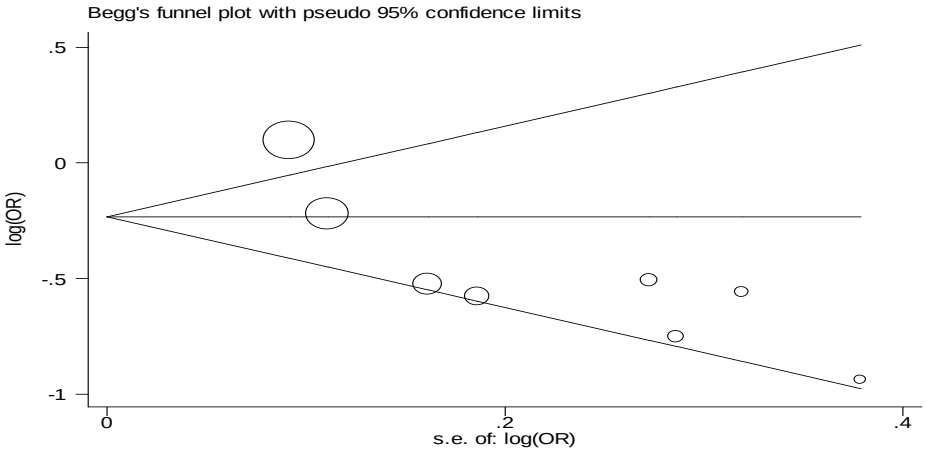

Figure 3. Funnel plot of publication bias based on Begg's regression test

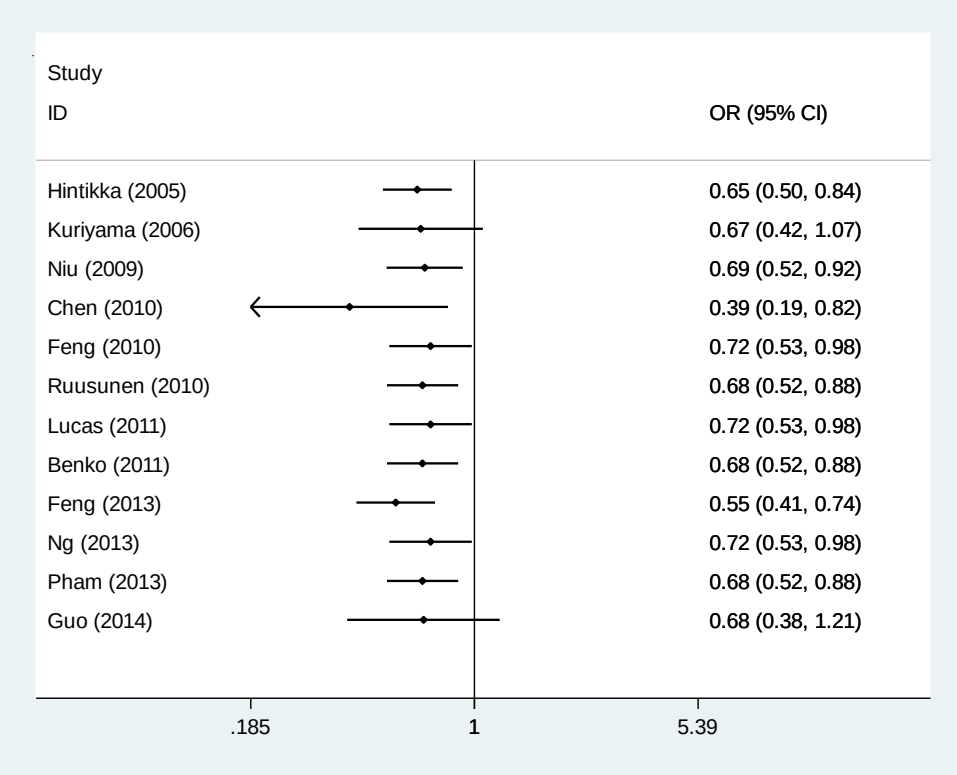

Figure 4. Distribution of the studies based on their authors and year of publication. The 95% confidence interval is illustrated as horizontal lines around the mean. In this diagram seven studies have reverse significant results and three have found weak relation.

