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A Review on the Role of Spicy Food Consumption in Reducing Mortality

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Abstract: This review aims to provide a comprehensive analysis of the relationship between chili consumption and disease risk, as well as mortality, while exploring the underlying mechanisms involved. Methods: To gather relevant literature, we conducted a systematic search using keywords such as "capsaicin" and "spicy food consumption and mortality" in the CNKI and Wanfang databases, which primarily focus on Chinese-language publications. In addition to the direct search, we also identified key studies through references cited in the selected articles. Further materials were discovered by reviewing related content, contributing to the synthesis of this review. Results: A total of 28 studies were included in this review, consisting of 3 Chinese articles and 25 English-language studies. Among the English-language studies, 10 were conducted in China. The studies included both cohort and case-control designs, and they examined various aspects of chili consumption, from its impact on metabolic health to its role in reducing the incidence of diseases. Conclusion: The consumption of spicy foods, particularly those containing capsaicin, has been found to be associated with a reduced risk of developing a range of diseases, including malignant tumors, cardiovascular diseases, and parasitic infections. Additionally, spicy food consumption appears to be linked to a lower overall mortality risk, making it a potentially beneficial dietary habit in promoting health and longevity.

Keywords: Red Chili Peppers, Consumption Frequency, Disease Incidence, Mortality Risk.

1. Introduction

With advancements in transportation and the proliferation of the internet, people around the world now have the opportunity to share their unique cuisines and cooking techniques through various media platforms. Spicy foods, once tied to specific geographic regions, have transcended their local boundaries and become global culinary staples. For instance, Mexican chili peppers are now exported to every corner of the globe, while Chongqing's fiery hot pot has found a fanbase worldwide. Similarly, Thailand's tangy and spicy Tom Yum soup can now be made anywhere with just a simple seasoning packet, making it accessible to all.

This blending of culinary traditions has sparked a fusion of historical, cultural, and health philosophies from different regions. For example, the Sichuanese staples of bird's eye chili and Sichuan peppercorn, often regarded as “cold-dispelling wonders,” might be considered by people in

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Guangdong as sources of “internal heat.” In contrast, Japan’s beloved wasabi may be perceived as too pungent or unpalatable by people from other countries, while Korea’s iconic spicy kimchi might not be well-received in some regions, depending on individual taste preferences.

Given the widespread consumption of spicy food, one might wonder: what impact does it truly have on the human body? To answer this question, statistical analysis and a thorough review of existing literature are essential. In the following sections, we will summarize representative findings from numerous studies, providing interpretations of results from over a dozen investigations. Additionally, we will discuss these findings in the context of related research, offering personal insights into the potential health implications of consuming spicy foods.

2. Research Method

2.1. Sources of Literature

The references for this study were primarily drawn from the CNKI and Wanfang databases, as well as derivative articles cited in the reference lists of these sources.

2.2. Inclusion Criteria

2.2.1. Research Topics

The relationship between spicy food consumption frequency and the prevalence of various diseases, overall mortality rates, and the underlying mechanisms of these effects.

2.2.2. Study Population

Residents of all age groups from regions including China, the Americas, and Mediterranean countries.

2.3. Search Strategy

2.3.1. Process

An initial search was conducted for Chinese-language literature on platforms such as CNKI and Wanfang. Relevant Chinese and English studies were identified through referenced citations. For English articles conducted in China, efforts were made to locate their Chinese versions. This "snowballing" approach ultimately yielded a total of 28 articles, which were organized and summarized to form the basis of this study.

2.3.2. Keywords

"Spicy food," "capsaicin," "mortality," "spicy food and depression," "Mediterranean diet," "climate and diet."

2.4. Article Selection

To ensure the generalizability of the conclusions, the selection of references prioritized geographical diversity. The 28 articles included data from China, the Americas, and Mediterranean countries. Most selected studies were large-scale, long-term cohort investigations.

