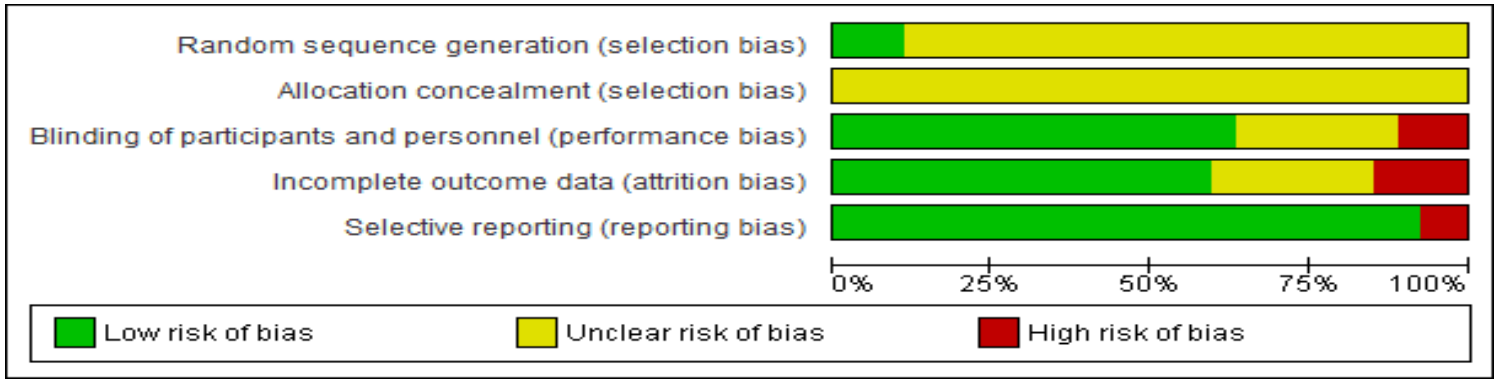
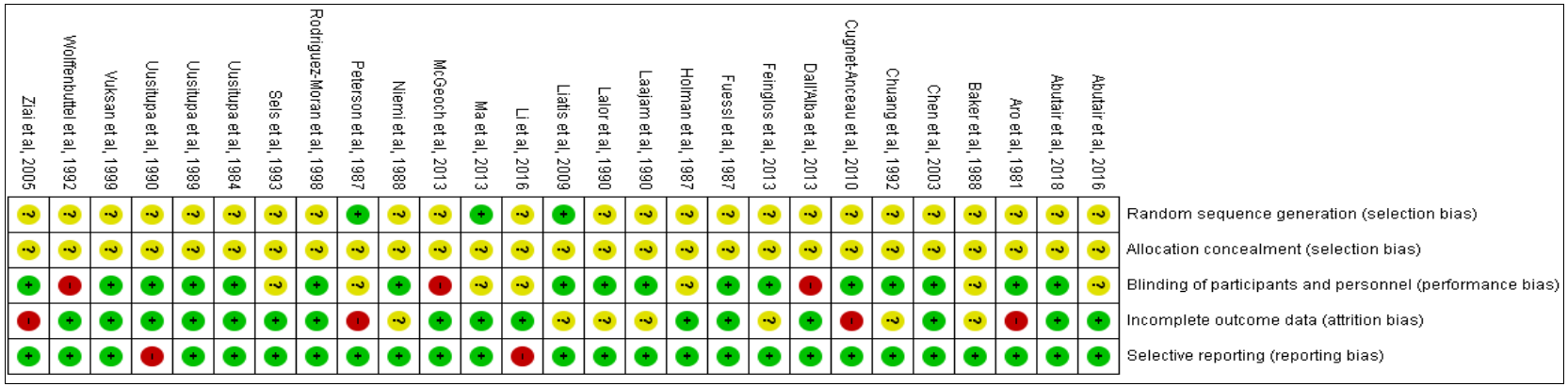
SUPPLEMENTARY DATA

Supplementary Figure S1. Risk of bias for all included trials Studies were rated "Low Risk of Bias" if the study design is unlikely to have little influence over the true outcome; "High Risk of Bias" if the design is likely to have an influential effect on the true outcome; "Unclear Risk of Bias" if insufficient information was given to assess risk.

A.



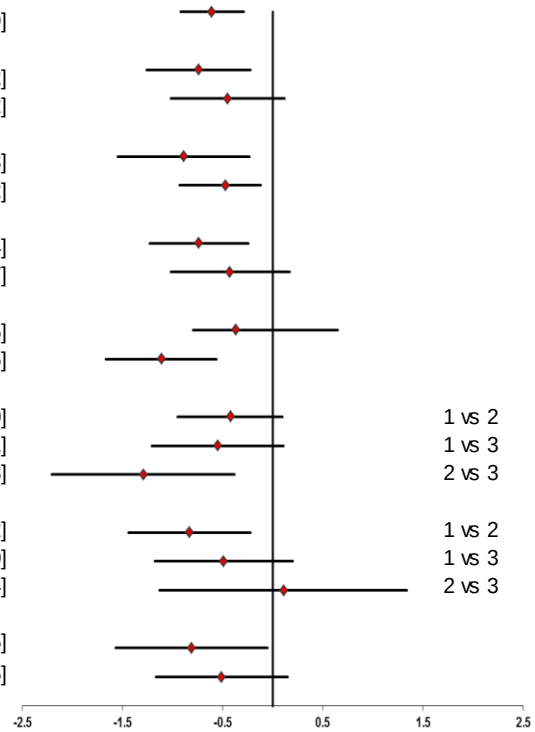
B.