Results of the present study revealed a significant relation between tea consumption and symptoms of depression (95% CI: 0.50-0.84, OR = 0.65).(Figure 2). Egger's test showed a significant dispersion error (p = 0.008) but no significant error was observed using Begg's test (p = 0.261).(Figure 3). The total amount of OR based on all of the studies showed that tea consumers would suffer from depression, 35% less than those who do not consume tea.(Figure 4).

Results of analysis based on the design of the study revealed that cohort studies have found no significant relation between tea consumption and depression; in other words, tea consumption has not decreased the risk of depression (pooled OR =0.81, 95%CI: 0.56-1.19); but other studies (except for cohort studies) reported a significant relation between tea consumption and depression which indicated that tea consumption was associated with decreased risk of depression (pooled OR=0.57, 95% CI: 0.47-0.69).

Discussion

The present study was conducted to evaluate the relation between tea consumption and depression. Results of the present study revealed a significant reverse relation between tea consumption and depression; meaning that tea consumption was associated with decreased risk of depression. Results of a dose-based meta-analysis by Grosso et al. (2016) showed that the risk of depression in those who consumes daily three cups of tea is 37%

lower than those who do not consume tea (11).

Results of all the reviewed studies except for the studies of Ruusunnen (17)in Finland, NG (13) in China, Feng (12)in Singapore and Lucas (19) in the USA, revealed a significant relation between tea consumption and depression. In the study of Ruusunnen (17)which was conducted on 2232 middle aged men in Finland, the relation between tea consumption and depression was not significant. In this study tea consumption was measured by instructed nutritionist checked 4d food scale of Finland. Results of the study by Hintika et al. (25)which was conducted on 2011 adults in Finland showed a weak significant relation between the two variables. It seems that the difference between the result of studies between Hintika and Ruusunnen could be due to the differences in the gender and age of samples, the measurement scales that were used for evaluation of depression and the design of the studies; the study of Ruusunnen was a cohort study with men-only samples that used the Center for Epidemiological Studies Depression Scale (CES-D) for evaluation of depression, while the cross-sectional study of Hintika was enrolled in both genders and Beck Depression Inventory (BDI) was used to evaluate depression.

Another study that was conducted by Lucas (19) on middle aged American women showed that women who daily consume more than four cups of caffeinated coffee were 20% less at the risk of depression than women who consumed less than four cups of coffee per day; but this relation was only observed for caffeinated coffee and no relation was observed for decaffeinated coffee and caffeinated tea. In the study of Lucas, psychiatrist's diagnosis and the history of antidepressants consumption were used for evaluation of depression. Results of a study by Benko (23) on 9 to 12 years old Brazilian children revealed no significant relation between tea consumption and depression; in this study, tea consumption was not the only studied case but the relation between the general consumption of caffeinated beverages including soft drinks, coffee and tea with depression was evaluated.

Results of the study by Guo et al. (18) were somehow complicated and interesting; because drinking tea alone was decreasing the risk for depression, but drinking tea with sweeteners besides sugar and honey, was increasing the risk for depression.

Reviewing conducted studies revealed that only three studies have mentioned thetype of the tea (consumption green tea) (12, 20, 24). Also in the study of Benko (23) the effect of a group of caffeinated beverages which included tea was evaluated. It seems that conducting further studies to determine the type of tea for more accurate evaluation of the relation between tea consumption and depression and also conducting clinical trials are necessary. In conducting the studies, the effect of confounding factors such as physical activity and consumption of alcohol and other stimulants and cigarettes should also be controlled.

The present study generally concluded that there is a significant reverse relation between tea consumption and depression. Various reasons have been presented for the reverse relation between tea consumption and depression. Zhu (26) believed that the reason is the existing polyphenols in tea, which is mostly contained of an antidepressant called Catechin. Results of the studies by Kaduka et al and Nathan et al which were conducted on rats showed that the existing L-Theanine in tea would regulate the density and volume of many of the neurotransmitters in the brain. Furthermore, tea consists of many other substances such as antibiotics, antioxidants, anti-inflammatories and prerequisites

neurotransmitters, especially in the dopaminergic system which could be an explanation for its antidepressant effects (27, 28). On the other hand, Pham et al. (21) showed that the serum folate level is higher among tea consumers than others and folate which is an antidepressant substance abundantly exists in tea. Another component of tea that has an antidepressant effect is caffeine (Trimethylxanthine), which is the most commonly, used mental stimulant substance in the world.

