



補充鉻是否可輔助糖尿病患者 血糖的控制?

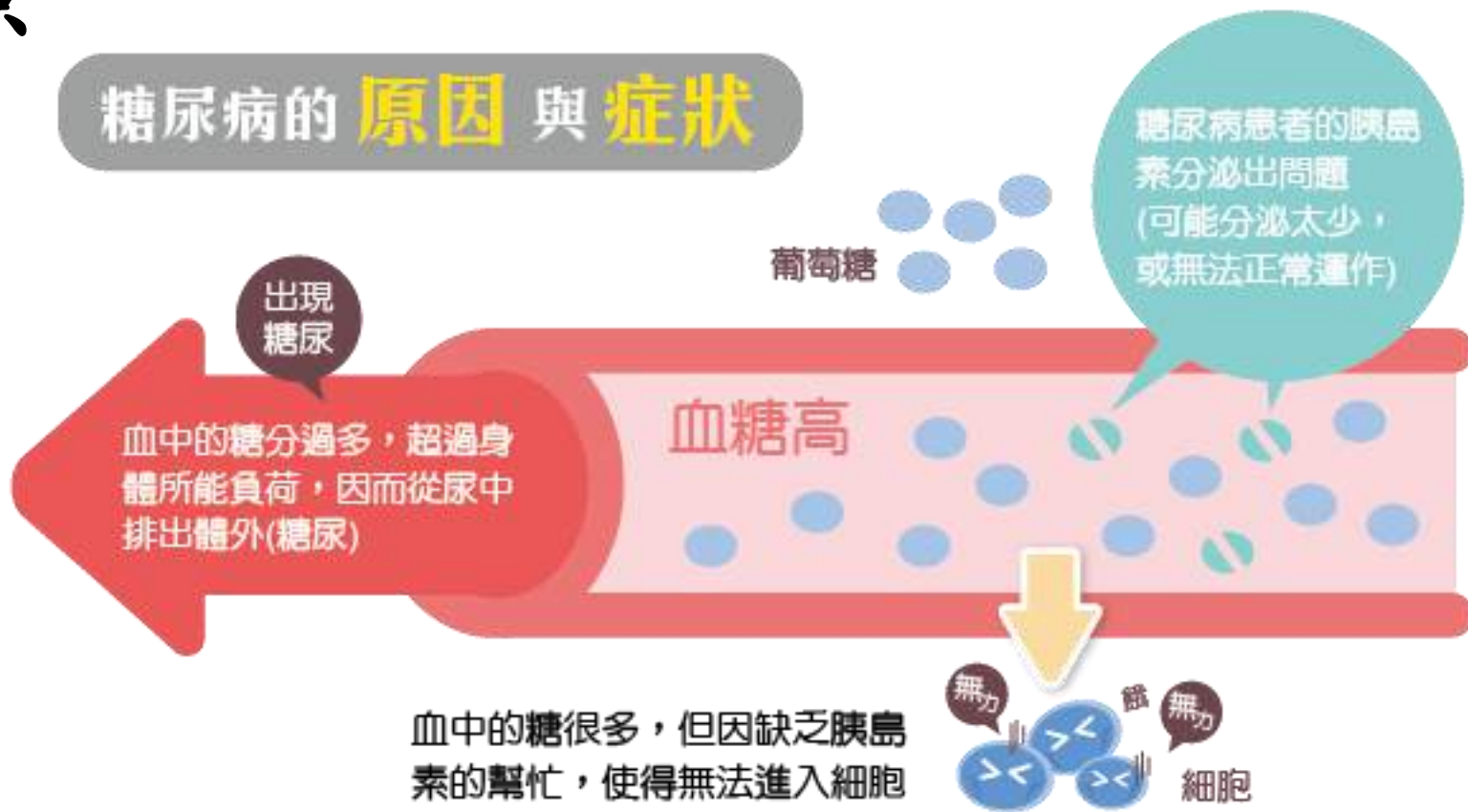
報告者：11A 翁莉雅
報告日期：111/10/25



簡介 背景

糖尿病（DM）是一種慢性代謝性疾病

糖尿病的 **原因** 與 **症狀**



細胞能代謝糖量有限，胰島素激增無法使血糖回穩，大量葡萄糖與胰島素留在血中即為胰島素抗阻



簡介



危機四伏

糖

尿

病

的

併

發

症

HEHO

2022第2型糖尿病臨床照護指引指出，微量營養素及補充品沒有足夠的證據支持常規使用草藥補充劑和微量營養素，例如肉桂、薑黃素、維生素D、蘆薈或鉻，對糖尿病有益處。

常見症狀

壞疽
足部潰瘍

麻痺

血管

高血壓
周邊動脈疾病(PAD)
體重下降



Heho健康



簡介

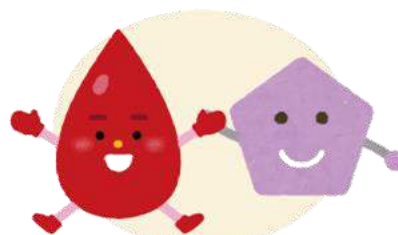


鉻(Cr)是維持健康所需且不可或缺的**微量元素**。

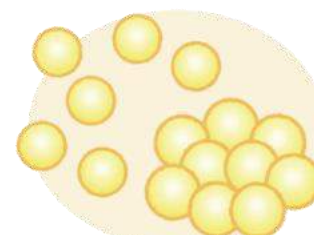
鉻3功效



預防
心血管疾病



幫助
調節血糖



減少
脂肪堆積



- 1、主要能激活細胞內信號通路包括葡萄糖轉運蛋白4(GLUT4)易位，而增加葡萄糖和氨基酸運輸。
- 2、抑制HMG輔酶A還原酶並干擾膽固醇代謝，所以透過上述機制，提高胰島素敏感性，因此被稱為治療糖尿病的輔助劑。





- 鉻有三價鉻及六價鉻兩種型式，對身體有益的鉻為三價鉻，它來自於天然食物，可供人體吸收、利用，而六價鉻對人體則具有毒性。
- 常見型態有吡啶甲基鉻 (Chromium Picolinate)、菸鹼酸鉻 (Chromium Nicotinate)、三氯化鉻 (Chromium Chloride)
- 人體吸收率的高低為：吡啶甲基鉻 > 菸鹼酸鉻 > 三氯化鉻 > 酵母鉻
- 國內目前沒有限制嚴格鉻的服用劑量。根據產品標籤服用，常見成人劑量範圍為每天服用50-400 μg 。



鉻能降低糖尿病值？
到底該不該
實證角度



鉻降低血糖效益如何



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Effects of chromium supplementation on glycemic control in patients with type 2 diabetes: a systematic review and meta-analysis of randomized controlled trials



