

A Guide to Critical Appraisal

How to find the evidence for PPPGs 2010

What is Critical Appraisal?

Critical appraisal is the process of weighing up the evidence to determine its usefulness, reliability and applicability. The critical appraisal process helps healthcare professionals cope with the problem of “information overload” by focusing on only the highest-quality studies that will guide their practice.

In order to make the best possible decisions, healthcare professionals will need to be able to:

- Make sense of the results.
- Decide whether studies have been undertaken in a way that makes their findings reliable.
- Know what these results mean in the context of the decision that needs to be made.

The easiest way to critically appraise a study or a piece of research is to use a validated checklist. A simple checklist is available on pages 5 and 6 of this handout. There are also many validated checklists which are freely available via the internet:

AGREE (Appraisal of Guidelines for Research & Evaluation)

Appraisal tool designed to assess the quality of clinical guidelines.

<http://www.agreetrust.org>

CASP Checklists

Critical appraisal checklists for various types of studies, including qualitative research.

www.phru.nhs.uk/pages/phd/resources.htm

Centre for Evidence-Based Medicine Critical Appraisal Guides

Critical appraisal checklists for various types of studies, including systematic reviews, randomized controlled studies,

<http://www.cebm.net/index.aspx?o=1157>

Consort Statement

A 25-item checklist for assessing the quality of randomized controlled trials. Available from:

<http://www.consort-statement.org>

How to Read a Paper...Series

A series of BMJ articles on assessing different types of studies. Available online from:

<http://www.bmj.com/collections/read.dtl>

Prisma Statement

A 27-item checklist for checking the quality of systematic reviews and meta-analyses. Available from:

<http://www.prisma-statement.org>

Scottish Intercollegiate Guidelines Network (SIGN)

Critical appraisal checklists for various types of studies, including systematic reviews, randomized controlled studies, cohort studies, case-control studies and more.

<http://www.sign.ac.uk/methodology/checklists.html>

Strobe Statement

Strengthening the reporting of observational studies in epidemiology. Checklist for cohort, case-control and cross-sectional studies.

<http://www.strobe-statement.org>

Checklist for Appraising the Research Design

1.	<p>Is the title of the study of relevance or interest?</p> <p>(a) Is the subject of the study relevant to your work or to a question you are asking about current practice?</p> <p>(b) Is the study population or sample of relevance to your practice?</p> <p>(c) Does the title specify the type of research method used?</p>
2.	<p>Is it clear why the study was conducted?</p> <p>(a) Has the background to the study been explained?</p> <p>(b) Is there a clear statement of the purpose of the study?</p> <p>(c) Is the purpose expressed as a hypothesis to be tested or as a question to be answered?</p>
3.	<p>Does the study consider available published literature?</p> <p>(a) Was a review of the literature undertaken?</p> <p>(b) Is the search strategy described or implied?</p> <p>(c) Does the search strategy appear to be appropriate?</p> <p>(d) Does the literature reference appear to be current?</p>
4.	<p>Is the population and sample clear?</p> <p>(a) Is the population or sample adequately described?</p> <p>(b) Is the population or sample studied appropriate?</p> <p>(c) Is the population or sample recruitment method appropriate?</p> <p>(d) If sampling was used is the sampling technique described and is it appropriate?</p> <p>(e) Is the sample size appropriate?</p>
5.	<p>How was the study carried out?</p> <p>(a) Is the study described in detail?</p> <p>(b) Would the study be able to be replicated?</p> <p>(c) If there were any problems encountered during the conduct of the study, are they described along with any changes in the design that were made as a consequence of the problems?</p> <p>(d) Are the data collected appropriate for the purpose of the study?</p> <p>(e) Did the authors of the study carry out a pilot study to determine the reliability and validity of the data collection instrument and were the results of the pilot study referred to?</p> <p>What are the conclusions about your research design?</p>

