مداخلات تغذیه‌ای در سندرم تخمدان پلی‌کیستیک: آیا رژیم غذایی می‌تواند جایگزین متفورمین شود؟

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Ranking the dietary interventions by their effectiveness in the management of polycystic ovary syndrome: a systematic review and network meta-analysis

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Polycystic Ovary Syndrome

- Affecting 5-18% of women in reproductive age
- Rotterdam Criteria:
  - Oligo-/amenorrhea or anovulation
  - Laboratory- or clinically-proven hyperandrogenism
  - A polycystic ovary is visible on an ultrasound image
- Hyperandrogenism, Hirsutism, Irregular Menstruation Cycle, and Infertility
- The role of insulin resistance and obesity

Pharmacological Interventions

- Metformin
- Inositol supplements

Non-Pharmacological Interventions

- The International Evidence-based Guideline for the Assessment and Management of PCOS recommendations:
  - Dietary and exercise interventions as the first line of management
  - A small weight reduction (5–10% of body weight)

Dietary Interventions

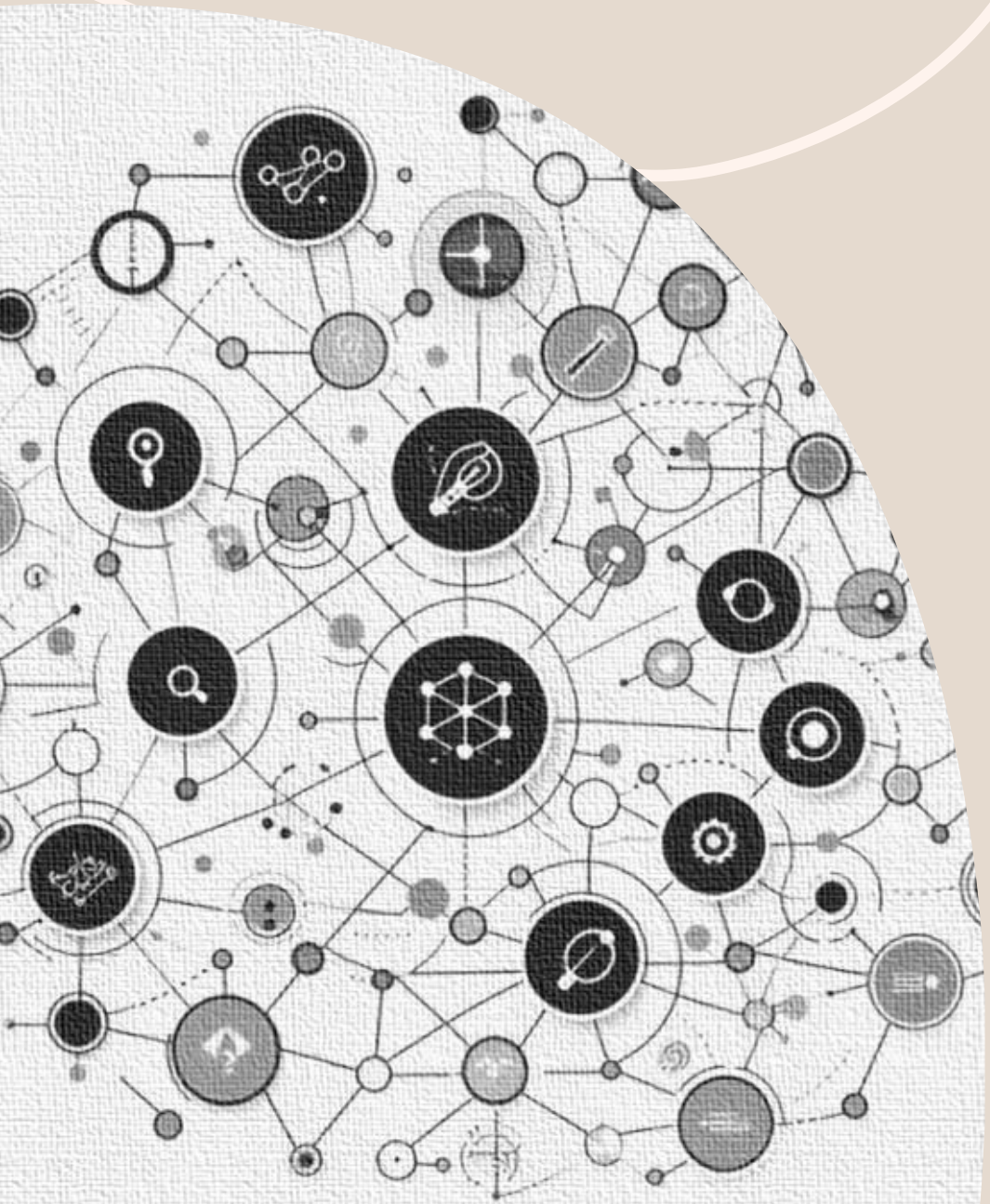
- Low-calorie
- Low carbohydrate
- Dietary Approaches to Stop Hypertension (DASH)
- Mediterranean diets

