



Philip Oddie & Abhishek Oswal

# The clinical scenario

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## The patient & problem

- Mrs C. Hocolate is a 57 year old known hypertensive who read in the Daily Mail that eating dark chocolate will help reduce her blood pressure

## The key research data needed

- In adults with hypertension, does eating dark chocolate reduce blood pressure compared to a dark chocolate free diet?

# The search (database & terms) & results

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Send to:  Filters: [Manage Filters](#)

Results: 36 to 40 of 105

Filters activated: published in the last 10 years. [Clear all](#) to show 119 items.

36. [The effect of nutrition on blood pressure.](#)  
Savica V, Bellinghieri G, Kopple JD.  
Annu Rev Nutr. 2010 Aug 21;30:365-401. doi: 10.1146/annurev-nutr-010510-103954. Review.  
PMID: 20645853 [PubMed - indexed for MEDLINE]  
[Related citations](#)

37. [Does chocolate intake during pregnancy reduce the risks of preeclampsia and gestational hypertension?](#)  
Saftlas AF, Triche EW, Beydoun H, Bracken MB.  
Ann Epidemiol. 2010 Aug;20(8):584-91. doi: 10.1016/j.annepidem.2010.05.010.  
PMID: 20609337 [PubMed - indexed for MEDLINE] **Free PMC Article**  
[Related citations](#)

38. [Cocoa reduces blood pressure and insulin resistance and improves endothelium-dependent vasodilation in hypertensives.](#)  
Grassi D, Necozione S, Lippi C, Croce G, Valeri L, Pasqualetti P, Desideri G, Blumberg JB, Ferri C.  
Hypertension. 2005 Aug;46(2):398-405. Epub 2005 Jul 18.  
PMID: 16027246 [PubMed - indexed for MEDLINE] **Free Article**  
[Related citations](#)

39. [\[Dark or white chocolate? Cocoa and cardiovascular health\].](#)  
Corti R, Perdrix J, Flammer AJ, Noll G.  
Rev Med Suisse. 2010 Mar 10;6(239):499-500, 502-4. Review. French.  
PMID: 20373696 [PubMed - indexed for MEDLINE]  
[Related citations](#)

40. [The flavan-3-ol fraction of cocoa powder suppressed changes associated with early-stage metabolic syndrome in high-fat diet-fed rats.](#)  
Osakabe N, Hoshi J, Kudo N, Shibata M.  
Life Sci. 2014 Sep 26;114(1):51-6. doi: 10.1016/j.lfs.2014.07.041. Epub 2014 Aug 14.  
PMID: 25132363 [PubMed - in process]  
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(chocolate OR cocoa)) AND r... (105) PubMed  
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(chocolate OR cocoa)) AND r... (119) PubMed  
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# Primary Study

**Reference:** Cocoa reduces blood pressure and insulin resistance and improves endothelium-dependent vasodilation in hypertensives. Grassi *et al.* Hypertension **2005** Aug;46(2):398-405.

## STUDY Question

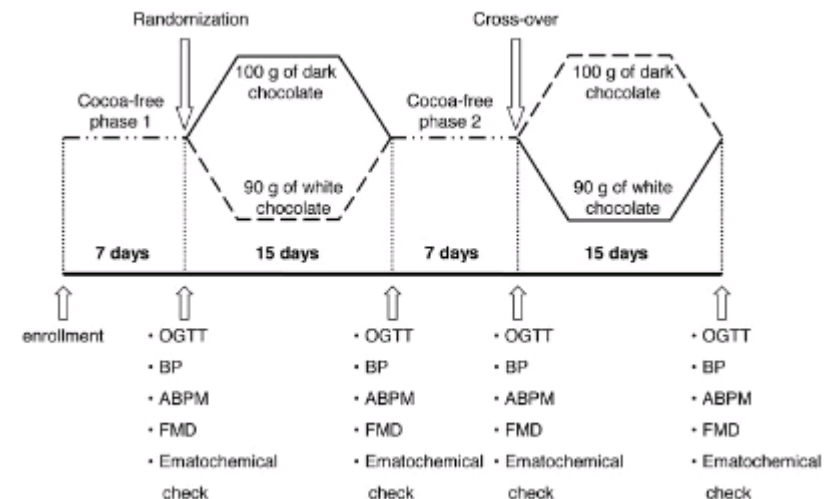
**Patients:** 25-60yr old (mean age 44, n = 20) 140<SBP<160mmHg.

