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TITLE OF PRESENTATION

Dietary Fibre, Gut microbiota dysbiosis and Type 2 diabetes

INTRODUCTION

- The prevalence of type 2 diabetes is increasing worldwide, both in developed countries and in developing economies [1,2].

- Type 2 diabetes represents about 90% of adults who are diagnosed with diabetes.

INTRODUCTION CONTD.

- Diabetes is associated with acute complications;
  - Hyperglycaemia
  - Diabetic ketoacidosis
  - Hyperosmolar hyperglycaemic state

INTRODUCTION CONTD.

- Chronic complications;
  - Kidney dysfunction
  - Neuropathy
  - Retinopathy
  - Cardiovascular diseases [3,4].

INTRODUCTION CONTD.

- A range of factors have been implicated in the aetiology of type 2 diabetes [5] including;
- Overweight and obesity
- Lifestyle
- Genetic predisposition
- Gut microbiota dysbiosis

INTRODUCTION CONTD.

- In particular, low intake of dietary fibre and consumption of foods that are high in fat and sugar which are common in western lifestyle have been reported to contribute to the depletion in the abundance of specific bacteria taxa and the diversity of the gut microbial community [6].

INTRODUCTION CONTD.

- It is possible that a higher intake of dietary fibre may alter the environment in the gut and provide the needed substrate for microbial bloom.

- Our current understanding of the exact relationships between gut microbiota and diseases is limited and continues to evolve [7,8].

INTRODUCTION CONTD.

- Previous reviews have focused on the role of general diet on gut microbiota

- However, the current review is a systematic review and meta-analysis which evaluated the role of dietary fibre in modulating gut microbiota dysbiosis in patients with type 2 diabetes.

METHOD

- The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) was the framework used for this review [9].
- Various electronic databases including:
- EBSCOHost with links to Health Sciences Research Databases – encompassing;
  - Academic Search Premier
  - MEDLINE
  - Psychology and Behavioral Sciences Collection

METHOD CONTD.

- APA PsycInfo
- CINAHL Plus with Full Text
- APA PsycArticles databases
- EMBASE
- Google Scholar
- The reference lists of articles were also searched.

METHOD CONTD.

- Searches were conducted from date of commencement of database to 5th August, 2020.
- The search strategy was based on Population, Intervention, Comparator, Outcomes, Studies (PICOS) framework
- Searches involved the use of synonyms and medical subject headings (MesH).

METHOD CONTD.

- Search terms were combined with Boolean operators (OR/AND).
- Results of the searches were screened for eligibility based on inclusion and exclusion criteria.
- Only randomised controlled trials were included in the review and the studies were evaluated for quality and risk of bias [10].
- The meta-analysis was conducted using Review Manager 5.3 software [11].

RESULTS

- Nine studies which met the inclusion criteria were selected for the systematic review and meta-analysis and four distinct areas were identified:
  - The effect of dietary fibre on gut microbiota
  - The role of dietary fibre on short chain fatty acids (SCFAs)
  - Glycaemic control
  - Adverse events

RESULTS CONTD.

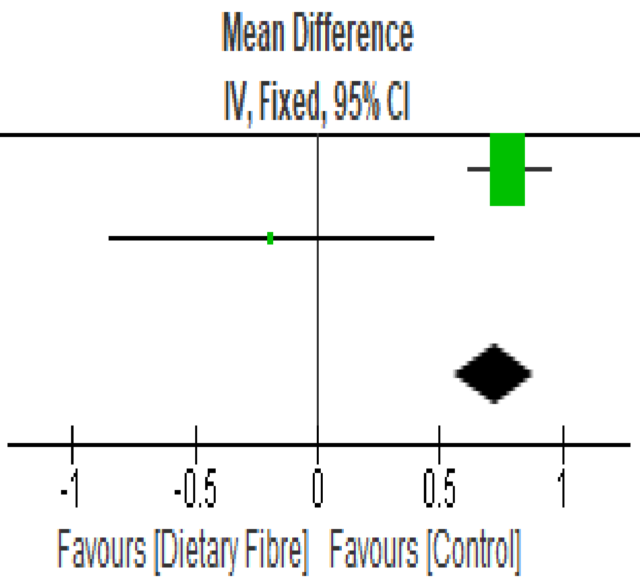
- There was significant improvement (P<0.01) in the relative abundance of Bifidobacterium with a mean difference of 0.72 (95% CI, 0.56, 0.89) in the dietary fibre group compared with placebo (Figure 1).