Omid Asbaghi^a, Fatemeh Naeini^b, Mahnaz Rezaei Kelishadi^c, Ehsan Ghaedi^{d,e}, Elham Eslampour^a, Behzad Nazarian^a, Damoon Ashtary-Larky^f, Amirmansour Alavi Naeini^{c,*}

^a Student Research Committee, Lorestan University of Medical Sciences, Khorramabad, Iran

^b Department of Clinical Nutrition, School of Nutritional Sciences and Dietetics, Tehran University of Medical Science, Tehran, Iran

^c Department of Community Nutrition, School of Nutrition and Food Science, Isfahan University of Medical Sciences, Isfahan, Iran

^d Department of Cellular and Molecular Nutrition, School of Nutritional Sciences and Dietetics, Tehran University of Medical Sciences, Tehran, Iran

^e Students Scientific Research Center (SSRC), Tehran University of Medical Sciences (TUMS), Tehran, Iran

^f Nutrition and Metabolic Diseases Research Center, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran



FAITH 系統性文獻回顧快速評讀表

✓ 步驟1：研究探討的問題為何（PICO）

□ 步驟2：研究的品質如何（內在效度）

□ 步驟3：研究結果之意義為何（效益）



步驟1：系統性文獻回顧探討的問題為何？

研究族群／問題
(Population/ Problem)：

- Diabetes mellitus patient

介入措施
(Intervention)：

- Take chromium

比較
(Comparison)：

- Non take chromium

結果
(Outcomes)：

- Glycemic control



FAITH 系統性文獻回顧快速評讀表

□ 步驟1：研究探討的問題為何（PICO）

✓ 步驟2：研究的品質如何（內在效度）

□ 步驟3：研究結果之意義為何（效益）



F—研究是否找到所有的相關證據？



2.1. 文獻搜索

良好的文獻搜尋至少應包括二個主要的資料庫(如：Medline, Cochrane 考科藍實證醫學資料庫, EMBASE 等)，並且加上文獻引用檢索(參考文獻中相關研究、Web of Science, Scopus 或 Google Scholar)、試驗登錄資料等。文獻搜尋應不只限於英文，並且應同時使用 MeSH 字串及一般檢索詞彙(text words)。

The present study was performed based on the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guide. A systematic literature search was done by the Web of Science, The Cochrane Library, Scopus, PubMed and, Embase databases until 5 February 2020. We used medical subject heading (MeSHs), abstract and keywords but the language and date limitations were not used. A systematic search was conducted using the following search terms ((("chromium") AND ("Type 2 diabetes" OR T2DM OR diabetes OR "gestational diabetes mellitus" OR GDM") AND "glucose" OR "insulin" OR "glucose tolerance" OR "insulin resistance" OR "FBG" OR "fasting blood glucose" OR "HbA1c" OR "hemoglobin A1c" OR "HOMA-IR" OR "homeostatic model assessment" OR "fasting blood sugar" OR "FBS"))). Electronic database systematic searches were completed along with reference lists and citation hand searches. The research process was performed by two authors (BN and EE) individually and in duplicate. Any disagreements in this regard were solved via discussion with the third researcher (OA).



F—研究是否找到所有的相關證據？



2. 2. 研究選擇(納入/排除)

- Two investigators selected eligible articles partly by reading titles, abstracts and whenever required the full-text of the publications. **All human RCTs** (either parallel or cross-over designs) reported the effect of chromium supplementation on glycemic control indices (fasting plasma glucose (**FPG**), insulin, hemoglobin A1C (**HbA1C**) and homeostatic model assessment for insulin resistance (**HOMA-IR**) were considered. The following studies were **excluded: (1) RCTs with treatment duration less than 2 weeks, (2) studies without any comparing control group.** To avoid overlapping, we selected studies with larger participants. Disagreements regarding the study selection process were solved by faceto-face discussion.

2. 3. 數據提取和計算

- The following data were extracted from the full-text of included studies using a pre-designed abstraction form: first author's specification, publication year, location of the study, total sample size, type and dose of intervention and placebo, study duration.
- In cases of lack of relevant data, we contacted the corresponding authors to receive their help.**



