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Meta-Analysis of the Effects of Barberry Consumption on Blood Pressure in Non-Communicable Disease Patients

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KEYWORDS
Barberry, Blood Pressure, Communicable Disease.

ABSTRACT
This study delves into the potential benefits of barberry consumption on blood pressure in individuals with hypertension and its effects on various non-communicable diseases. Barberry was chosen for investigation due to its historical use in traditional medicine and emerging evidence suggesting its positive impact on health. Barberry contains bioactive compounds like berberine, which have been associated with cardiovascular health benefits such as lowering blood pressure and cholesterol levels. Given the rising prevalence of hypertension and other non-communicable diseases globally, understanding the potential therapeutic effects of barberry could offer novel preventive and therapeutic strategies. Through the systematic review and meta-analysis of relevant literature, this study aims to provide a comprehensive assessment of the efficacy of barberry in managing blood pressure and its implications for public health interventions targeting non-communicable diseases.

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INTRODUCTION

Non-communicable diseases, also known as non-transmissible diseases, encompass a group of ailments that are not transmitted between individuals and develop gradually over a prolonged period (Babashahi et al., 2021; Toniolo et al., 2024; Vatanabe et al., 2020). Diabetes mellitus is a medical disorder characterized by chronically elevated blood glucose levels over an extended period. Broadly speaking, diabetes can be categorized into four distinct types: type I diabetes, type II diabetes, gestational diabetes, and another form of diabetes triggered by external factors (Antar et al., 2023; Association, 2014; Belwal et al., 2020; Choudhury & Rajeswari, 2021). Most diabetes patients have hypertension due to diabetes. Diabetics have a higher risk of cardiovascular disease, nephropathy, retinopathy, and neuropathy if they suffer from hypertension (Haq et al., 2019; Sethi et al., 2023).

Adults who have hypertension (high blood pressure) most often experience cardiovascular disease. 43% of annual deaths are caused by hypertension and other "vascular diseases," such as kidney failure and stroke (Aisha & Muhammad, 2014). As per the guidelines suggested by the European Society of Cardiology (ESC) and the European Society of Hypertension (ESH), hypertension (HT) is characterized by having a systolic blood pressure (SBP) exceeding 140 mmHg or a diastolic blood pressure (DBP) surpassing 90 mmHg. (Lee & Lee, 2016; Lipert et al., 2022).

Barberry, which has many polyphenols, improves health and prevents and treats disease (Emamat et al., 2020; Endalamaw et al., 2023). As a hepatoprotective, hypoglycemic, and herbal medicine, barberry has been reported to have promising and selective anticancer properties, hypertension, positive impacts on atherosclerosis, enhancement of immune response against coronary heart disease, and possessing hypolipidemic and antioxidant properties that can be beneficial (Kermani et al., 2020; Safari et al., 2020). Barberry has been documented to possess hepatoprotective and hypoglycemic properties, and it's utilized as a herbal remedy for addressing diverse ailments such as diabetes, liver disorders, gallbladder discomfort, gallstone-induced diarrhoea, digestive issues, and urinary tract ailments (Aisha & Muhammad, 2014; Amini et al., 2020; Hadi et al., 2019).

In line with previous research demonstrating the impact of barberry consumption on hypertension, researchers embarked on a study utilizing automated reviews and existing meta-analyses to consolidate findings from primary studies. This systematic approach aims to refine estimates and derive fresh insights regarding the effect of barberry intake on the blood pressure of hypertensive individuals.

METHOD

The methodology employed in this study involves a systematic review and meta-analysis methodology, adhering to the PRISMA diagram. The selection of articles adhered to the PICO Model criteria, which includes Patient (P), Barberry consumption (I), Non-barberry consumption (C), and Blood pressure (O). The articles were obtained from the Google Scholar database, using keywords such as "barberry," "blood pressure," "cholesterol," "cardiovascular," and "randomized controlled trial."

The meta-analysis was performed through a series of five steps, outlined as follows:

1. Generate research questions using the PICO framework, incorporating Demographics, Treatment, Contrasting Group, and Results.
2. Conduct a thorough search for original research articles from diverse electronic databases, including but not limited to popular ones like Google Scholar.
3. Carry out definite screening criteria inclusion exclusion and melape yokeherecritical service.
4. Extract the primary outcome data from the study and synthesize the effect estimates using the Rev app.
5. Interpret the results and draw tosimhome.