Checklist for Appraising the Research Findings

1.	<p>Are the results presented clearly?</p> <ul style="list-style-type: none">(a) Are the data presented in a logical fashion?(b) Are descriptive statistics presented first?(c) Does the text explain the data presented?(d) Do the numbers add up?(e) Are the reasons for the statistics explained?(f) Are the statistical methods used appropriate?(g) Do the graphics help the understanding of the findings?(h) Do the results fulfil the aims of the study?(i) Are there any flaws or inconsistencies in the data presented?(j) Is there an over-use of statistical tests?
2.	<p>What are the study implications?</p> <ul style="list-style-type: none">(a) Do the results confirm the findings of the other studies?(b) Do the results suggest new findings?(c) Could the results be generalized?(d) Should the findings be acted on?(e) Do you agree with the author's interpretation of the results?
3.	<p>Is there anything else of interest?</p> <ul style="list-style-type: none">(a) Has the paper identified anything else of value?

Review

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Chocolate and Prevention of Cardiovascular Disease: A Systematic Review

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Abstract

Background: Consumption of chocolate has been often hypothesized to reduce the risk of cardiovascular disease (CVD) due to chocolate's high levels of stearic acid and antioxidant flavonoids. However, debate still lingers regarding the true long term beneficial cardiovascular effects of chocolate overall.

Methods: We reviewed English-language MEDLINE publications from 1966 through January 2005 for experimental, observational, and clinical studies of relations between cocoa, cacao, chocolate, stearic acid, flavonoids (including flavonols, flavanols, catechins, epicatechins, and procyanadins) and the risk of cardiovascular disease (coronary heart disease (CHD), stroke). A total of 136 publications were selected based on relevance, and quality of design and methods. An updated meta-analysis of flavonoid intake and CHD mortality was also conducted.

Results: The body of short-term randomized feeding trials suggests cocoa and chocolate may exert beneficial effects on cardiovascular risk via effects on lowering blood pressure, anti-inflammation, anti-platelet function, higher HDL, decreased LDL oxidation. Additionally, a large body of trials of stearic acid suggests it is indeed cholesterol-neutral. However, epidemiologic studies of serum and dietary stearic acid are inconclusive due to many methodologic limitations. Meanwhile, the large body of prospective studies of flavonoids suggests the flavonoid content of chocolate may reduce risk of cardiovascular mortality. Our updated meta-analysis indicates that intake of flavonoids may lower risk of CHD mortality, RR = 0.81 (95% CI: 0.71–0.92) comparing highest and lowest tertiles.

Conclusion: Multiple lines of evidence from laboratory experiments and randomized trials suggest stearic acid may be neutral, while flavonoids are likely protective against CHD mortality. The highest priority now is to conduct larger randomized trials to definitively investigate the impact of chocolate consumption on long-term cardiovascular outcomes.

Conclusion

On balance, would you say this review was systematic?

...a group, is a leading [1], and worldwide,

causing over 16.7 million deaths globally in 2002 [2]. In 1990, greater than 85,000,000 disability-adjusted life-years were lost worldwide due to coronary heart disease

(CHD) and stroke; this CVD disease burden is projected to rise to 143,000,000 disability-adjusted life-years by 2020 [2]. Studies suggest cardiovascular diseases may be preventable by lifestyle modifications, such as exercise and nutrition [3-7]. Additionally, the American Heart Association, American Diabetes Association, and the U.S. Preventive Services Task Force have each indicated the likely importance of diet for the prevention of CVD [8-10].

In the American diet, fruits, vegetables, tea, wine and chocolate are major sources of antioxidants, which have been shown to have protective effects against CVD [11,12]. One class of antioxidants, flavonoids, commonly found in such foods, have attracted great interest in potentially lowering risk of CVD. Since cocoa products contain greater antioxidant capacity and greater amounts of flavonoids per serving than all teas and red wines [12,13], it is important to explore chocolate's potential effects on CVD.