PRISMA

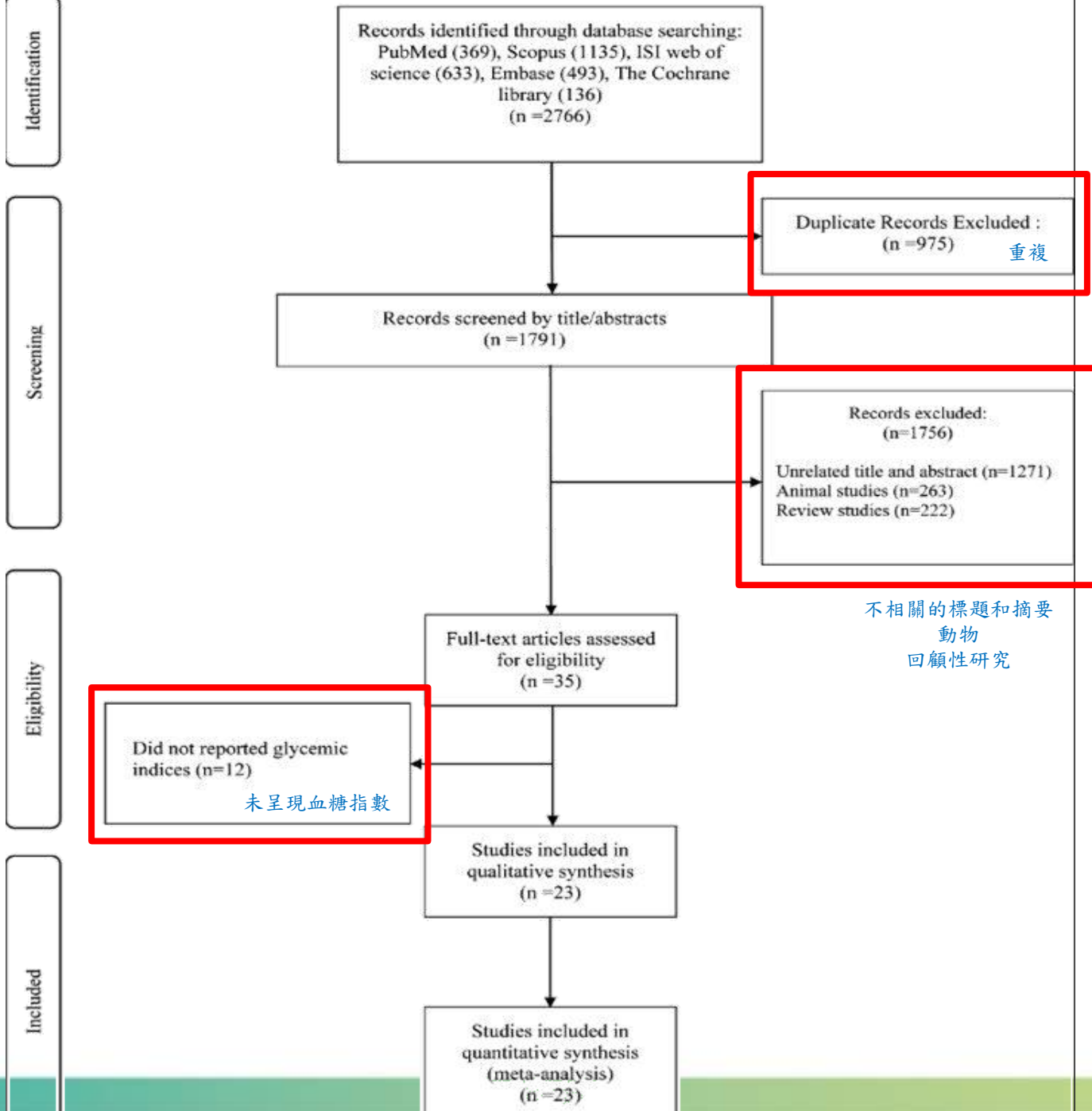


Table 1

Characteristic of included studies in meta-analysis

50-1000微克

Author	Publication years	Country	Study Design	Population	Sample (Sex)	Trial Duration (Week)	Means Age		Means BMI		Intervention	介入	控制	Chromium adverse effects	Sample Size	
							IG	CG	IG	CG		Treatment group	Chromium dose (μg)		control	IG
L Sherman(A) (51)	1968	Island 冰島	crossover	DM	7: 7 M	16	28.47	28.47	NR	NR	Trivalent Chromium	150	Placebo	No	7	7
L Sherman(B) (51)	1968	Island	crossover	DM	3: 3M	16	28.47	28.47	NR	NR	Trivalent Chromium	150	Placebo	No	3	3
AE Hunt(32)	1985	USA	parallel	T2DM	39:17 M, 22F	12	62 ± 1.6	62 ± 1.6	> 25	> 25	Chromium yeast	272	Placebo	No	22	17
AS Abraham(52)	1992	Israel 以色列	parallel	T2DM and atherosclerotic disease	25:M/F	12	63.6 ± 14.3	63.6 ± 14.3	NR	NR	chromium chloride	250	Placebo	No	13	12
RA Anderson (A) (33)	1997	China 中國	parallel	T2DM	60:M/F	17	55.7 ± 9.29	55.5 ± 9.29	25 ± 3.87	24.8 ± 3.87	chromium pidolate	200	Placebo	No	53	50
RA Anderson (B) (33)	1997	China	parallel	T2DM	60:M/F	17	54.6 ± 10.84	55.5 ± 9.29	24.8 ± 3.09	24.8 ± 3.09	chromium pidolate	1000	Placebo	No	52	50
M Dinarto(34)	1998	Indonesia 印尼	crossover	T2DM	20: 13 M, 7F	4	54 ± 8.7	50.7 ± 6.6	26 ± 1.8	25.1 ± 1.6	chromium picolinate	500	No intervention	No	10	10
SM Bahijiri(53)	2000	Saudi Arabia 阿拉伯	crossover	T2DM	78: 30 M, 48F	8	36.68	36.68	31.04 ± 8.41	31.04 ± 8.41	chromium chloride	200	Placebo	No	78	78
D Ghosh(35)	2002	India 印度	crossover	T2DM	50: 35 M, 15F	12	53.5 ± 10.9	53.5 ± 10.9	22 ± 3.1	22 ± 3.1	chromium picolinate	400	Placebo	No	50	50
M Vrtovec(36)	2005	USA	crossover	T2DM	60:M/F	12	NR	NR	29.9 ± 3.6	30.9 ± 5.2	chromium picolinate	1000	Placebo	No	30	30
N Kleefstra (A) (31)	2006	Netherlands	parallel	T2DM in obese patient	31: 14 M, 17F	25	60 ± 8.8	62 ± 7.5	35 ± 7.2	34 ± 4.3	chromium picolinate	500	Placebo	One patient complained of	14	17
N Kleefstra (B) (31)	2006	Netherlands 紐西蘭	parallel	T2DM in obese patient	32: 15 M, 17F	25	59 ± 6.4	62 ± 7.5	33 ± 4.2	34 ± 4.3	chromium picolinate	1000	Placebo	frequent watery stools, weakness, dizziness, nausea, and headaches and The other patient developed complaints of vertigo with nausea and vomiting	15	17
D Pei(37)	2006	Taiwan	parallel	T2DM	60: 33 M, 27F	16	54.2 ± 7.1	55.6 ± 8.2	25.2 ± 4.1	26.2 ± 3.2	chromium chloride	200	Placebo	No	30	30
J Racek(38)	2006	Denmark 丹麥	parallel	T2DM	36: 9 M, 27F	12	60.8 ± 7.5	61.8 ± 10.75	33.59 ± 5.6	35.16 ± 6.55	chromium yeast	400	Placebo	No	19	17
N Kleefstra (45)	2007	Netherlands	parallel	T2DM	57: 35 M, 22F	25	68 ± 8.2	66 ± 8.6	30 ± 5.9	30 ± 5.6	chromium yeast	400	Placebo	One patient in the intervention group complained of nausea, which disappeared when the medication was stopped	29	28



Table 1 (continued)