SUPPLEMENTARY DATA

Supplementary Figure S2. A priori and post-hoc subgroup analyses using categorical predictors to assess the effect of viscous fiber supplementation on glycated hemoglobin (HbA1c). Point estimates for each subgroup level (diamonds) represent the pooled effect estimates. The residual I2 value indicates the inter-study heterogeneity unexplained by the subgroup. Subgroup effects were assessed by meta-regression analyses where P< 0.05 is significant.

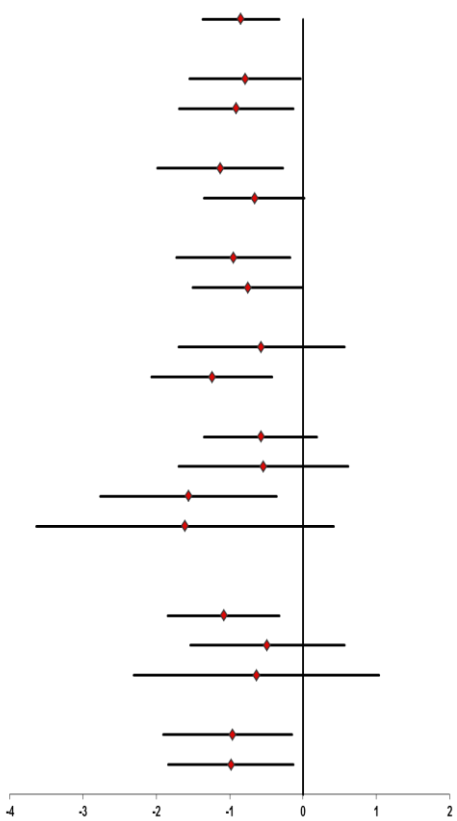
Subgroup	Level	No. of Trials	N	Within Subgroup	MD [95% CI] in HbA1c (%)		Between Subgroups	Residual I^2 (%)	P-Value
Total		19	910	-0.61 [-0.92, -0.29]					< 0.01
Dose (g/d)	< 11.2	10	684	-0.74 [-1.26, -0.22]			0.28 [-0.49, 1.05]	91.74	0.78
	≥ 11.2	9	226	-0.45 [-1.02, 0.12]					
Duration (wk)	< 8	6	344	-0.89 [-1.55, -0.23]			0.41 [-0.39, 1.22]	91.50	0.29
	≥ 8	13	566	-0.47 [-0.93, -0.12]					
Study Design	Parallel	10	726	-0.74 [-1.23, -0.24]			0.31 [-0.47, 1.09]	91.06	0.41
	Crossover	9	184	-0.43 [-1.02, 0.17]					
Baseline HbA1c (%)	< 9.3	9	475	-0.37 [-0.80, 0.65]			-0.75 [-1.45, -0.47]	83.58	0.04
	≥ 9.3	9	406	-1.11 [-1.67, -0.56]					
Fiber Type	Guar Gum	11	270	-0.42 [-0.95, 0.10]		1 vs 2	-0.13 [-0.97, 0.71]		
	B-glucan	5	535	-0.55 [-1.21, 0.11]		1 vs 3	-0.87 [-1.92, 0.18]	91.65	0.24
	Psyllium	3	105	-1.29 [-2.21, -0.38]		2 vs 3	-1.0 [-2.53, 0.54]		
Matrix	Powder/Granules	9	253	-0.83 [-1.44, -0.22]		1 vs 2	0.34 [-0.58, 1.26]	92.63	0.35
	Food	6	547	-0.49 [-1.18, 0.20]		1 vs 3	0.93 [-0.44, 2.31]		
	Capsule/Tablet	2	59	0.11 [-1.13, 1.34]		2 vs 3	1.26 [-0.60, 3.13]		
BMI (kg/m^2)	< 27.3	7	516	-0.81 [-1.57, -0.05]			0.29 [-0.71, 1.30]	91.00	0.63
	≥ 27.3	8	274	-0.51 [-1.17, 0.15]					



SUPPLEMENTARY DATA

Supplementary Figure S3. A priori and post-hoc subgroup analyses using categorical predictors to assess the effect of viscous fiber supplementation on fasting glucose (FBG). Point estimates for each subgroup level (diamonds) represent the pooled effect estimates. The residual I2 value indicates the inter-study heterogeneity unexplained by the subgroup. Subgroup effects were assessed by meta-regression analyses where P< 0.05 is significant.