2.5. Analytical Approach

The analysis began with a focus on overall mortality, identifying a negative correlation between mortality rates and spicy food consumption frequency. Evidence was then sought on specific diseases

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potentially prevented by spicy food. This was followed by an exploration of known mechanisms underlying these effects. Finally, a synthesis of materials was used to propose hypotheses and expectations for future research.

3. Research Findings

3.1. General Research Process

Most studies use the frequency of spicy food consumption as the independent variable. Some studies also include subgroups based on additional factors such as the source of spicy food or lifestyle habits related to chili consumption. Participants are typically categorized based on their frequency of spicy food intake:

Near-zero consumption.

Low consumption (less than once per week).

Moderate consumption (1–2 days per week).

Frequent consumption (3–5 days per week).

High consumption (6–7 days per week).

The dependent variables vary widely, including cause-specific mortality rates (e.g., malignant tumors, cardiovascular diseases, parasitic infections) and overall mortality over a specified period.

3.2. Existing Findings

3.2.1. Frequency of Spicy Food Consumption as the Independent Variable

Existing studies show a negative association between spicy food intake and both overall mortality and cause-specific mortality (e.g., malignant tumors, ischemic heart disease, respiratory diseases):

A Prospective Study in China (2004–2013):

Conducted across 10 regions with 3.5 million participants, this study revealed a negative association between spicy food consumption and the risk of death from malignant tumors, ischemic heart disease, and respiratory diseases after multivariable adjustments. There were no statistically significant differences between genders, though the association was slightly weaker in men compared to women. Furthermore, women who consumed spicy foods daily or almost daily had a reduced risk of mortality from certain infectious and parasitic diseases [1].

A Survey of 17,598 Chinese Adults:

This study found a negative correlation between the frequency of spicy food consumption and the risk of certain gastrointestinal cancers, particularly among individuals who rarely smoked or drank alcohol [2].

A Cohort Study in Molise, Italy:

Involving 24,325 participants, this large prospective cohort study found a negative association between spicy food frequency and mortality over the observation period [3].

A Mediterranean Study of ~700,000 Adults:

With an average follow-up of 8.6 years, this study found that regular chili consumption was associated with a lower risk of overall mortality and death from cardiovascular diseases [4].

3.2.2. Source of Spicy Flavor as the Independent Variable

A subgroup analysis from the previously cited Chinese study [1] found that the negative association between spicy food consumption and the risk of death from malignant tumors, ischemic heart disease, and diabetes was stronger among individuals who consumed fresh chili peppers.

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This finding suggests that certain bioactive compounds found in fresh chili peppers may contribute to a reduction in disease prevalence and mortality. Interestingly, although the association between spicy food consumption and diabetes-related mortality was not statistically significant in the overall population, it was observed in individuals using fresh chili peppers as their primary source of spiciness. This aligns with previous research showing that capsaicin may help improve glucose homeostasis [5].

4. Known Potential Mechanisms of Action

4.1. Capsaicin Regulation of Human Metabolism

There is strong evidence that capsaicin receptors, including the Transient Receptor Potential Vanilloid 1 (TRPV1) and Transient Receptor Potential Ankyrin 1 (TRPA1), are expressed in cells throughout the body. These receptors have the potential to exert beneficial effects on systemic metabolism, including glucose metabolism [6]. Agonists of TRPV1 and TRPA1 activate a variety of processes, including weight control, satiety, hormone secretion, fat cell regulation, thermogenesis, and modification of neuronal activity. These regulatory effects are closely tied to overall health.

4.1.1. Effects on Cardiovascular Function

Both experimental and population studies have shown that capsaicin contributes to improved cardiovascular function and metabolic regulation [7].

4.1.2. Inhibition of Obesity

(1) Studies in humans have demonstrated that capsaicin consumption can activate various receptors, improving insulin control and promoting weight loss [8]. Evidence from a large epidemiological study suggests that capsaicin consumption is negatively correlated with the incidence of overweight/obesity, supporting its weight-reducing properties [9].

(2) Capsaicin stimulation promotes the secretion of gastrointestinal digestive fluids, which not only aid in food digestion but also enhance gastrointestinal motility, reducing the accumulation of food residues in the stomach and intestines.