Not previously treated

**Intervention:** Dark Chocolate

**Comparison:** White Chocolate

**Outcome:** OGTT, BP, ABPM, FMD,  
Haematological check



## Quality of Study

**Randomised?** – Yes?

**Accounted for:** obesity, pregnancy, tobacco, alcohol, atherosclerosis, cardiac abnormalities, cholesterol

**Measurement:** (blinded OR objective?): Objective

**Overall:** Good 😊

# Primary Study Results

**TABLE 1. General Characteristics of Essential Hypertensives (n=20; 10 Males, 10 Females; Age 43.6± 7.8 Years) at Baseline and After 15 Days of DC or WC Consumption**

Characteristic	DC		WC	
	Before	After	Before	After
Body mass index (kg/m <sup>2</sup> )	25.4±1.7	25.4±1.7	25.4±1.7	25.4±1.7
Body weight (kg)	73.7±9.2	73.7±9.2	73.7±9.2	73.7±9.2
Total cholesterol (mmol/L)	5.4±0.6	5.0±0.7*	5.4±0.6	5.4±0.6
LDL cholesterol (mmol/L)	3.4±0.5	3.0±0.6†	3.4±0.5	3.4±0.5
HDL cholesterol (mmol/L)	1.4±0.3	1.4±0.3	1.4±0.3	1.4±0.3
Triglycerides (mmol/L)	1.3±0.4	1.1±0.4	1.3±0.4	1.3±0.4

Data are given as mean±SD.

\*P=0.0003 DC vs baseline and WC values; †P<0.05 DC vs WC and baseline values.

**TABLE 2. 24-Hour ABPM Data at Baseline and After 15 Days of DC or WC Ingestion in 20 Essential Hypertensives**

Characteristic	DC		WC	
	Before	After	Before	After
BP (mm Hg)				
24-hour SBP ABPM	135.5±5.8	123.6±6.3*	135.6±5.5	134.7±4.7
24-hour DBP ABPM	88.0±4.1	79.6±5.4*	87.6±4.3	87.5±4.6
SBP daytime ABPM	141.3±4.8	129.3±5.7*	141.1±5.4	140.4±4.6
SBP nighttime ABPM	120.2±11.6	108.7±9.1*	120.9±11	119.4±10.2
DBP daytime ABPM	92.4±3.8	84.6±5.6*	91.8±4.7	91.6±4.7
DBP nighttime ABPM	76.2±6.3	66±7*	76.4±6.1	76.4±5.7

Data are given as mean±SD.

\*P<0.0001 DC vs WC and baseline values.

# The search (database & terms) & results

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Clear all

Show additional filters

Display Settings: Summary, Sorted by Recently Added

Send to: Filters: Manage Filters

Results: 4

Filters activated: Meta-Analysis. Clear all to show 88 items.

- Effect of **cocoa** on **blood pressure**.  
1. Ried K, Sullivan TR, Fakler P, Frank OR, Stocks NP.  
Cochrane Database Syst Rev. 2012 Aug 15;8:CD008893. doi: 10.1002/14651858.CD008893.pub2. Review.  
PMID: 22895979 [PubMed - indexed for MEDLINE]  
[Related citations](#)
- Effects of **cocoa** products/dark **chocolate** on serum lipids: a **meta-analysis**.  
2. Tokede OA, Gaziano JM, Djoussé L.  
Eur J Clin Nutr. 2011 Aug;65(8):879-86. doi: 10.1038/ejcn.2011.64. Epub 2011 May 11. Review.  
PMID: 21559039 [PubMed - indexed for MEDLINE]  
[Related citations](#)
- Does **chocolate** reduce **blood pressure**? A **meta-analysis**.  
3. Ried K, Sullivan T, Fakler P, Frank OR, Stocks NP.  
BMC Med. 2010 Jun 28;8:39. doi: 10.1186/1741-7015-8-39.  
PMID: 20584271 [PubMed - indexed for MEDLINE] **Free PMC Article**  
[Related citations](#)
- Methemoglobinemia** related to local anesthetics: a summary of 242 episodes.  
4. Guay J.  
Anesth Analg. 2009 Mar;108(3):837-45. doi: 10.1213/ane.0b013e318187c4b1.  
PMID: 19224791 [PubMed - indexed for MEDLINE]  
[Related citations](#)