Subgroup	Level	No. of Trials	N	Within Subgroup	MD [95% CI] in Fasting Glucose (mmol/L)		Between Subgroups	Residual I^2 (%)	P-Value
Total		27	1156	-0.85 [-1.37, -0.32]					< 0.01
Dose (g/d)	< 15	13	766	-0.79 [-1.55, -0.03]			-0.12 [-1.21, 0.97]	92.00	0.82
	≥ 15	14	390	-0.91 [-1.69, -0.13]					
Duration (wk)	< 8	10	517	-1.13 [-1.99, -0.27]			0.47 [-0.63, 1.56]	90.93	0.39
	≥ 8	17	639	-0.66 [-1.35, 0.02]					
Study Design	Parallel	12	885	-0.95 [-1.73, -0.17]			0.20 [-0.89, 1.29]	91.97	0.71
	Crossover	15	271	-0.75 [-1.51, -0.01]					
Baseline FBG (mmol/L)	< 9.8	12	645	-0.57 [-1.70, 0.57]			-0.57 [-1.70, 0.57]	91.62	0.31
	≥ 9.8	13	425	-1.24 [-2.07, -0.42]					
Fiber Type	Guar Gum	15	324	-0.57 [-1.35, 0.19]		1 vs 2	0.04 [-1.35, 1.42]	92.17	0.98
	B-glucan	5	535	-0.54 [-1.70, 0.62]		1 vs 3	-0.99 [-2.41, 0.44]		
	Psyllium	5	264	-1.56 [-2.77, -0.36]		1 vs 4	-1.03 [-3.21, 1.14]		
	Konjac	2	33	-1.61 [-3.64, 0.42]		2 vs 3	-0.95 [-3.22, 1.32]		
						2 vs 4	-1.00 [-3.80, 1.81]		
						3 vs 4	-2.02 [-4.84, 0.80]		
Matrix	Powder/Granules	15	466	-1.08 [-1.85, -0.32]		1 vs 2	0.60 [-0.71, 1.90]	92.67	0.62
	Food	7	558	-0.49 [-1.54, 0.57]		1 vs 3	0.45 [-1.39, 2.30]		
	Capsule/Tablet	3	81	-0.63 [-2.31, 1.04]		2 vs 3	1.04 [-1.46, 3.55]		
BMI (kg/m^2)	< 27.3	9	556	-0.96 [-1.91, -0.15]			-0.02 [-1.30, 1.25]	90.09	0.97
	≥ 27.3	10	416	-0.98 [-1.84, -0.13]					

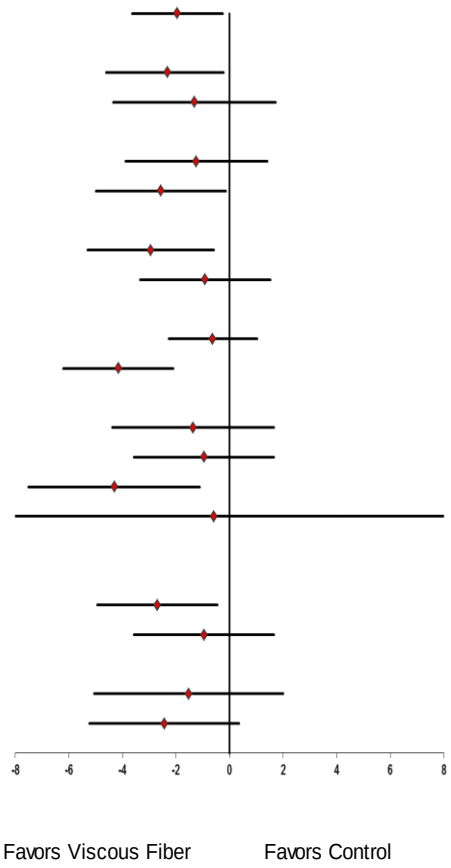


Favors Viscous Fiber Favors Control

SUPPLEMENTARY DATA

Supplementary Figure S4. A priori and post-hoc subgroup analyses using categorical predictors to assess the effect of viscous fiber supplementation on HOMA-IR. Point estimates for each subgroup level (diamonds) represent the pooled effect estimates. The residual I2 value indicates the inter-study heterogeneity unexplained by the subgroup. Subgroup effects were assessed by meta-regression analyses where P< 0.05 is significant.

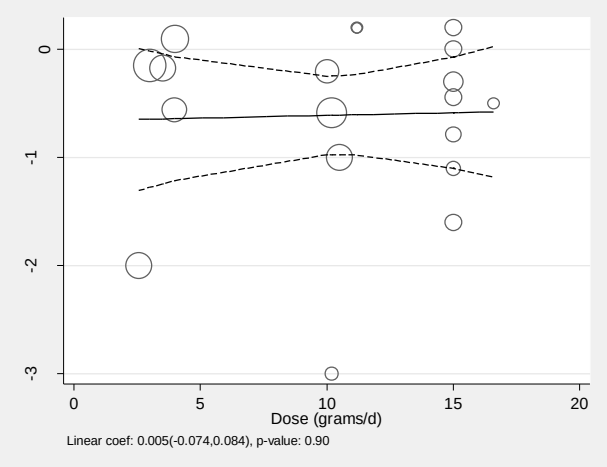
Subgroup	Level	No. of Trials	N	Within Subgroup	MD [95% CI] in HOMA-IR		Between Subgroups	Residual I^2 (%)	P-Value
Total		10	414	-1.95 [-3.65, -0.25]					0.02
Dose (g/d)	< 12.75	5	326	-2.32 [-4.62, -0.22]			1.01 [-2.81, 4.82]	94.89	0.56
	≥ 12.75	5	88	-1.31 [-4.36, 1.73]					
Duration (wk)	< 7	5	293	-1.24 [-3.89, 1.41]			-1.33 [-4.92, 2.27]	91.22	0.42
	≥ 7	5	212	-2.57 [-5.00, -0.13]					
Study Design	Parallel	4	299	-2.94 [-5.31, -0.58]			2.04 [-1.36, 5.43]	94.93	0.21
	Crossover	6	115	-0.91 [-3.35, 1.53]					
Baseline HOMA-IR	< 6.36	4	265	-0.63 [-2.28, 1.03]			-3.51 [-6.16, -0.87]	69.92	0.02
	≥ 6.36	5	110	-4.14 [-6.21, -2.10]					
Fiber Type	Guar Gum	4	77	-1.36 [-4.39, 1.67]		1 vs 2	0.41 [-3.60, 4.41]	82.69	0.31
	B-glucan	3	254	-0.95 [-3.57, 1.66]		1 vs 3	-2.94 [-7.35, 1.47]		
	Psyllium	2	72	-4.30 [-7.51, -1.10]		1 vs 4	0.77 [-9.28, 10.82]		
	Konjac	1	11	-0.59 [-10.17, 8.99]		2 vs 3	-2.53 [-9.87, 4.81]		
						2 vs 4	1.18 [-10.45, 12.82]		
						3 vs 4	-2.17 [-13.95, 9.61]		
Matrix	Powder/Granules	6	149	-2.70 [-4.95, -0.45]			1.75 [-1.71, 5.20]	84.94	0.27
	Food	4	265	-0.95 [-3.58, 1.67]					
BMI (kg/m^2)	< 27.8	3	235	-1.52 [-5.06, 2.01]			-0.92 [-5.43, 3.59]	94.14	0.64
	≥ 27.8	5	159	-2.44 [-5.25, 0.36]					