Since ancient times, chocolate has long been used as a medicinal remedy [14] and been proposed in medicine today for preventing various chronic diseases [15,16]. While chocolate has also sometimes been criticized for its saturated fat content, mostly in the form of long-chain stearic acid, chocolate has also been lauded for its antioxidant potential. However, to this date there are no long-term randomized feeding trials of chocolate to assess effects on actual cardiovascular events. Nevertheless, there have been many short-term trials of cocoa and chocolate examining effects on cardiovascular intermediates, and numerous epidemiology studies of stearic acid and flavonoids exploring associations with cardiovascular outcomes.

This systematic review serves to comprehensively evaluate the experimental and epidemiologic evidence of cocoa and chocolate products. Particularly, we focus on the controversial potential benefits of the chocolate components stearic acid and flavonoids; review their overall effects on CVD risk factor intermediates and CVD endpoints; and conduct a meta-analysis of total flavonoid intake and risk of CHD mortality.

Methods

We reviewed English-language MEDLINE publications from January 1965 through June 2005 for experimental, observational, and clinical studies of relations between the exposure search terms of chocolate, stearic acid, flavonoids (including flavonols, flavanols, catechins, epicatechins, and procyanadins) and the outcome search terms of cardiovascular disease (coronary heart disease, ischemic heart disease, stroke), cholesterol, blood pressure, platelet, oxidation, and thrombosis. Approximately 400 papers were reviewed. Based on the relevance, strength, and qual-

ity of the design and methods, 136 publications were selected for inclusion.

We mainly focused on studies in humans, particularly randomized trials of either parallel or cross-over design, and prospective observational studies. Since no randomized trials have yet assessed chocolate in relation to definitive CVD outcomes, prospective observational studies evaluating chocolate sub-components and the risk of CVD outcomes were weighted equally in the overall evaluation. For overall objective evaluation, the strength of the evidence was evaluated by the design and quality of individual studies, the consistency of findings across studies, and the biologic plausibility of possible mechanisms. Finally, consistent with methods of the outdated prior analysis [17], an updated meta-analysis was conducted and relative risks estimates pooled using a random-effects model [18].

Review

Stearic acid in chocolate

Saturated fat has long been thought to contribute to atherosclerosis, and thus, adverse for CVD risk. However, stearic acid has been suggested to be a non-atherogenic type of dietary saturated fat. Stearic acid is a long-chain 18:0 saturated fatty acid found commonly in meats and dairy products. Cocoa butter, a fat derived from cocoa plants and predominantly found in dark chocolate [19], contains an average of 33% oleic acid (cis-18:1 monounsaturated), 25% palmitic acid (16:0 saturated), and 33% of stearic acid [20]. Though it is generally considered that saturated fats overall adversely increase the total cholesterol and LDL levels [21-23], early studies have also suggested stearic acid may be non-cholesterolemic [21,22]. This has been confirmed in a series of studies and a meta-analysis of 60 controlled feeding trials which concludes stearic acid neither lowers HDL, nor increases LDL or total cholesterol [24-28]. The meta-analysis also estimates, that per 1% energy isocaloric replacement of stearic acid for

Did the Authors:

- Search a range of major databases?
- Give details of their search strategy?
- Contact experts?
- Hand-search the literature?
- Search non-English studies?

been found in several animal and human studies [36-38], though only minimally in others [34,35]. These discrepancies may be attributed to the relative position of stearate on the triglyceride molecule which may affect its relative absorption rate [36,37]. This might also explain the suggestion that stearic acid from plants sources, such as cocoa, may be different from animal derived sources of



REVIEW

Clinical effectiveness of alcohol-based products in increasing hand hygiene compliance and reducing infection rates: a systematic review

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Available online 25 July 2007

KEYWORDS

Healthcare-associated infection; Alcohol-based hand hygiene product

Summary Reducing the incidence of healthcare-associated infection represents a major challenge. This systematic review of the evidence base considers the clinical effectiveness of incorporating an alcohol-based hand hygiene product into procedures aimed at improving compliance with hand hygiene guidelines, and thereby reducing the incidence of healthcare-associated infections. Multi-component interventions that included alcohol-based products were as effective as those that did not, both in achieving sustained hand hygiene compliance and in reducing infection rates. However, a number of difficulties were encountered in assessing hand hygiene studies: the problem of attributing efficacy to an alcohol-based product when used in a multi-component intervention; the variability inherent in the design of such studies; and how to use data from uncontrolled, unblinded studies in the assessment.