Author	Publication years	Country	Study Design	Population	Sample (Sex)	Trial Duration (Week)	Means Age		Means BMI		Intervention			Chromium adverse effects	Sample Size	
							IG	CG	IG	CG	Treatment group	Chromium dose (μg)	control		IG	CG
MH Lai(39)	2008	Taiwan	parallel	T2DM	20: 9 M, 11F	25	53.2 ± 2	50.5 ± 1.9	25.7 ± 0.9	25.8 ± 0.8	chromium yeast	1000	Placebo	No	10	10
WT Cefalu(46)	2010	USA	parallel	T2DM in overweight or obese patient	137: 76 M, 61F	24	58.7 ± 8.36	56.1 ± 9	30.8 ± 4.18	31.5 ± 4.91	chromium picolinate	1000	Placebo	No	70	67
S Sharma (47)	2011	India	parallel	T2DM	40:M/F	12	35-67	35-67	25.09 ± 8.58	26.12 ± 3.89	chromium yeast	378	Placebo	No	20	20
E Król(40)	2011	Poland 波蘭	crossover	T2DM	20: 11 M, 9F	8	54.7 ± 9.4	54.7 ± 9.4	35.3 ± 9.2	35.3 ± 9.2	chromium yeast	500	Placebo	three persons reported subjective side effects, such as skin rash (one person), decreasing appetite (one person), and constipation (one person). These adverse effects disappeared within 7 days and supplementation followed on	20	20
SK Jain (A)(41)	2012	USA	parallel	T2DM	50: 9 M, 41F	12	51.12 ± 10.15	48.64 ± 9.95	35.44 ± 10.3	38 ± 8.55	chromium picolinate	400	Placebo	No	25	25
SK Jain (B)(41)	2012	USA	parallel	T2DM	49: 10 M, 39F	12	48.79 ± 8.91	48.64 ± 9.95	36.85 ± 10.77	38 ± 8.55	Chromium Dinicocysteinate	400	Placebo	No	24	25
MM Guimaraes (A)(42)	2013	Brazil 巴西	parallel	T2DM in overweight or obese patient	26: 7 M, 19F	12	50.75 ± 6.48	50.47 ± 4.21	31.66 ± 4.72	29.99 ± 4.72	Chromium Nicotinate	50	Placebo	No	13	13
MM Guimaraes (B)(42)	2013	Brazil	parallel	T2DM in overweight or obese patient	29: 9 M, 20F	12	51.35 ± 6.48	50.47 ± 4.21	33.1 ± 4.72	29.99 ± 4.72	Chromium Nicotinate	200	Placebo	No	16	13
YL Chen(43)	2013	Taiwan	parallel	T2DM	66: 43 M, 23f	16	53.3 ± 10.1	54.2 ± 8.5	28.2 ± 4.2	26.8 ± 3.9	chromium chloride	400	Placebo	No	38	28
S Kalbasi(49)	2013	Iran	parallel	T2DM	60:M/F	12	NR	Nr	NR	NR	chromium picolinate	200	Placebo	No	30	30
N Parsaeyan (48)	2013	Iran 伊朗	parallel	T2DM	100: 58 M, 42f	12	53.15 ± 11.9	52.7 ± 12.5	24 ± 4.1	23.8 ± 3.2	chromium picolinate	400	Placebo	No	50	50
AN Paiva(50)	2015	Brazil	parallel	T2DM	71: 25 M, 46F	16	55.9 ± 9.1	51.9 ± 7.6	32.2 ± 7.3	31.1 ± 6.1	chromium picolinate	600	Placebo	No	39	32
A Farrokhian (44)	2019	Iran	parallel	T2DM with chronic heart disease	64: 32 M, 32F	12	58 ± 8	60.9 ± 7.7	30.4 ± 4.3	29.9 ± 3.8	chromium picolinate	200	Placebo	No	32	32



A—文獻是否經過嚴格評讀？

評讀結果：

☐ 是

☐ 否

☒ 不清楚

應根據不同臨床問題的文章類型，選擇適合的評讀工具，並說明每篇研究的品質（如針對治療型的臨床問題，選用隨機分配、盲法、及完整追蹤的研究類型）。

2.4 偏見風險評估

We had used [Cochrane Collaboration's tools](#) for quality evaluation of studies . The tool separates a judgment about the risk of bias from a description of the support for that judgment, for a series of items covering different domains of bias. **Two investigators (BN and EE)** partly examined the methods and the quality of the eligible studies via Cochrane Collaboration's tools, which includes seven domains: 1) random sequence generation; 2) allocation concealment; 3) blinding of participants and personnel; 4) blinding of outcome assessment; 5) incomplete outcome data; 6) selective reporting, and 7) other sources of bias.

文中未說明有意見分歧時，是否有第三人進行協商



I—文獻是否只納入具良好效度的文章？

評讀結果：

☒ 是

☐ 否

☐ 不清楚



僅進行文獻判讀是不足夠，系統性文獻回顧只納入至少要有一項研究結果是極小偏誤的試驗。

L : Low risk 、H : High risk 、U : Unclear risk of bias

Table 3

Quality assessment

Study	隨機分派 Random sequence generation	分派隱匿 Allocation concealment	選擇性報導 Selective reporting	其他選樣偏差 Other sources of bias	受試者與研究人員盲性 Blinding (participants and personnel)	結果評估盲性 Blinding (outcome assessment)	不完整的研究結果報告 Incomplete outcome data
L Sherman	L	H	H	H	L	U	L
AE Hunt	L	H	H	H	L	U	L
AS Abraham	L	U	H	H	U	H	L
RA Anderson	H	H	H	H	L	U	L
M Dinarto	H	H	H	H	H	H	L
SM Bahijiri	L	H	H	H	L	H	L
D Ghosh	H	H	H	H	L	H	L
M Vrtovec	L	H	H	H	L	U	L
N Kleefstra	L	U	H	H	L	U	L
D Pei	L	U	L	H	L	H	L
J Racek	L	U	H	H	L	U	L
N Kleefstra	L	L	L	H	L	U	L
MH Lai	L	U	L	L	L	U	L
WT Cefalu	L	U	H	H	L	H	L
S Sharma	L	L	H	H	L	H	L
E Król	L	L	L	H	L	U	L
SK Jain	L	L	L	L	L	H	L
MM Guimaraes	L	L	L	H	L	H	L
YL Chen	L	H	H	H	L	H	L
S Kalbasi	L	U	H	H	L	U	L
N Parsaeyan	L	U	H	H	L	U	L
AN Paiva	L	L	H	H	L	U	L
A Farrokhian	L	L	H	H	L	U	L

根據指南，每項研究的總體質量為被認為是好的（超過兩個的低風險），一般的（低風險兩例）或弱（少於兩例的低風險）

T-作者是否以表格和圖表總結試驗結果?



Table 2

Subgroup analyses of chromium supplementation on glycemic profile.

次群組分析	NO	WMD (95%CI)	P within group	P heterogeneity	I ²
Subgroup analyses of chromium supplementation on FPG level.					
Overall effect	26	- 19.00 (-36.15, -1.85)	0.030	< 0.001	99.8%
Trial duration (week)					
≥ 12	23	- 58.74 (-59.62, -57.85)	< 0.001	< 0.001	99.6%
< 12	3	- 1.78 (-2.94, -0.61)	0.003	0.001	86.3%
chromium Dose (μg)					
≤ 200	9	- 26.45 (-28.05, -24.85)	< 0.001	< 0.001	99.4%
> 200	17	- 40.69 (-41.47, -39.90)	< 0.001	< 0.001	99.8%
Subgroup analyses of chromium supplementation on insulin level.					
Overall effect	18	- 12.35 (-17.86, -6.83)	< 0.001	< 0.001	98.1%
Trial duration (week)					
≥ 12	16	- 24.09 (-24.63, -23.56)	< 0.001	< 0.001	98.3%
< 12	2	8.99 (-3.50, 21.49)	0.158	0.225	32.1%
chromium Dose (μg)					
≤ 200	5	- 22.94 (-23.56, -22.32)	< 0.001	< 0.001	98.6%
> 200	13	- 27.23 (-28.29, -26.17)	< 0.001	< 0.001	97.8%
Subgroup analyses of chromium supplementation on HbA1C.					
Overall effect	22	- 0.71 (-1.19, -0.23)	0.004	< 0.001	99.2%
Trial duration (week)					
≥ 12	21	- 1.70 (-1.73, -1.66)	< 0.001	< 0.001	99.2%
< 12	1	- 0.25 (-0.94, 0.44)	0.480	-	-
chromium Dose (μg)					
≤ 200	5	- 1.13 (-1.20, -1.06)	< 0.001	< 0.001	99.5%
> 200	17	- 1.88 (-1.92, -1.84)	< 0.001	< 0.001	99.0%
Subgroup analyses of chromium supplementation on HOMA-IR.					
Overall effect	9	- 1.53 (-2.35, -0.72)	< 0.001	< 0.001	89.9%
Trial duration (week)					
≥ 12	8	- 1.53 (-1.73, -1.34)	< 0.001	< 0.001	90.8%
< 12	1	1.56 (-1.63, 4.75)	0.339	-	-
chromium Dose (μg)					
≤ 200	4	- 0.94 (-1.21, -0.66)	< 0.001	< 0.001	89.2%
> 200	5	- 2.16 (-2.44, -1.88)	< 0.001	0.007	71.8%