The quality evaluation of this study employs the critical appraisal checklist derived from the Cross-Sectional Study Checklist, developed and published by CEBM.

The research included in this study was collected by utilizing the PRISMA and Dian flow diagrams analysis, employing the Review Manager 5.3 software. The identified research outcomes were examined by determining the effect size and evaluating the consistency of heterogeneity (I2).

RESULTS

Articles on the effects of barberry consumption on high blood pressure were sought using databases such as Google Scholar and PubMed. The search utilized keywords like "barberry," "blood pressure," "cholesterol," "cardiovascular," and "randomized controlled trial." The review process, outlined in Figure 1, involved identifying relevant articles. Initially, 627 articles were found, but after removing duplicates and irrelevant publications, 132 remained. Of these, 84 met the criteria for inclusion. After a thorough full-text review, three articles passed quality assessment and were included in a meta-analysis. Figure 2 illustrates that the research originates from Iran.

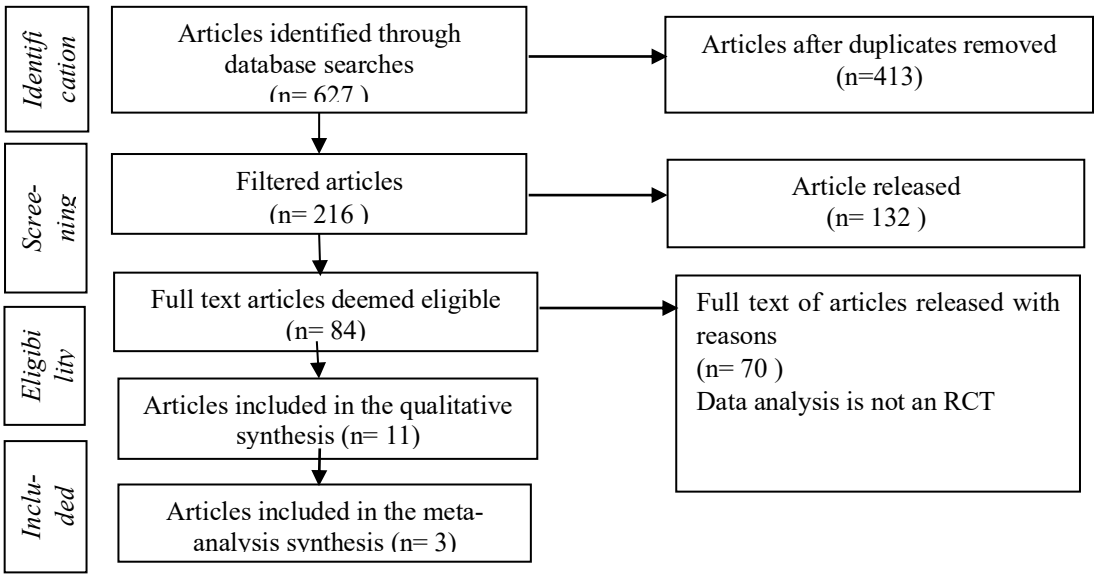

Figure 1. PRISMA Flow Diagram

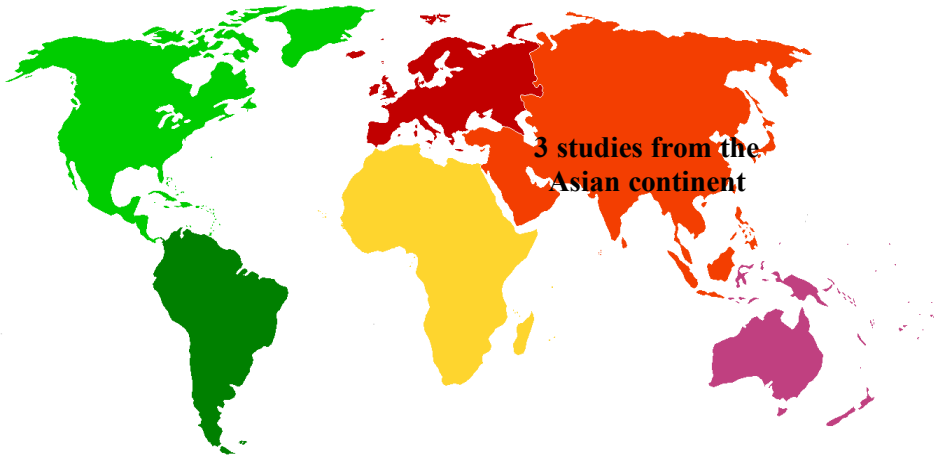

Figure 2. Map of the research area

Table 1. The Findings from the Quality assessment of the Case-Control Studies

Researcher (Year)	Question Criteria												Total
	1	2	3	4	5	6	7	8	9	10	11	12	
Emamat et al. 2022	2	2	2	2	2	2	2	2	2	2	2	2	24