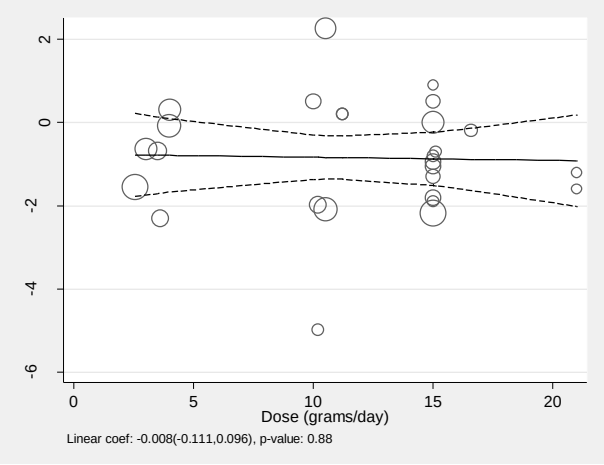
SUPPLEMENTARY DATA

Supplementary Figure S5. Linear dose-response analyses. Individual trials are represented by circles, with their weight in the overall analysis represented by circle size. The solid line represents the estimate dose-response for viscous fiber on (A) HbA1c, (B) fasting blood glucose, (C) fasting insulin, (D) HOMA-IR. The dashed lines represent 95% CI. P< 0.05 indicates significance.

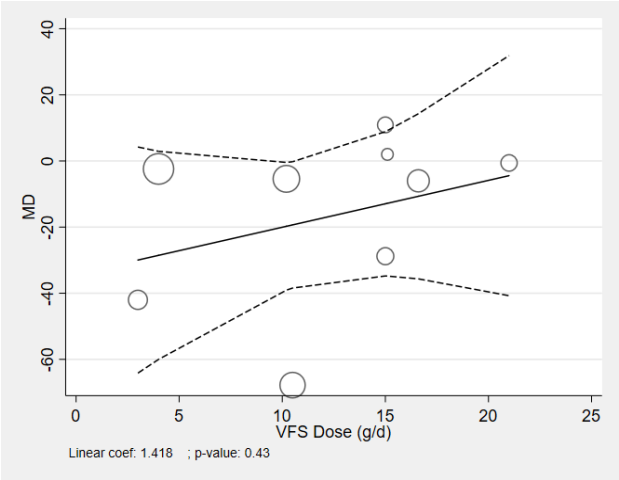
(A) HbA1c (%)



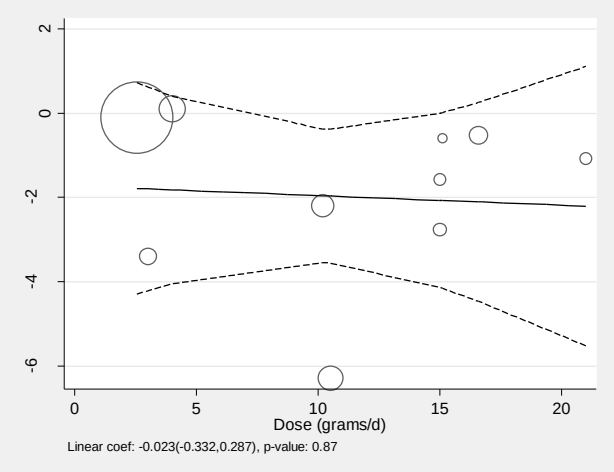
(B) Fasting Blood Glucose (mmol/L)



(C) Fasting Insulin (pmol/L)