Most of the conducted meta-analyses in this field have evaluated the general relation between tea, coffee and caffeine with depression and have not distinguished these drinks from each other; but in the present study the effort was to exclusively evaluate the relation between tea consumption and depression. Also the method of tea consumption measurement was not similar in different studies and different scales and methods were used to measure tea consumption or even the measurement was not reported clearly; this was one of the limitations of the present study. Some studies mentioned the number and the capacity of each cup as the scale while others mentioned the number of time of tea consumption. Also, different scales were used for depression evaluation and except for a few studies; none of them used the diagnosis of psychiatrist as the depression evaluation. Also, in most of the studies the effect of confounding factors was not controlled. Another limitation of the present study was not using international tools by the researchers to determine the quality of selected studies for enrollment in the meta-analysis. In the present study, a checklist was used for determining the quality of the study.

Results of the present study showed that tea consumption would decrease the risk of depression. Considering the high levels of tea consumption in the world and also the high prevalence of depression, regular daily consumption of tea is recommended as a method for preventing depression.

Acknowledgments

We thank all authors of the articles that were used to write this manuscript.

Conflict of Interest

The authors declare that they have no conflicts of interest.

References

1. Dong X, Yang C, Cao S, Gan Y, Sun H, Gong Y, et al. Tea consumption and the risk of depression: A meta-analysis of observational studies. Australian and New Zealand journal of psychiatry. 2015; 49(4): 334-45.
2. Bridle C, Spanjers K, Patel S, Atherton NM, Lamb SE. Effect of exercise on depression severity in older people: systematic review and meta-analysis of randomized controlled trials. The British Journal of Psychiatry. 2012; 201(3): 180-5
3. Montazeri A, Mousavi S J, Omidvari S, et al. Depression in Iran: a systematic review of the literature (2000-2010). Journal of the Iranian Institute for Health Sciences.2013;12: 567-594.
4. Farajzadeh M, Hosseini M, Mohtashami J, Chaibakhsh S, Tafreshi MZ, et al. The Association Between Obstructive Sleep Apnea and Depression in Older Adults. Nursing and Midwifery Studies. 2016; 5(2):1-5.
5. Meijer A, Zuidersma M, Jonge P. Depression as a non-causal variable risk-marker in coronary heart disease. BMC Medicine. 2013;11:130
6. Manzouri L, Babak A, Merasi M. The Depression Status Of The Elderly and It's Related Factors In Isfahan In 2007.

Iranian Journal of Ageing. 2010; 4(4): 27-33(Full Text in Persian).

7. Dowlati Y, Herrmann N, Swardfager W, Liu H, Sham L, Reim EK, et al. A meta-analysis of cytokines in major depression. Biological psychiatry. 2010 Mar 1;67(5):446-57.

8. Petersen I, Bhana A, Swartz L. Mental health promotion and the prevention of mental disorders in South Africa. African journal of Psychiatry. 2012; 15(11): 411-416.

9. SheibaniTazraji F, Pakdaman S, Dadkhah A, HasanzadehTavakoli M. The effect of music therapy on depression and loneliness in old people. Iranian Journal of Ageing. 2010; 5(2): 54-60 [Persian]

10. Farajzadeh M, Hosseini M, Mohtashami J, Chaibakhsh S, ZaghariTafreshi M, Hajnasiri H. Studying relationship between body mass index and obstructive sleep apnea in depressed elderly patients in Saqqez city in 2014. Medical Science Journal of Islamic Azad Univesity-Tehran Medical Branch. 2016; 26(2): 116-22.

11. Grosso G, Micek A, Castellano S, Pajak A, Galvano F. Coffee, tea, caffeine and risk of depression: A systematic review and dose–response meta- analysis of observational studies. Molecular nutrition & food research. 2016; 60(1): 223-34.