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Introduction

One of the biggest challenges facing healthcare services is to reduce the incidence of healthcare-associated infections (HAIs). An HAI, or nosocomial infection, is defined as an infection that was not present at the time of hospital admission but was acquired via the provision of healthcare.¹ HAIs are endemic worldwide and their prevalence

in Scotland is comparable with that in other European countries, where the estimated incidence ranges from 6 to 10%.² In Scotland, HAIs are a major factor in an estimated 457 deaths each year, and are a contributory factor in a further 1372 deaths, claiming more lives than traffic accidents, drug-related deaths and acquired immune deficiency syndrome.³ HAI can also complicate treatment of the condition that required hospitalization, cause patient distress, slow recovery, increase the duration of hospital stay and cause disability.⁴ The economic burden of HAI is substantial, with the annual cost to NHS Scotland estimated as £186 million.

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Did the Authors:

- Explain the background to the study?

As healthcare staff often play a role in the spread of HAI, good hand hygiene practices are important in reducing the incidence of such infections.^{5,6} However, compliance with hand hygiene guidelines and standards is unsatisfactory, and various initiatives have been developed to improve the situation. One approach involves the use of alcohol-based hand hygiene products, which, unlike soap and water, do not require access to a sink, and are also quicker to use.⁷ Whilst alcohol-based products do not replace hand-washing for visibly soiled hands, these products have a role in improving hand hygiene in other situations where the hands may be contaminated.⁷

The systematic review described here was carried out by NHS Quality Improvement Scotland, as part of a Health Technology Assessment (HTA) entitled 'The provision of alcohol-based products to improve compliance with hand hygiene' in May 2005.⁸ NHS Quality Improvement Scotland is a Special Health Board, established by the Scottish Executive in 2003 to improve the quality of healthcare delivered by NHS Scotland. One of its roles is to provide evidence-based advice to the NHS in Scotland.

The review aimed to assess the clinical effectiveness of alcohol-based hand hygiene products, in terms of improvements in hand hygiene compliance and/or associated HAI rates. As these products are usually introduced as part of multi-component interventions, it is often not possible to evaluate their effects independently from those of the other intervention components. Therefore, literature assessing the clinical effectiveness of multi-component interventions that did not include alcohol-based hand hygiene products was also reviewed.

Methods

A systematic literature search was performed between May and November 2004. The search strategy combined terms for the concept of 'handwashing' with those relating to 'infection', 'alcohol cleanser' or 'compliance'. Studies were excluded if they were conducted in dental surgeries, considered to be surgical scrubbing, aimed to improve hand hygiene solely or primarily as a universal precaution (i.e. to protect healthcare workers from infection), examined handwashing technique or duration as the sole compliance outcome measure, considered interventions implemented as part of outbreak control for nosocomial infections, did not include a baseline measure of compliance/infection rate, or did not include sufficient detail regarding intervention or outcome measures. No language or date restrictions were applied.

MEDLINE, EMBASE, CINAHL, HMC, the Web of Science and the Cochrane Library databases were

searched, as was the British Library Online Public Access Catalogue. Literature was also identified via: the British Library's Zetoc alerts service; citation searching on key papers; internet searches using a general browser; and inviting experts, professional groups and other interested parties to submit evidence.