Figure 1 shows the effect of dietary fibre on Bifidobacterium (%)

	High Fibre Diet			Control				Mean Difference
Study or Subgroup	Mean	SD	Total	Mean	SD	Total	Weight	IV, Fixed, 95% CI
Medina - Vera et al 2019	0.899	0.449	28	0.117	0.058	25	94.0%	0.78 [0.61, 0.95]
Pedersen et al 2016	0.178	1.128	14	0.369	0.55	13	6.0%	-0.19 [-0.85, 0.47]
Total (95% CI)			42			38	100.0%	0.72 [0.56, 0.89]

Heterogeneity: Chi² = 7.79, df = 1 (P = 0.005); I² = 87%

Test for overall effect: Z = 8.71 (P < 0.00001)



RESULTS CONTD.

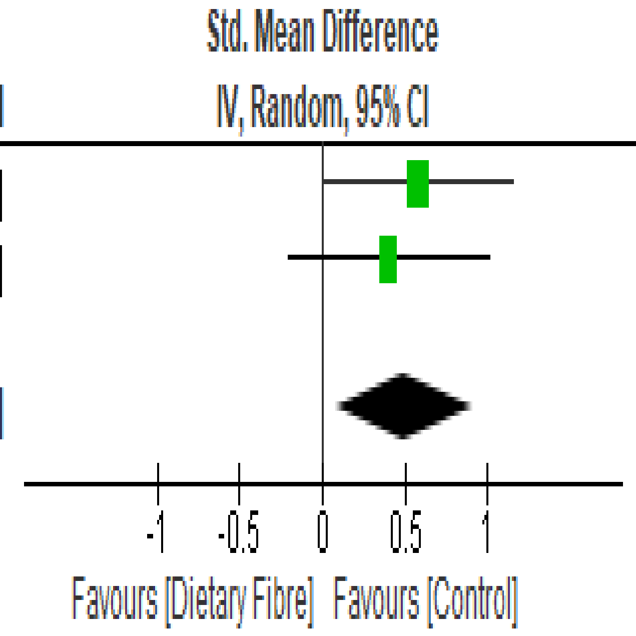
- In relation to the meta-analysis for SCFAs, there was significant difference (P=0.02) between the dietary fibre group and placebo with a standardised mean difference of 0.5 (95% CI, 0.08, 0.91) regarding total SCFAs (Figure 2).
- The differences were not significant (P>0.05) in relation to acetic acid, propionic acid and butyric acid.

Figure 2 shows the effect of dietary fibre on Total Short Chain Fatty Acids

	High Fibre Diet			Control				Std. Mean Difference
Study or Subgroup	Mean	SD	Total	Mean	SD	Total	Weight	IV, Random, 95% CI
Birkeland et al 2020	10.513	25.266	25	-5.74	29.589	25	53.1%	0.58 [0.01, 1.15]
Zhao et al 2018	27.33	283.666	27	-88.84	284.154	18	46.9%	0.40 [-0.20, 1.00]
Total (95% CI)			52			43	100.0%	0.50 [0.08, 0.91]

Heterogeneity: Tau² = 0.00; Chi² = 0.18, df = 1 (P = 0.67); I² = 0%

Test for overall effect: Z = 2.36 (P = 0.02)



RESULTS CONTD.

- There was only significant improvement (P=0.002) with respect to glycated haemoglobin with a mean difference of -0.18 (95% CI, -0.29, -0.06) in the dietary fibre group compared with placebo group (Figure 3).