使用STATA, 11.2版 (Stata Corp, College Station, TX).進行統計分析，其P值< 0.05

T-作者是否以表格和圖表總結試驗結果?

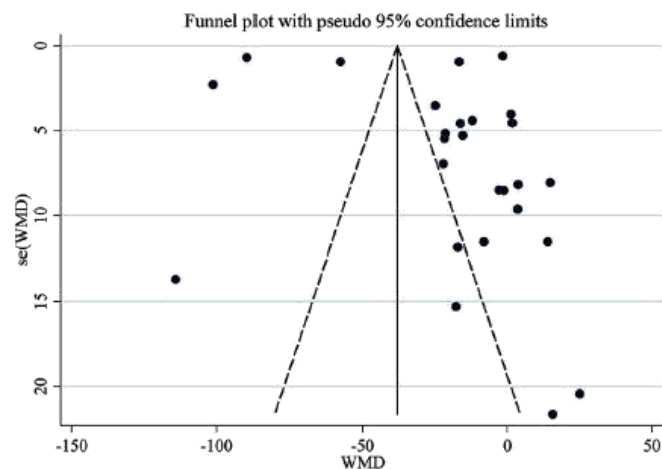


Fig. 6. Funnel plot for the effect of chromium supplementation on fasting plasma glucose.

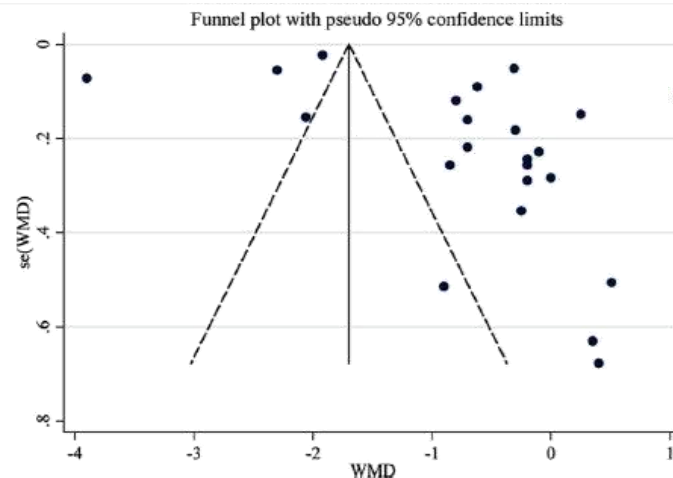


Fig. 8. Funnel plot for the effect of chromium supplementation on hemoglobin A1C.

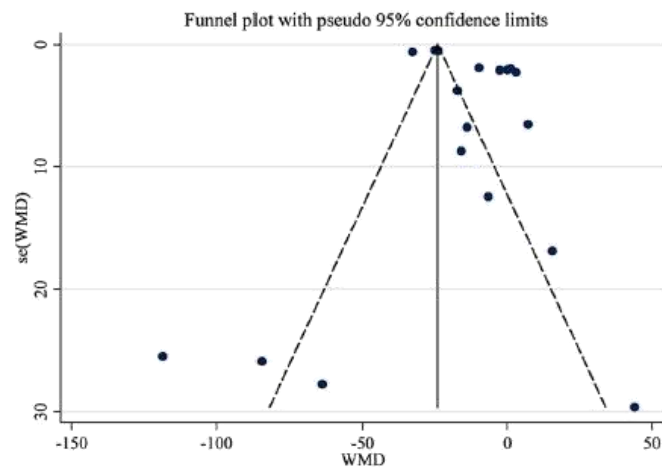


Fig. 7. Funnel plot for the effect of chromium supplementation on insulin level.

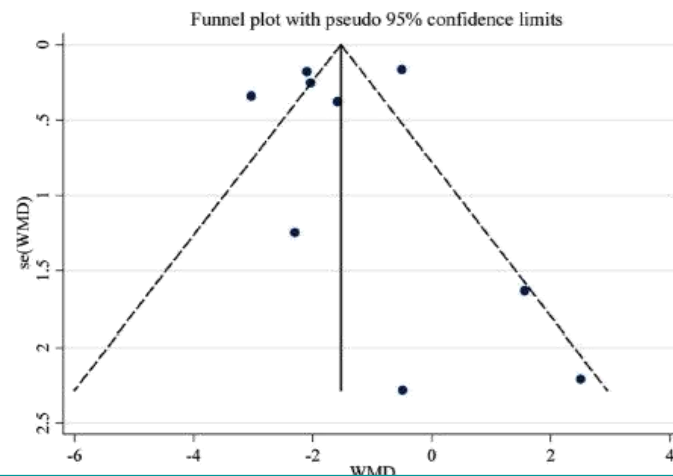


Fig. 9. Funnel plot for the effect of chromium supplementation on homeostatic model assessment for insulin resistance.