Results

Interventions to improve compliance with hand hygiene

Twenty-six studies met the inclusion criteria. Of these, 20 were uncontrolled prospective studies, five were prospective studies with non-randomized parallel control groups, and one employed a cross-over design. Hand hygiene compliance was assessed by self-reporting (one study), hand hygiene product usage (two studies), or direct observation (23 studies). There was considerable variation in the indication for hand hygiene; some studies required the procedure before and/or after each patient care episode, others specified particular activities requiring hand hygiene. One study specified a minimum acceptable standard for the quality/duration of the hand hygiene procedure. Given the variations in study design and the intervention and outcome measures used, statistical analysis of the results was not possible.

Alcohol-based hand hygiene products

Four studies examined the effects of an alcohol-based hand hygiene product independently of the awareness-raising and educational activity accompanying its introduction.^{9–12} Three reported significant findings in favour of alcohol-based products, with relative increases of 44–92% in handwashing compliance at 5–12 weeks.^{9,11,12} Maury *et al.* found that although compliance decreased to 21% above baseline by 6 months; this difference remained statistically significant ($P = 0.007$).¹² Conversely, Doebbeling *et al.* found that handwashing compliance was better using medicated soap than an alcohol-based product [relative risk 1.28; 95% confidence interval (CI) 1.02, 1.60].¹⁰

Alcohol-based hand hygiene products with education

Seven studies considered the effect of introducing an alcohol-based product with appropriate educational support.^{13–19} Three studies reported statistically significant improvements in hand hygiene, with relative increases in compliance of 41–

Did the Authors:

- Search a range of major databases?
- Give details of their search strategy?
- Contact experts?
- Hand-search the literature?
- Search non-English studies?

Critical Appraisal Exercise Sheet

In groups or pairs, please read the assigned article and answer the following questions:

1. What type of study is this article based on?

2. Do you think this is a reliable source of evidence? Why/Why not? (Hint: Consult the pyramid of evidence)

3. Does the study explain how participants were recruited?

4. Does the study address potential sources of bias?

5. Does the study address any limitations?

6. Was ethical approval obtained where necessary?

7. Were there any conflicts of interest declared?

8. Do the authors conclusions match the findings? (See p641 of study)

THE HISTORY OF THE UNITED STATES

The history of the United States is a story of growth, struggle, and achievement. From the first European settlers to the present day, the nation has evolved through various stages of development. The early years were marked by exploration and the establishment of colonies. The American Revolution led to the birth of a new nation, and the subsequent years saw the expansion of territory and the growth of industry. The Civil War was a pivotal moment in the nation's history, leading to the abolition of slavery and the strengthening of the federal government. The 20th century brought significant social and economic changes, including the rise of the industrial revolution and the emergence of the United States as a global superpower. Today, the United States continues to play a leading role in the world, facing new challenges and opportunities.

THE AMERICAN REVOLUTION

The American Revolution was a period of significant change and conflict. It began with the colonists' growing dissatisfaction with British rule, particularly over issues of taxation and trade. The Boston Tea Party and the Intolerable Acts were key events that led to the outbreak of war. The Continental Congress declared independence in 1776, and the United States fought the Revolutionary War against Britain. The war ended with the signing of the Treaty of Paris in 1783, which recognized the United States as an independent nation. The revolution led to the adoption of the Constitution and the establishment of a new government. The American Revolution is a testament to the power of the people and the pursuit of freedom and self-determination.

CONCLUSION

The history of the United States is a complex and multifaceted story. It is a story of the struggles and triumphs of a young nation. From the first settlers to the present day, the United States has been shaped by the actions and decisions of its people. The American Revolution was a defining moment in the nation's history, leading to the birth of a new nation. The Civil War was another pivotal moment, leading to the abolition of slavery and the strengthening of the federal government. The 20th century brought significant social and economic changes, including the rise of the industrial revolution and the emergence of the United States as a global superpower. Today, the United States continues to play a leading role in the world, facing new challenges and opportunities. The history of the United States is a story of growth, struggle, and achievement, and it is a story that continues to inspire and shape the world.