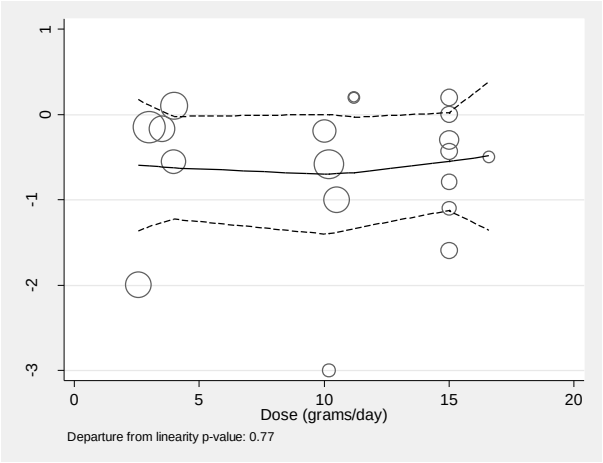
(D) HOMA-IR



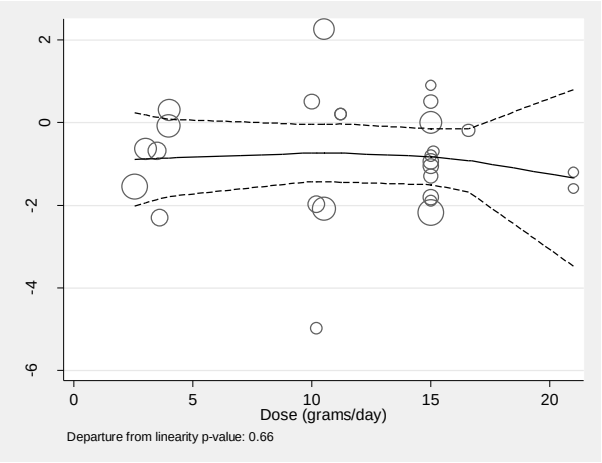
SUPPLEMENTARY DATA

Supplementary Figure S6. Non-linear dose-response analyses. Individual trials are represented by circles, with their weight in the overall analysis represented by circle size. The solid line represents the estimate dose-response for viscous fiber on (A) HbA1c, (B) fasting blood glucose, (C) HOMA-IR. The dashed lines represent 95% CI. P< 0.05 indicates significance. Visual inspection suggests doses >10 g/d may be more effective in HOMA-IR improvement compared to lower dose, although it did not reach significance.

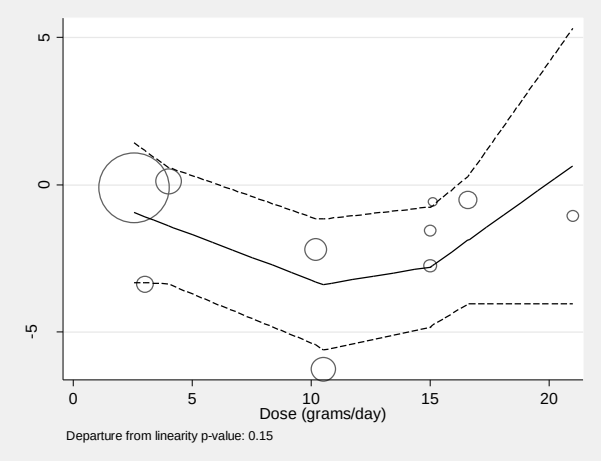
(A) HbA1c (%)



(B) Fasting Blood Glucose (mmol/L)

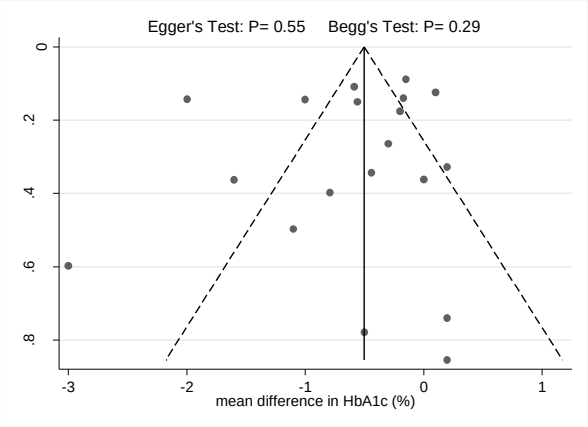


(C) HOMA-IR

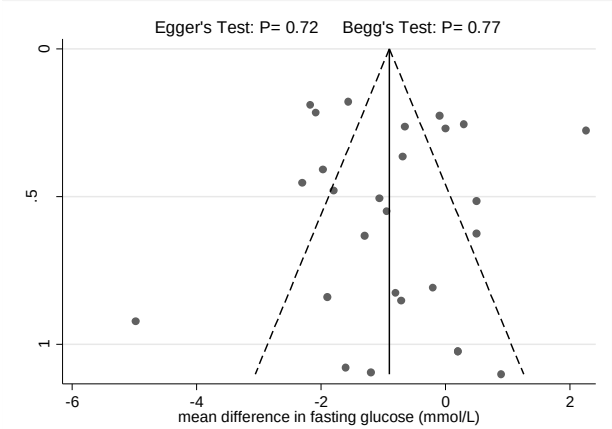


SUPPLEMENTARY DATA

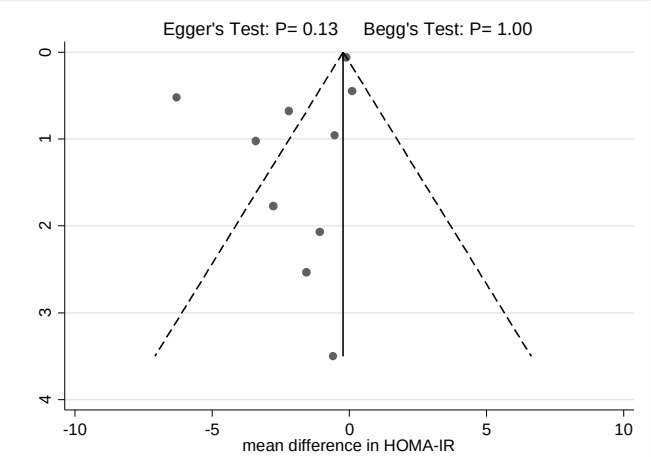
Supplementary Figure S7. Funnel plots assessing publication bias and effect of small and/or imprecise study effects for (A) HbA1c, (B) fasting glucose, and (C) HOMA-IR. The horizontal line represents the pooled effect estimate expressed as the mean difference for each analysis. Diagonal lines represent the pseudo-95% CI. P-values are derived from quantitative assessment of publication bias by Egger and Begg tests. P< 0.05 is considered evidence for small-study effects.



A.