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# Systematic Review

Reference: Does chocolate reduce blood pressure? A meta-analysis. Reid *et al.* BMC Med. **2010** Jun 28;8:39.

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## **STUDY Question**

**Patients:** Adults

**Intervention:** Low dose of a flavanol containing cocoa product for >2 weeks

**Comparison:** Low Flavanol placebo or white chocolate

**Outcome:** Change in SBP/DBP

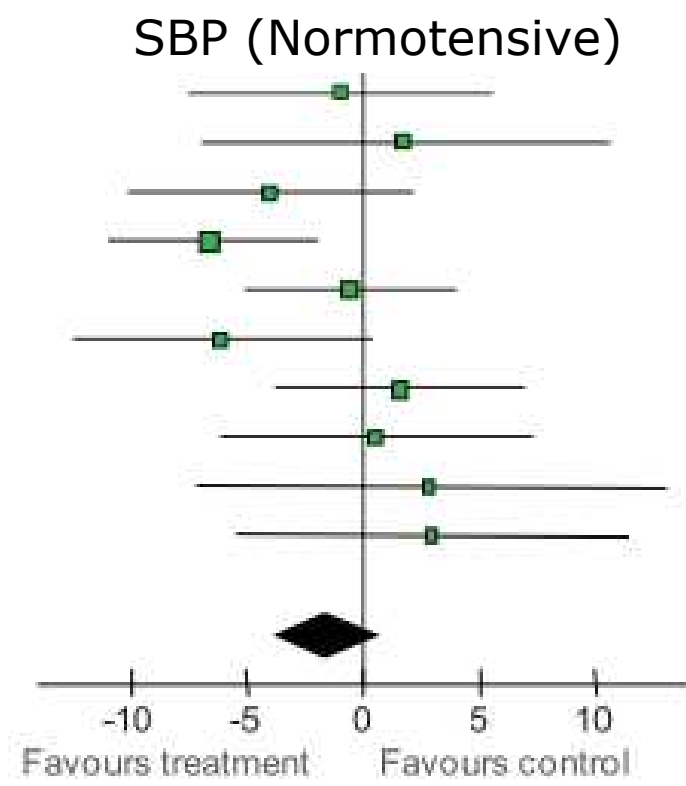
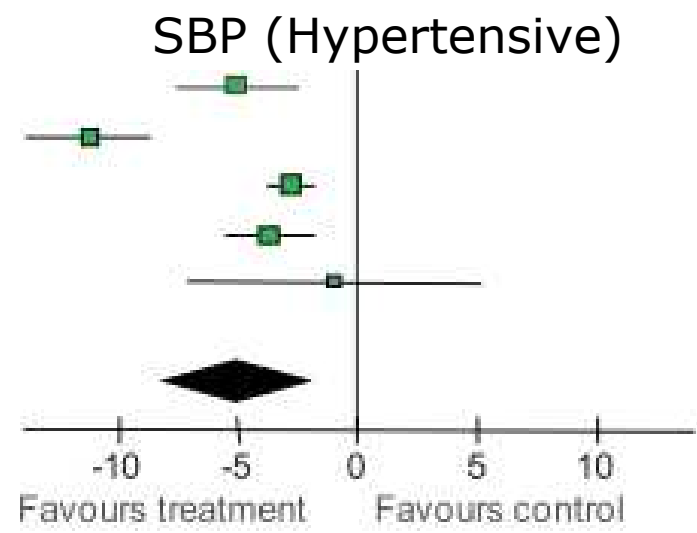
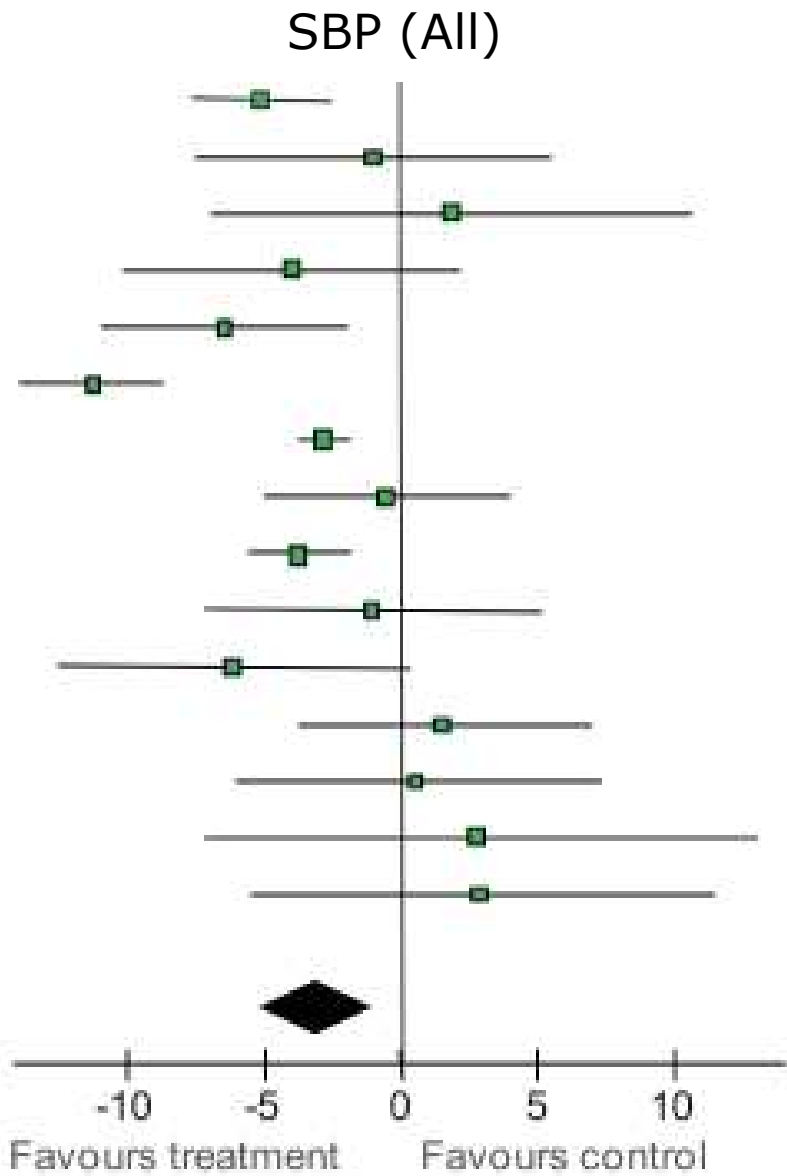
## **Quality of Study**

**Find:** "chocolate OR cocoa AND blood pressure" in Medline, Cochrane and grey literature databases. Could have used more?

**Appraised:** Scored using Cochrane guidelines

**Synthesised:** Meta-analysis with forest plots performed

**Overall:** Good methods, but high degree of heterogeneity





# Key Results & application to patient

Outcomes	Difference/mmHg [95CI]	I <sup>2</sup>
SBP (all)	-3.16 [-5.08, -1.23]	74
DBP (all)	-2.02 [-3.35, -0.69]	62
SBP (hypertensive)	-5.02 [-7.99, -2.05]	90
DBP (hypertensive)	-2.73 [-4.89, -0.48]	79
SBP (normotensive)	-1.56 [-3.81, +0.69]	23
DBP (normotensive)	-1.28 [-2.88, +0.33]	24

## The Benefits and risks to patient

- Unclear whether the benefits seen in hypertensive patients are valid

## Your Recommendation

- Have it in moderation, but important to consider other factors too