Lazavi et al. 2018	2	2	2	2	2	2	2	2	2	2	2	2	24
Kermani et al. 2020	2	2	2	2	2	2	2	2	2	2	2	2	24

Answer score Description:
0 = No
1 = Undecided
2 = Yes
Explanation of the question requirements:
1. Does this goal address the researcher's focus/problem clearly?
2. What cross-sectional research methods are accessible for addressing research inquiries?
3. What is a concise explanation of the subject selection method called "penetrative"?
4. Does the sampling method avoid generating bias?
5. Does the selected sample for the study effectively represent the target population?
6. Is the sample size determined primarily by pre-established considerations?
7. Has the response met the desired level of satisfaction or accomplishment?
8. What is the metric used for the PE research instrument? Is it both valid and reliable?
9. What is the statistical significance of the mark?
10. Is the confidence interval ingiveright for the main results?
11. What confounding variables (such as type, gender, and age) have been documented?
12. Do the results apply to your research?

After evaluating the research's caliber, three articles were acquired featuring a randomized controlled trial study format, slated for employment as source material in a meta-analysis exploring the impacts of barberry intake on hypertension. Afterwards, the articles were collected and summarized using the PICO framework that was employed in the study.

Table 2. Description of primary dust exposure studies included in the meta-analysis

Author (Year)	Country	Sample	P	I	C	O
Emamat et al. (2022)	Iran	39	Hypertensive patients	Consuming barberries	Do not consume barberry	Blood pressure
Lazavi et al. (2018)	Iran	23	Diabetic patients	Consuming barberries	Do not consume barberry	Blood pressure
Kermani et al. (2020)	Iran	26	Metabolic syndrome patients	Consuming barberries	Do not consume barberry	Blood pressure

According to Table 2, a review of original studies investigating a study carried out to examine the effects of barberry consumption on blood pressure. This study involved conducting a meta-analysis of three articles conducted in various locations across Iran. These studies shared commonalities, such as utilizing a randomized controlled trial design, enrolling patients diagnosed with high blood pressure, and administering either barberry or a placebo. Discrepancies were noted in sample sizes, ranging from 23 to 88 participants.