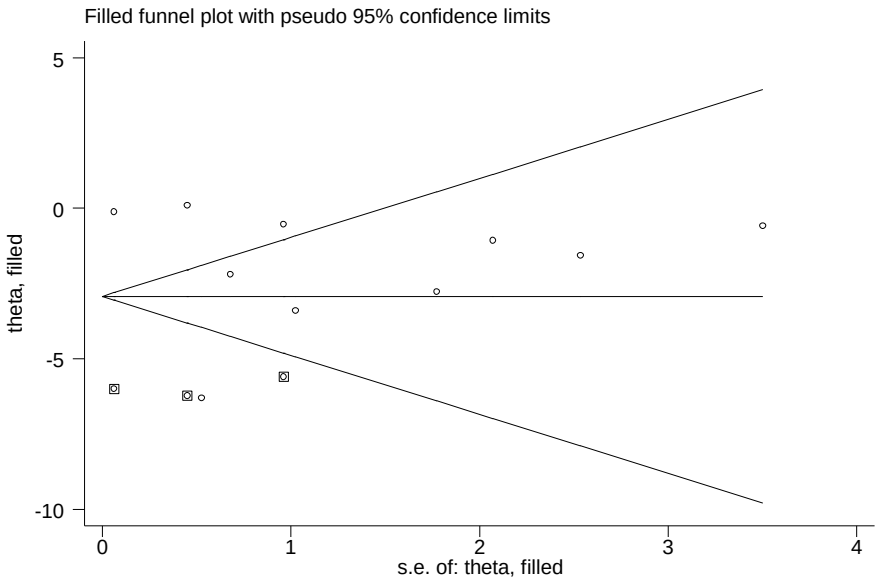


B.



C.

Supplementary Figure S8. Trim and Fill funnel plot for HOMA-IR. The horizontal line represents the pooled effect estimate expressed as MD, the diagonal lines represent the pseudo-95 % CIs of the MD, the circles represent effect estimates for each included studies, and squares represent imputed "missed" studies. Imputed MD is provided where P< 0.05 is considered evidence of small-study effects.



SUPPLEMENTARY DATA

Supplementary Table S1. Search Strategy. For all databases, searches were performed through June 15, 2018.

MEDLINE	EMBASE	COCHRANE
1 exp dietary fiber/	1 exp dietary fiber/	1 exp Dietary Fiber/
2 Dietary fiber*.tw.	2 Dietary fiber*.tw.	2 Dietary fiber*.ti,ab,kw.
3 Dietary fibre*.tw.	3 Dietary fibre*.tw.	3 Dietary fibre*.ti,ab,kw.
4 Amorphophallus/	4 Amorphophallus/	4 Amorphophallus/
5 Amorphophallus.mp.	5 Amorphophallus.mp.	5 Amorphophallus. ti,ab,kw.
6 Konjac*.mp.	6 Konjac*.mp.	6 Konjac*.ti,ab,kw.
7 Konjak*.mp.	7 Konjak*.mp.	7 Glucomannan*.ti,ab,kw.
8 Konnyaku*.mp.	8 Konnyaku*.mp.	8 Psyllium/
9 Glucomannan*.mp.	9 Glucomannan*.mp.	9 Psyllium. ti,ab,kw.
10 exp ispaghula/	10 exp ispaghula/	10 Ispaghula*.ti,ab,kw.
11 Psyllium*.mp.	11 Psyllium*.mp.	11 Plantago/
12 Ispaghula*.mp.	12 Ispaghula*.mp.	12 Plantago*.ti,ab,kw.
13 Plantago/	13 Plantago/	13 Metamucil. ti,ab,kw.
14 plantago*.mp.	14 plantago*.mp.	14 Guar*.ti,ab,kw.
15 metamucil.mp.	15 metamucil.mp.	15 Cyamopsis/
16 Cyamopsis/	16 Cyamopsis/	16 Cyamopsis. ti,ab,kw.
17 Cyamopsis.mp.	17 Cyamopsis.mp.	17 Avena. ti,ab,kw.
18 Guar*.mp.	18 Guar*.mp.	18 Oat. ti,ab,kw.
19 Avena/	19 Avena/	19 Oats. ti,ab,kw.
20 Avena*.tw.	20 Avena*.tw.	20 Hordeum/
21 Oat.tw.	21 Oat.tw.	21 Hordeum. ti,ab,kw.
22 Oats.tw.	22 Oats.tw.	22 Barley. ti,ab,kw.
23 Hordeum/	23 Hordeum/	23 Beta-Glucans/
24 Hordeum.mp.	24 Hordeum.mp.	24 Beta glucan*.ti,ab,kw.
25 Barley.mp.	25 Barley.mp.	25 Pectins/
26 beta glucan/	26 beta glucan/	26 Pectin*.ti,ab,kw.
27 Beta glucan*.mp.	27 Beta glucan*.mp.	27 Locust bean gum. ti,ab,kw.
28 B-glucan*.mp.	28 B-glucan*.mp.	28 Carob*.ti,ab,kw.
29 Pectin/	29 Pectin/	29 Galactomannan*.ti,ab,kw.
30 Pectin*.mp.	30 Pectin*.mp.	30 Xanthan. ti,ab,kw.
31 Locust bean gum.mp.	31 Locust bean gum.mp.	31 Alginates/
32 Carob*.mp.	32 Carob*.mp.	32 Algin*.ti,ab,kw.
33 Galactomannan*.mp.	33 Galactomannan*.mp.	33 Brown alga*.ti,ab,kw.
34 Supercol.mp.	34 Supercol.mp.	34 Phaeophyta/
35 E410.mp.	35 E410.mp.	35 Phaeophyta*.ti,ab,kw.
36 Xanthan/	36 Xanthan/	36 Kelp/
37 Xanthan.mp.	37 Xanthan.mp.	37 Kelp.ti,ab,kw.
38 Alginic acid/	38 Alginic acid/	38 Carrageenan/
39 Algin*.mp.	39 Algin*.mp.	39 Carrageen*.ti,ab,kw.
40 Brown alga/	40 Brown alga/	40 Agar/
41 Brown alga*.tw.	41 Brown alga*.tw.	41 Agar*.ti,ab,kw.
42 Phaeophyta.mp.	42 Phaeophyta.mp.	42 Kanten. ti,ab,kw.
43 Kelp/	43 Kelp/	43 Sepharose/
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45 Carrageenan/	45 Carrageenan/	45 1 or 2 or 3 or 4 or 5 or