12. Feng L, Gwee X, Kua EH et al. Cognitive function and tea consumption in community dwelling older Chinese in Singapore. J Nutr Health Aging. 2010; 14: 433–438.

13. Ng T P, Aung K C Y, Feng L, Nyunt M S Z, Yap K B. Tea consumption and physical function in older adults: A cross-sectional study. The journal of nutrition, health & aging. 2014; 18(2): 161-166.

14. Odegaard A O, Pereira M A, Koh W P, Arakawa K, Lee H P, Yu M C. Coffee, tea, and incident type 2 diabetes: the Singapore Chinese Health Study. Am J ClinNutr. 2008; 88(4): 979-85.

15. Bahorun T, Luximon-Ramma A, Neergheen-Bhujun V S, Gunness T K, Googoolye K, Auger C, et al. The effect of black tea on risk factors of cardiovascular disease in a normal population. Prev Med. 2011.

16. Niu K, Hozawa A, Kuriyama S, Ebihara S, Guo H, Nakaya N, et al. Green tea consumption is associated with depressive symptoms in the elderly. The American journal of clinical nutrition. 2009; 90(6): 1615-1622.

17. Ruusunen A, Lehto SM, Tolmunen T, Mursu J, Kaplan GA, Voutilainen S. Coffee, tea and caffeine intake and the risk of severe depression inmiddle-aged Finnish men: the Kuopio Ischaemic Heart Disease Risk Factor Study. Public Health Nutr. 2010; 13(8): 1215-1220.

18. Guo X, Park Y, Freedman ND, Sinha R, Hollenbeck AR, Blair A, Chen H. Sweetened beverages, coffee, and tea and depression risk among older US adults. PloS one. 2014; 9(4):e94715.

19. Lucas M, Mirzaei F, Pan A, Okereke OI, Willett WC, et al. Coffee, caffeine, and risk of depression among women. Arch Intern Med. 2011; 171: 1571–1578.

20. Chen X, Lu W, Zheng Y, Gu K, Chen Z, Zheng W, Shu XO. Exercise, tea consumption, and depression among breast cancer survivors. Journal of Clinical Oncology. 2010. 20; 28(6): 991-8.

21. Pham N M, Nanri A, Kurotani K, Kuwahara K, Kume A, Sato M, Hayabuchi H, Mizoue T. Green tea and coffee consumption is inversely associated with depressive symptoms in a Japanese working population. Public health nutrition. 2014; 17(03): 625-33.

22. Feng L, Zhongrui Yan, Sun B, Cai C, Jiang H, Kua E, Ng T, et al. Tea consumption and depressive symptoms in older people in rural china. Journal of the

American Geriatrics Society. 2013; 61(11), 1943-1947.

23. Benko CR, Farias AC, Farias LG, Pereira EF, Louzada FM, Cordeiro ML. Potential link between caffeine consumption and pediatric depression: a case-control study. BMC Pediatrics. 2011. 25; 11(1): 73.

24. Kuriyama S, Hozawa A, Ohmori K, Shimazu T, Matsui T, Ebihara S, et al. Green tea consumption and cognitive function: a cross-sectional study from the Tsurugaya Project. The American journal of clinical nutrition. 2006;83(2):355-61.

25. Hintikka J, Tolmunen T, Honkalampi K et al. Daily tea drinking is associated with a low level of depressivesymptoms in the Finnish general population. EurJEpidemiol. 2005; 20: 359–363.

26. Zhu WL, Shi HS, Wei YM et al. Green tea polyphenols produce antidepressant-like effects in adult mice. Pharmacol Res.2012; 65: 74–80.

27. Kakuda T, Hinoi E, Abe A et al. Theanine, an ingredient of green tea, inhibits [3H] glutamine transport in neurons and astroglia in rat brain. J Neurosci Res. 2008; 86:1846–1856.

28. Nathan PJ, Lu K, Gray M et al. The neuropharmacology of L-theanine (N-ethyl-L-glutamine): A possible neuroprotective and cognitive enhancing agent. J Herb Pharmacother. 2006; 6: 21–30.