(3) Existing evidence shows that capsaicin may have anti-obesity, antioxidant, anti-inflammatory, anti-cancer, and anti-hypertensive effects and can improve glucose homeostasis. These findings mostly come from experimental studies or studies with small sample sizes [10–12].

4.2. Capsaicin's Effects on Gut Microbiota

4.2.1. Antibacterial Effects

Spicy condiments, including chili peppers, have long been considered to possess antibacterial properties [13,14], which may significantly influence gut microbiota. Recent studies increasingly indicate that the gut microbiota plays a crucial role as a new metabolic factor influencing host health [15]. Research involving humans has found that the abundance, composition, and metabolites of the gut microbiota are linked to risks of obesity [16-18], diabetes [19,20], liver cirrhosis [28], and cardiovascular diseases [21,22].

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4.2.2. Interaction with Gut Microbiota

Animal studies suggest that the interaction between dietary capsaicin and the gut microbiota is a new mechanism by which capsaicin exerts anti-obesity effects. This occurs through the prevention of microbial imbalance, gut barrier dysfunction, and chronic low-grade inflammation [23].

4.3. Inhibition of Cancer Cell Proliferation

In addition to its anti-inflammatory, analgesic, and atherosclerosis-protective properties [24], capsaicin has been reported to induce apoptosis in cancer cells [25]. For example, capsaicin can induce apoptosis in renal cell carcinoma 786-O cells by altering the expression of apoptosis-related proteins, making it a promising novel anti-cancer drug. However, high concentrations of capsaicin may cause harmful effects.

4.4. Capsaicin's Effects on Human Cognition

Capsaicin, particularly the pungent compound in chili peppers (capsaicinoids), stimulates nerve endings in the tongue and oral mucosa, promoting salivation through brain reflexes, aiding digestion, and inducing a feeling of excitement. Some studies suggest that consuming chili peppers may enhance cognitive function, improve mental agility, and stabilize mood [26], which may help in preventing dementia in the elderly [27].

5. Conclusion

5.1. Summary

A review of existing literature reveals that the consumption of spicy foods is linked to a lower risk of developing several serious health conditions, including malignant tumors, cardiovascular diseases, and parasitic infections, as well as a reduced overall mortality risk. The potential mechanisms underlying these health benefits are multifaceted. One key factor is capsaicin, the active compound in chili peppers, which has been shown to play a significant role in regulating human metabolism. Capsaicin's effects include promoting weight loss, improving glucose metabolism, and enhancing cardiovascular health. Additionally, capsaicin has been found to influence gut microbiota, helping to maintain a balanced microbial ecosystem that supports overall health and prevents metabolic disorders. Furthermore, capsaicin is known to induce apoptosis in cancer cells, suggesting a potential anticancer effect. Finally, emerging evidence indicates that capsaicin may have a positive impact on human cognition, improving mood, enhancing alertness, and potentially reducing the risk of neurodegenerative diseases such as Alzheimer's. These findings collectively suggest that incorporating spicy foods into the diet may offer significant health benefits through a combination of metabolic, microbial, cellular, and cognitive pathways.

5.2. Limitation

There are still some limitations in current research. For example, some studies have not considered certain risk factors that may lead to increased mortality in populations who consume spicy foods. Chili lovers may share similar lifestyle habits: they tend to live in rural areas, prefer salty foods, and may engage in drinking, smoking, or eating other pungent foods such as Sichuan peppercorns and mustard [1].

Moreover, regions with a high concentration of chili consumers may have specific climatic conditions. For instance, the humid climate in Sichuan and Chongqing (areas known for spicy food) and the heavy air pollution in Southeast Asian countries may also influence health outcomes and lifespan. These environmental and climatic factors may also affect individual health.

5.3. Significance and Outlook

It is hoped that people today can gain inspiration from the relationship between spicy food consumption and human health. Through dedicated research, individuals should consider their living environment, objective conditions, and physical state to scientifically find the most beneficial diet and lifestyle while still enjoying flavorful foods.

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