46 Carrageen*.mp.
47 Chondrus/
48 Chondrus.mp.
49 Irish moss*.mp.
50 Eucheuma.tw.
51 Agar/
52 Agar*.mp.
53 Kanten.mp.
54 Sepharose/
55 Sepharose.mp.
56 1 or 2 or 3 or 4 or 5 or
6 or 7 or 8 or 9 or 10 or
11 or 12 or 13 or 14 or
15 or 16 or 17 or 18 or
19 or 20 or 21 or 22 or
23 or 24 or 25 or 26 or
27 or 28 or 29 or 30 or
31 or 32 or 33 or 34 or
35 or 36 or 37 or 38 or
39 or 40 or 41 or 42 or
43 or 44 or 45 or 46 or
47 or 48 or 49 or 50 or
51 or 52 or 53 or 54 or
55 or 56
57 Diabetes mellitus/
58 Diabetes type 2.tw.
59 Non insulin dependent diabetes mellitus.tw.
60 NIDDM.tw.
61 Type II diabetes.tw.
62 Type 2 Diabetes.tw.
63 T2DM.tw.
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66 HbA1c.tw.
67 (blood adj3 glucose).mp.
68 glucose blood level/
69 Glyc?emi*.tw.
70 Hyperglyc?emi*.tw.
71 Hypoglyc?emi*.tw.
72 fructosamine/
73 Fructosamine*.tw.
74 Fasting insulin.tw.
75 Insulin resistance/
76 HOMA-IR.tw.
77 57 or 58 or 59 or 60 or 61 or
62 or 63 or 64 or 65 or 66 or
67 or 68 or 69 or 70 or 71 or
72 or 73 or 74 or 75 or 76
78 56 and 77
79 exp Animals/ not Humans/
80 78 not 79
81 random:.tw. or placebo:.mp. or double-blind:.tw.
82 80 and 81

46 Carrageen*.mp.
47 Chondrus/
48 Chondrus.mp.
49 Irish moss*.mp.
50 Eucheuma.tw.
51 Agar/
52 Agar*.mp.
53 Kanten.mp.
54 Sepharose/
55 Sepharose.mp.
56 1 or 2 or 3 or 4 or 5 or
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11 or 12 or 13 or 14 or
15 or 16 or 17 or 18 or
19 or 20 or 21 or 22 or
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31 or 32 or 33 or 34 or
35 or 36 or 37 or 38 or
39 or 40 or 41 or 42 or
43 or 44 or 45 or 46 or
47 or 48 or 49 or 50 or
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55 or 56
57 Diabetes mellitus/
58 Diabetes type 2.tw.
59 Non insulin dependent diabetes mellitus.tw.
60 NIDDM.tw.
61 Type II diabetes.tw.
62 Type 2 Diabetes.tw.
63 T2DM.tw.
64 Hemoglobin A1c/
65 Hemoglobin A1c.mp.
66 HbA1c.tw.
67 (blood adj3 glucose).mp.
68 glucose blood level/
69 Glyc?emi*.tw.
70 Hyperglyc?emi*.tw.
71 Hypoglyc?emi*.tw.
72 fructosamine/
73 Fructosamine*.tw.
74 Fasting insulin.tw.
75 Insulin resistance/
76 HOMA-IR.tw.
77 57 or 58 or 59 or 60 or 61 or
62 or 63 or 64 or 65 or 66 or
67 or 68 or 69 or 70 or 71 or
72 or 73 or 74 or 75 or 76
78 56 and 77
79 exp Animals/ not Humans/
80 78 not 79
81 random:.tw. or placebo:.mp. or double-blind:.tw.
82 80 and 81

6 or 7 or 8 or 9 or 10 or
11 or 12 or 13 or 14 or 15 or
16 or 17 or 18 or 19 or 20 or
21 or 22 or 23 or 24 or 25 or
26 or 27 or 28 or 29 or 30 or
31 or 32 or 33 or 34 or 35 or
36 or 37 or 38 or 39 or 40 or
41 or 42 or 43 or 44
46 Diabetes Mellitus, Type 2/
47 Diabetes type 2. ti,ab,kw.
48 Non Insulin dependent diabetes. ti,ab,kw.
49 NIDDM. ti,ab,kw.
50 Type II diabetes. ti,ab,kw.
51 Type 2 diabetes. ti,ab,kw.
52 T2DM. ti,ab,kw.
53 Adult-onset diabetes. ti,ab,kw.
54 Hemoglobin A, Glycosylated/
55 HbA1c. ti,ab,kw.
56 Hemoglobin A1c. ti,ab,kw.
57 (Blood adj3 glucose). ti,ab,kw.
58 Blood Glucose/
59 Glyc?emi*.ti,ab,kw.
60 Hyperglyc?emi*.ti,ab,kw.
61 Hypoglyc?emi*.ti,ab,kw.
62 Fructosamine/
63 Fructosamine*.ti,ab,kw.
64 Fasting insulin. ti,ab,kw.
65 Insulin Resistance/
66 HOMA-IR. ti,ab,kw.
67 55 or 56 or 57 or 58 or 59 or
60 or 61 or 62 or 63 or 64 or
65 or 66 or 67 or 68 or 69 or
70 or 71 or 72 or 73 or 74 or 75
68 45 and 67