Mediterranean Diet

- Vegetables, fruits and whole grains
- Fish, poultry, beans and nuts
- Olive oil
- Limits red meat and added sugar
- Moderate portions of dairy products

DASH diet

- Vegetables, fruits and whole grains
- Fat-free or low-fat dairy products
- Fish, poultry, beans and nuts
- Limits added sugar and saturated fat
- Limits sodium, increases potassium, calcium and magnesium



Methods

Eligibility Criteria

- RCTs including women with diagnosed PCOS

- Excluded studies if patients performed exercise alongside their diet or were given dietary supplements

Measured Outcomes

- **Anthropometric changes:** BMI, weight

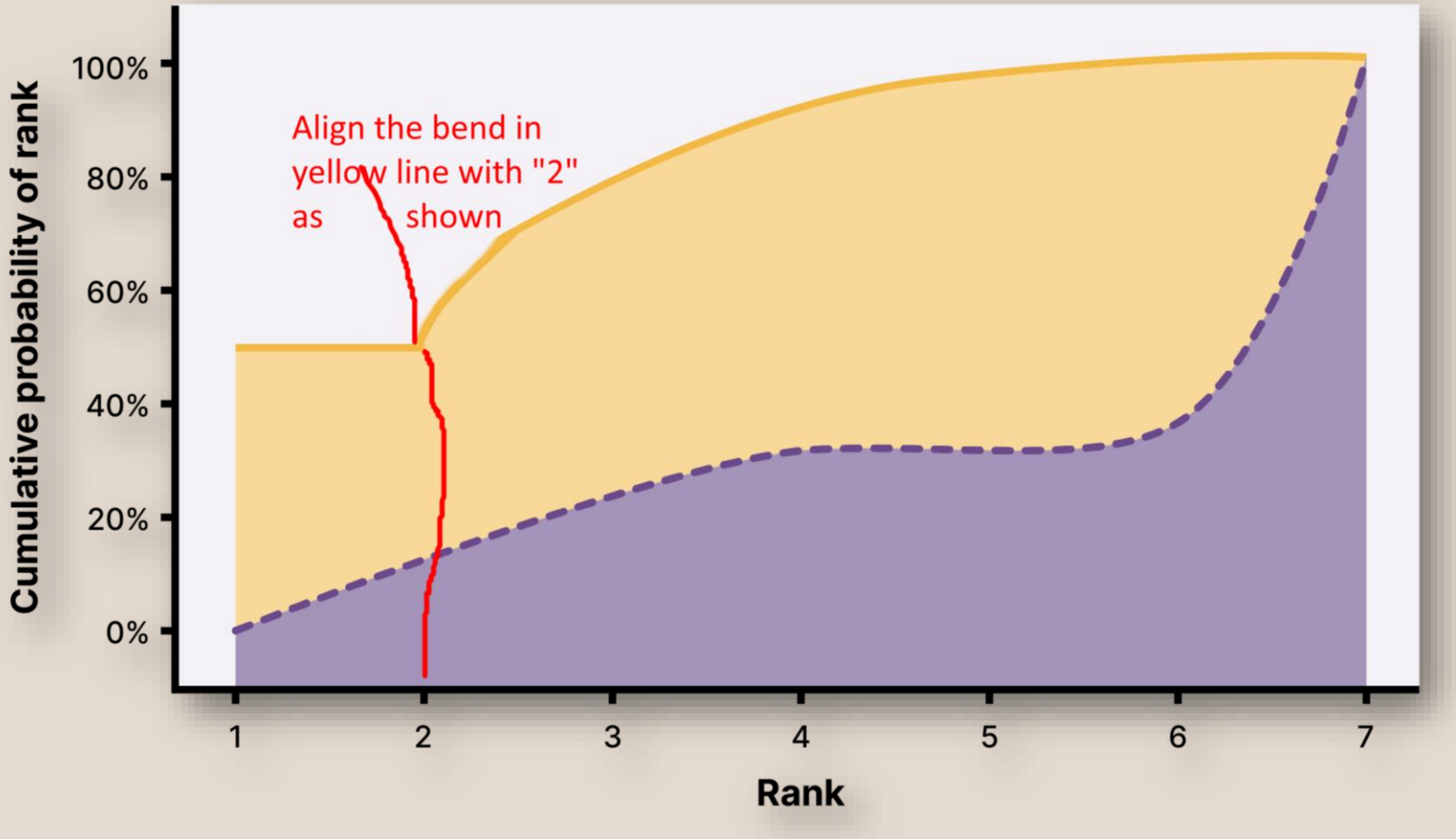
- **Hormonal changes:** total testosterone (TT), follicle-stimulating hormone (FSH), luteinizing hormone (LH)