評讀結果：

☐ 是

☒ 否

☐ 不清楚



H-試驗的結果是否相近-異質性？

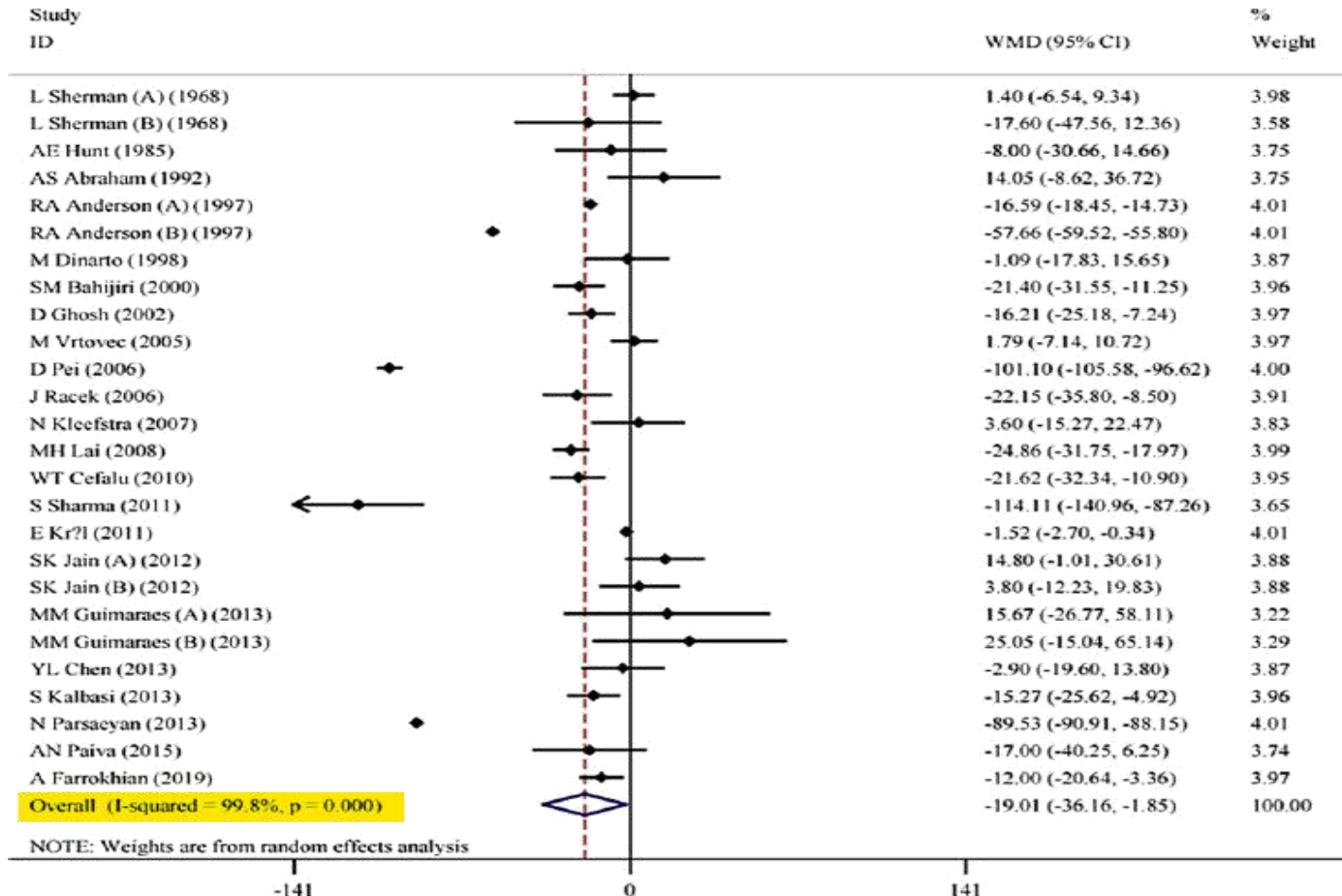


Fig. 2. Forest plot detailing weighted mean difference and 95% confidence intervals (CIs) for the effect of chromium supplementation on fasting plasma glucose.



H-試驗的結果是否相近-異質性?

評讀結果：

☐ 是

☒ 否

☐ 不清楚

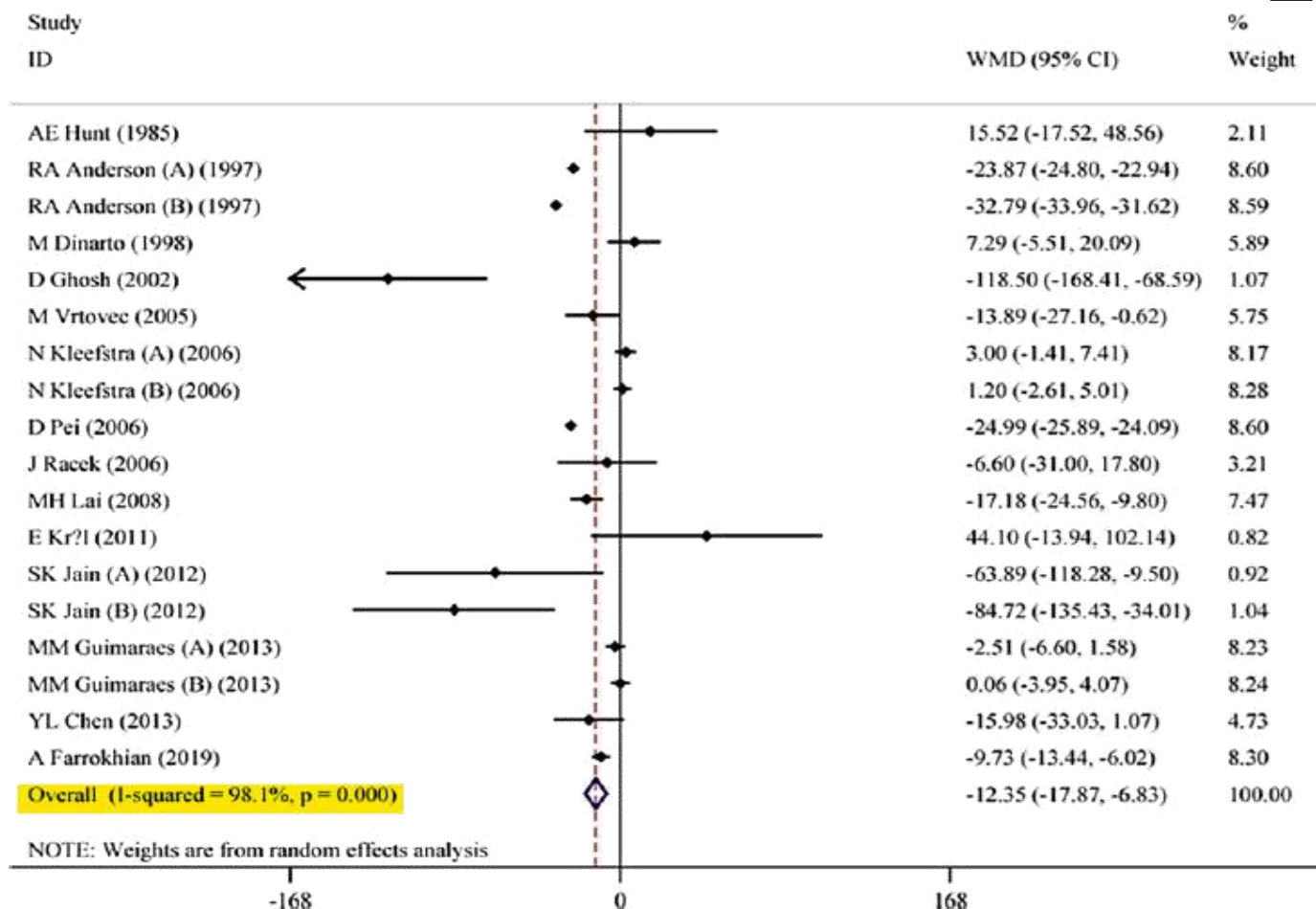


Fig. 3. Forest plot detailing weighted mean difference and 95% confidence intervals (CIs) for the effect of chromium supplementation on insulin level.