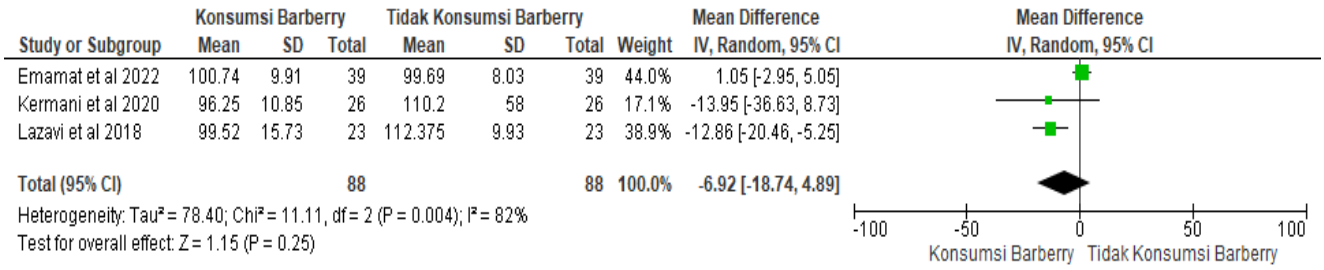

Figure 3. Forest plot

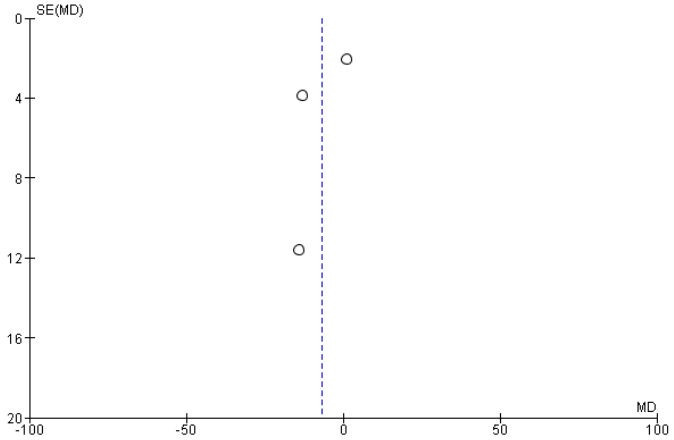

Figure 4. Funnel plot

Figure 3 illustrates that the consumption of barberry leads to a decrease in high blood pressure. High blood pressure patients who consumed barberry experienced a reduction of -6.92 times compared to those who did not (SMD= -6.92; 95% CI= -18.74 to 4.89; p=0.004), with statistically significant results.

The funnel plots in Figure 4 reveal an unequal spread of effect estimates among studies, implying a potential bias in publication, particularly towards underestimation. On one side, there are two plots with standard errors spanning from 0 to 12, while on the other side, there's only one plot with standard errors ranging from 0 to 3, centred around the vertical line denoting 0.

Discussion

Although not statistically significant, consuming barberry can lower blood pressure. However, inter-study heterogeneity is large. A subgroup analysis conducted over eight weeks showed that Barberry supplementation had greater short-term and overall effects (Atefi et al., 2021). Barberry has been documented to possess cardioprotective properties and aid in the management of hypertension, hyperlipidemia, and other chronic inflammatory conditions in humans. Additionally, it has been shown to help prevent cardiovascular disease (CVD) (Emamat et al., 2020).

Barberry contains different vasodilator constituents, such as aqueous and berberine, that can lower blood pressure by affecting the central nervous system (Ma et al., 2021). In a study conducted by Emamat et al. (2022b), the impact of consuming Berberis integerrima on blood pressure was investigated in individuals with cardiovascular risk factors. The results indicated that the average systolic and arterial blood pressure were significantly reduced with the daily consumption of 10 g of barberry, as evaluated through ABPM. The study found that there were no changes in the participants' 24-hour urinary sodium and potassium levels. No significant differences between the groups were observed in plasma ACE activity or NOx concentrations. The barberry group had significantly higher urinary NOx levels than the

control group. Additionally, the study observed that changes in urinary NOx were linked to opposite changes in systolic blood pressure.

Berries like barberries have shown potential in reducing overall cholesterol and LDL-C levels by affecting the activity of low-density lipoprotein receptors using methods that include enhancing the stability of mRNA following its transcription, distinct from the effects of statin medications (Lazavi et al., 2018). Our findings indicate that incorporating seedless barberries into one's diet can decrease plasma CRP levels and enhance lipid profile among individuals at risk of cardiovascular disease. These improvements were observed regardless of participants' body weight, physical activity, or dietary habits. Based on our study outcomes, it may be advisable for individuals with cardiovascular risk factors to consume dried black barberries daily to promote better lipid profiles and reduced inflammation. Nevertheless, further investigations with larger sample sizes and varying doses of barberries are warranted to validate these findings (Emamat et al., 2022a).

CONCLUSION

This research examined how consuming barberry affects blood pressure in hypertensive patients, focusing on its potential to manage non-communicable diseases. A meta-analysis conducted in Iran using data from three randomized trials revealed that the consumption of barberry had a substantial impact on reducing high blood pressure in individuals with hypertension. Previous studies have also highlighted barberry's various health benefits, such as protecting the liver, lowering blood sugar levels, and protecting the heart. Barberry contains polyphenols and vasodilator compounds like berberine, which is believed to reduce blood pressure by impacting the functioning of the central nervous system. Additionally, research suggests that the intake of barberry can enhance lipid profiles and alleviate inflammation in individuals susceptible to heart disease. However, this study has limitations, including differences between studies and the need for more extensive research with larger sample sizes and different doses of barberry to confirm the results. In summary, this study indicates that including barberry in one's daily diet may help manage hypertension and decrease the likelihood of cardiovascular disease, but further investigation is necessary to fully understand its potential and determine the optimal dosage for therapeutic purposes.

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