SUPPLEMENTARY DATA

Supplementary Table S2. Continuous *a priori* and post-hoc subgroup analyses

A) HbA1c

Subgroup	No. of Trials	N	β [95% CI]	Residual I^2 (%)	P-value
Viscous Fiber Dose (g/d)	19	910	-0.005[-0.07, 0.08]	91.71	0.90
Duration (wk)	19	910	0.006 [-0.03, 0.04]	91.75	0.74
Baseline HbA1c (%)	18	881	-0.14 [-0.36, 0.07]	84.33	0.18
Baseline BMI (kg/m^2)	15	790	-0.008 [-0.25, 0.23]	93.03	0.95

B) Fasting Glucose

Subgroup	No. of Trials	N	β [95% CI]	Residual I^2 (%)	P-value
Viscous Fiber Dose (g/d)	27	1156	-0.008 [-0.11, 0.84]	92.21	0.88
Duration (wk)	27	1156	0.02 [-0.04, 0.07]	91.85	0.49
Baseline Fasting Glucose (mmol/L)	25	1070	-0.20 [-0.64, 0.24]	91.75	0.36
Baseline BMI (kg/m^2)	19	972	-0.05 [-0.34, 0.25]	90.32	0.75

C) HOMA-IR

Subgroup	No. of Trials	N	β [95% CI]	Residual I^2 (%)	P-value
Viscous Fiber Dose (g/d)	10	414	-0.02 [-0.33, 0.29]	90.72	0.87
Duration (wk)	10	414	-0.10 [-0.83, 0.64]	92.31	0.77
Baseline HOMA-IR	9	375	-0.33 [-0.69, 0.04]	75.75	0.07
Baseline BMI (kg/m^2)	8	394	-0.30 [-1.25, 0.66]	93.94	0.48

SUPPLEMENTARY DATA

Supplementary Table S3. GRADE Assessment

GRADE Assessment							No. of Participants		Effect	Quality
No. of Trial Comparisons	**Study Design**	**Risk of Bias**	**Inconsistency**	**Indirectness**	**Imprecision**	**Other Considerations**	**Viscous Fiber**	**Control**	**Absolute (95% CI)**	
HbA1c										
20	**RCTs**	**not serious [a]**	**serious [b]**	**not serious**	**not serious**	**none**	**809**	**544**	**-0.58 % (-0.88, -0.28)**	**⊕⊕⊕◯ MODERATE**
Fasting Glucose										
28	**RCTs**	**not serious [a]**	**serious [c]**	**not serious**	**not serious**	**none**	**961**	**704**	**-0.82 mmol/L (-1.32, -0.31)**	**⊕⊕⊕◯ MODERATE**
Fasting Insulin										
9	**RCTs**	**not serious [a]**	**not serious [d]**	**not serious**	**serious [e]**	**none [f]**	**177**	**166**	**-17.56 pmol/L (-37.54, 2.42)**	**⊕⊕⊕◯ MODERATE**
Fructosamine										
2	**RCTs**	**not serious [a]**	**not serious**	**not serious**	**very serious [g]**	**none [h]**	**23**	**23**	**-0.12 mmol/L (-0.33, 0.08)**	**⊕⊕◯◯ LOW**
HOMA-IR										
11	**RCTs**	**not serious [a]**	**serious [i]**	**not serious**	**not serious**	**none [j]**	**463**	**304**	**-1.89 (-3.45, -0.33)**	**⊕⊕⊕◯ MODERATE**

SUPPLEMENTARY DATA

Explanations

a. No downgrade for risk of bias: Plausible selection bias unlikely to seriously alter the results
b. Downgraded for inconsistency: Evidence of substantial inter-study heterogeneity (I^2= 91%, P< 0.00001) which could not be explained
c. Downgrade for inconsistency: Evidence of substantial inter-study heterogeneity (I^2= 92%, P< 0.00001) which could not be explained
d. No downgrade for inconsistency: Evidence of substantial inter-study heterogeneity (I^2= 90%, P< 0.00001), however, Abutair et al, 2016 accounted for 47% of heterogeneity
e. Downgraded for imprecision: The pooled estimate of effect includes the clinical decision threshold for meaningful benefit (= 5 pmol/L) however; the 95% CI also includes 0
f. No downgrade for publication bias: Publication bias could not be assessed due to lack of power for assessing funnel plot asymmetry and small study effects (< 10 RCTs)
g. Downgraded for imprecision: The 95% CI includes 0 and excludes the minimally important difference for benefit of 10% (= 0.3) calculated using rule of thumb = 0.5 * SD of pooled effect. The total number of participants is < OIS criterion
h. No downgrade for publication bias: Publication bias could not be assessed due to lack of power for assessing funnel plot asymmetry and small study effects (<10 RCTs)
i. Downgraded for inconsistency: Evidence of substantial inter-study heterogeneity (I^2= 94%, P< 0.00001). *A priori* subgroup and sensitivity analyses partially explained however, evidence remained substantial
j. No downgrade for publication bias: Although visual inspection of funnel plots suggested asymmetry for HOMA-IR and Trim and Fill analyses suggest small study effects, Egger and Begg tests were not significant and adjusted pooled effect estimate after Trim and Fill did not change direction or significance.