H-試驗的結果是否相近-異質性?

評讀結果：

□ 是

■ 否

□ 不清楚

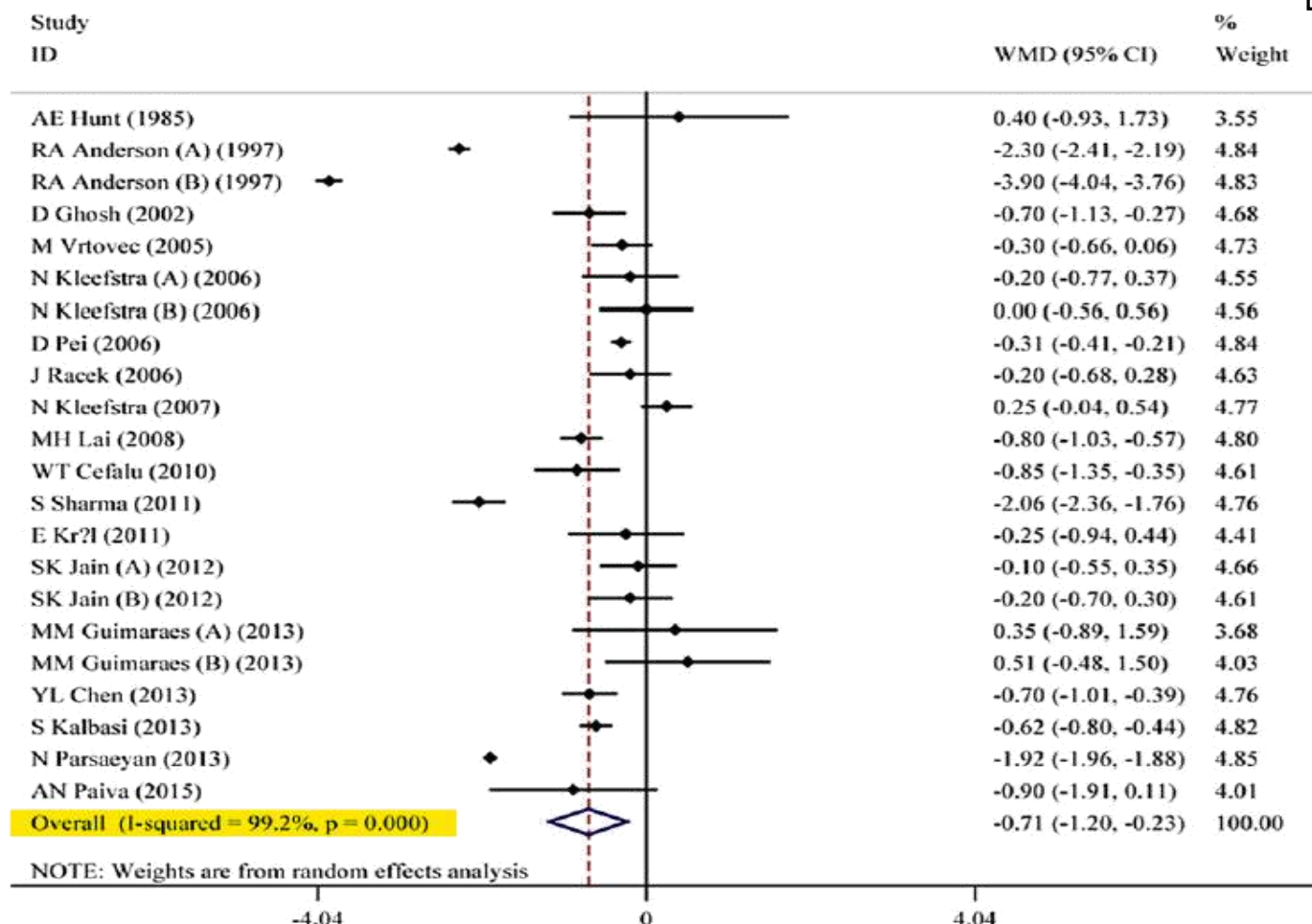


Fig. 4. Forest plot detailing weighted mean difference and 95% confidence intervals (CIs) for the effect of chromium supplementation on hemoglobin A1C.



H-試驗的結果是否相近-異質性?