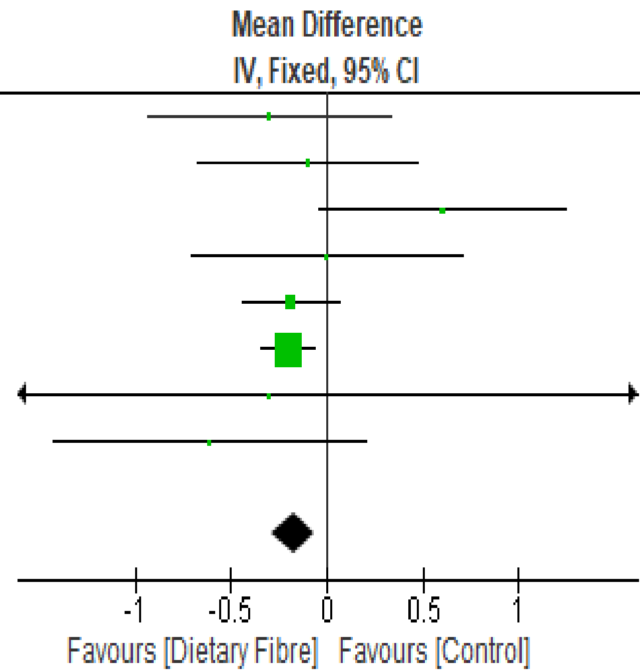
- Differences between the two groups were not significant (P>0.05) in relation to fasting blood glucose and Homeostatic Model Assessment of Insulin Resistance (HOMAR – IR).

Figure 3 shows the effect of dietary fibre on Glycated Haemoglobin (%)

Study or Subgroup	High Fibre Diet			Control				Mean Difference
	Mean	SD	Total	Mean	SD	Total	Weight	IV, Fixed, 95% CI
Candela et al 2016	-0.4	1.068	21	-0.1	0.969	19	3.2%	-0.30 [-0.93, 0.33]
Gonai et al 2017	-0.1	1.153	28	0	1.015	27	3.9%	-0.10 [-0.67, 0.47]
Medina - Vera et al 2019	0.4	1.254	28	-0.2	1.114	25	3.1%	0.60 [-0.04, 1.24]
Pedersen et al 2016	0.2	1.123	14	0.2	0.721	13	2.5%	0.00 [-0.71, 0.71]
Reimer et al 2020	-0.23	0.928	147	-0.04	1.25	143	19.7%	-0.19 [-0.44, 0.06]
Soare et al 2014	-0.4	0.296	25	-0.2	0.2	26	65.4%	-0.20 [-0.34, -0.06]
Soare et al 2016	-0.687	2.119	17	-0.382	4.711	23	0.3%	-0.31 [-2.48, 1.87]
Zhao et al 2018	-1.91	1.222	27	-1.3	1.355	16	1.9%	-0.61 [-1.42, 0.20]
Total (95% CI)			**307**			**292**	**100.0%**	**-0.18 [-0.29, -0.06]**

Heterogeneity: Chi² = 7.39, df = 7 (P = 0.39); I² = 5%

Test for overall effect: Z = 3.06 (P = 0.002)



RESULTS CONTD.

- There were no significant differences between the two groups in subjects who reported adverse events.

DISCUSSION

- It is possible that the promotion of SCFA producers in greater diversity and abundance by dietary fibre in this review led to improvement in glycated haemoglobin, partly due to increased glucagon-like peptide-1 (GLP – 1) production [12].

- Bifidobacterium lactis has been reported to increase glycogen synthesis, decrease expression of hepatic gluconeogenesis – genes, improve translocation of glucose transport– 4 and promote glucose uptake [13].

DISCUSSION CONTD.

- It is also possible that the reduction in body weight of participants in the intervention group compared with control may have contributed to the observed improvement in glycated haemoglobin in the dietary fibre group [14].

CONCLUSION

- This systematic review and meta-analysis have demonstrated that dietary fibre can significantly improve ($P<0.05$) the relative abundance of Bifidobacterium, total SCFAs and glycated haemoglobin.

- However, dietary fibre did not appear to have significant effect ($P>0.05$) on fasting blood glucose, HOMAR – IR, acetic acid, propionic acid, butyric acid and adverse events.

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