評讀結果：
☐ 是
☒ 否
☐ 不清楚

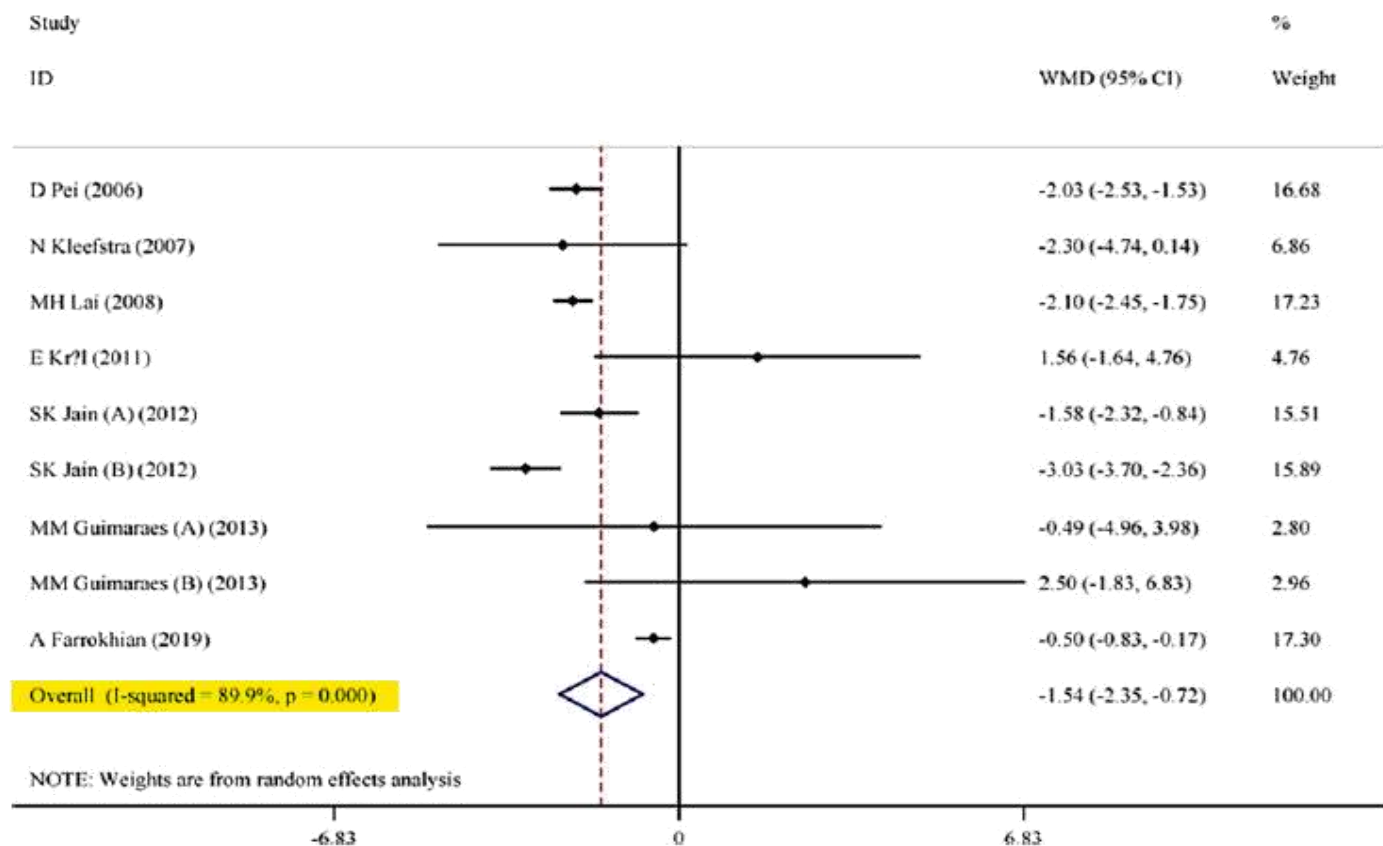


Fig. 5. Forest plot detailing weighted mean difference and 95% confidence intervals (CIs) for the effect of chromium supplementation on homeostatic model assessment for insulin resistance.

胰島素抗性



評讀總表

系統性文獻回顧的品質

研究是否找到(Find) 所有的相關證據？

評讀結果  是

文獻是否經過嚴格評讀(Appraisal)？

評讀結果  不清楚

是否只納入(Included)具良好效度的文章？

評讀結果  是

作者是否以表格和圖表「總結」(Total up) 試驗結果？

評讀結果  是

試驗的結果是否相近－異質性(Heterogeneity)？

評讀結果  否

FAITH 系統性文獻回顧快速評讀表

□ 步驟1：研究探討的問題為何（PICO）

□ 步驟2：研究的品質如何（內在效度）

✓ 步驟3：研究結果之意義為何（效益）



結論

- 鉻補充劑之介入，對type 2糖尿病者的空腹血糖（fasting plasma glucose, FPG），有顯著差異（ I^2 :99.8， $P<0.001$ ）。
- 鉻補充劑之介入，對type 2糖尿病者的血糖濃度（insulin level），有顯著差異（ I^2 :98.1， $P<0.001$ ）。
- 鉻補充劑之介入，對type 2糖尿病者的HbA1C，有顯著差異（ I^2 :99.2， $P<0.001$ ）。
- 鉻補充劑之介入，對type 2糖尿病者的HOMA-IR（胰島素抗性指數），有顯著差異（ I^2 :90.8， $P<0.001$ ）。
- 綜整上述結果來看，研究結果支持使用鉻補充劑來改善type 2糖尿病者的血糖控制。



結論

- 針對重要PICO問題的結果指標，均個別以平均差異、p值及 I^2 值呈現試驗是否具有異質性，整體而言，結果異質性高，內文提及在當前的分析中，提到和研究持續的時間、鉻攝取的劑量導致異質性。然而可能也和次群組分析中，各組族群落差大，而導致異質性。

結論



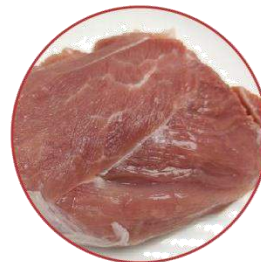
鉻元素食物大統整



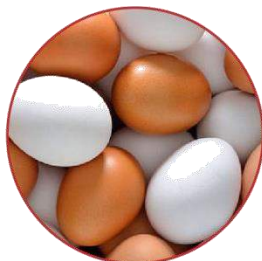
菇類



穀類



瘦肉



雞蛋



牛奶



胡椒



(任3罐送洗衣精) 【補體素】鉻100糖尿病適用奶 ...
\$780



【QUAKER桂格】完膳營養素糖尿病適用配方100 ...
\$615



(本月強打) 【補體素】鉻100糖尿病適用 (237ml ...
\$458



【QUAKER桂格】完膳營養素50鉻配方禮盒 (250 ...
\$600



【德森蜜】酵母鉻配方奶粉 (1.5kg / 罐) 廠商直送
\$1,155



贈罐4罐

贈罐4罐
(贈4罐) 【QUAKER桂格】完膳營養素50鉻配方 ...
\$3,600
\$3,456



【QUAKER桂格】完膳100鉻 (237ml X 24罐 / 箱) ...
\$1,848



贈罐2罐

贈罐2罐
(贈2罐) 【QUAKER桂格】完膳營養素50鉻配方 ...
\$1,800
\$1,728



特價



NOW Foods GTF鉻
補充片,200微克,250
片

\$258.00 ~~\$396.00~~

iHerb

★★★★★ (7,545)

平衡
代謝



【NOW健而婷】濟
體富(菸鹼酸鉻) (100
顆瓶) [台灣唯一總...

\$600.00

NOW健而婷 台灣...

免運費



第4袋0元【大醫生
技】酵母B群+鉻複
方錠 30錠

\$320.00

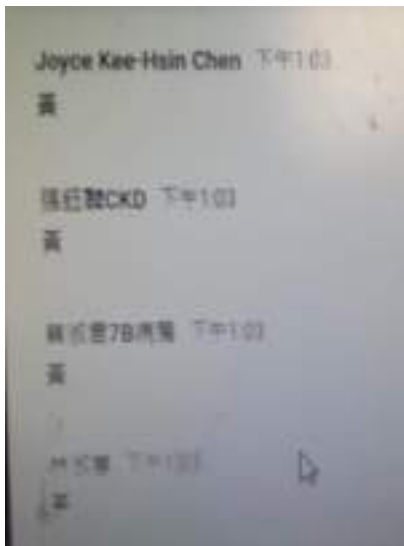
大醫生技



能依系統性文獻回顧之結論回答T2D患者的問題嗎？

• 是否同意教導糖尿病人補充鉻輔助血糖的控制？

- 贊成 2票
- 不贊成 2票
- 不確定 22票



thank you for your attention