- **Metabolic:** fasting blood glucose (FBG), fasting insulin (FI), Homeostatic Model Assessment of Insulin Resistance (HOMA-IR), total cholesterol (TC), TG, HDL, and LDL

Statistical Analysis

- The researchers conducted a **Network Meta-Analysis**
- This allows for **both direct and indirect comparisons** across multiple interventions, even if some were never compared in the same study.
- This method ranks treatments **based on their effectiveness** in improving PCOS symptoms.
- **Surface Under the Cumulative Ranking Curve (SUCRA):** How likely a treatment is to be the best option; shown in %

Cumulative Ranking Curve



Results

Anthropometric measures

- BMI
  - 11 studies, 8 interventions, and 428 patients
  - Low-calorie diet (SUCRA 73.58%) as the most effective
  - No statistically significant difference in pairwise comparisons of the interventions.

Dietary approaches		Anthropometric measurements	
		BMI	Weight
DASH	SUCRA %	57.1	53.3[2]
High-P		29.6	17.9
Low-calorie		**73.6**	69.9
Low-carb		–	–
Low-fat		60.1	60.6
Low-GI		36.6	35.3
Low-P		–	–
Mediterranean		65.6	–
Low-calorie + M		–	**74.4**
Metformin		38.5	–
Normal		38.8	35.8

Anthropometric measures

- Weight
  - 12 studies. 7 interventions, and 418 patients
  - The low-calorie diet with metformin (SUCRA 73.7%) ranked as the most effective intervention
  - A statistically significant difference in the comparisons bellow:
    - Low-fat VS low-GI
    - DASH VS high-protein diet
    - DASH VS normal diet

Dietary approaches		Anthropometric measurements	
		BMI	Weight
DASH	SUCRA %	57.1	53.3[2]
High-P		29.6	17.9
Low-calorie		**73.6**	69.9
Low-carb		–	–
Low-fat		60.1	60.6
Low-GI		36.6	35.3
Low-P		–	–
Mediterranean		65.6	–
Low-calorie + M		–	**74.4**
Metformin		38.5	–
Normal		38.8	35.8

Glycemic Factors

- HOMA-IR
  - 7 studies and interventions with 286 patients
  - DASH diet (SUCRA 80.47%) as the most effective intervention
  - Statistically significant difference between DASH and the normal diet
- FBG
  - 11 studies, 9 interventions, and 372 patients
  - DASH diet (SUCRA 76.6%) as the most effective dietary intervention
  - No statistically significant difference between the interventions

Dietary approaches		Glycemic factors		
		HOMA-IR	FBG	FI
DASH	SUCRA %	**80.4**[2]	**76.6**	**79.7**
High-P		–	50.0	39.3
Low-calorie		59.1	20.1	67.5
Low-carb		50.7	73.4	52.9
Low-fat			51.1	61.2
Low-GI		32.6	40.4	34.8
Low-P		–	–	16.0
Mediterranean		–	–	–
Low-calorie + M		59.6	31.4	64.5
Metformin		30.9	54.5	37.9
Normal		36.6	52.5	46.1

Glycemic Factors

- FI
  - 10 studies and interventions with 376 patients
  - DASH diet (SUCRA 79.73%) as the most effective intervention
  - No statistically significant difference between the interventions

Dietary approaches		Glycemic factors		
		HOMA-IR	FBG	FI
DASH	SUCRA %	**80.4**[2]	**76.6**	**79.7**
High-P		–	50.0	39.3
Low-calorie		59.1	20.1	67.5
Low-carb		50.7	73.4	52.9
Low-fat			51.1	61.2
Low-GI		32.6	40.4	34.8
Low-P		–	–	16.0
Mediterranean		–	–	–
Low-calorie + M		59.6	31.4	64.5
Metformin		30.9	54.5	37.9
Normal		36.6	52.5	46.1

Lipid Factors

- LDL and HDL
  - 8 studies, 6 interventions, and 276 patients
  - Metformin (SUCRA 78.08%) as the most effective intervention regarding LDL levels
  - Normal diet (SUCRA 65.69%) as the most effective intervention regarding HDL levels
  - No statistically significant difference with the pairwise comparisons of the included interventions

Dietary approaches		Lipid factors			
		TC	TG	HDL	LDL
DASH	SUCRA %	61.8	**82.1**	61.8	44.4
High-P		43.9	53.6	23.6	54.9
Low-calorie		51.8	38.7	56.8	41.5
Low-carb		**69.7**	46.7	55.2	22.5
Low-fat		52.5	43.6	–	–
Low-GI		53.8	64.1	–	–
Low-P		–	–	–	–
Mediterranean		–	–	–	–
Low-calorie + M		–	–	–	–
Metformin		23.7	28.5	36.6	**78.1**
Normal		42.6	42.6	**65.7**	58.4

Lipid Factors

- TG
  - 8 studies and interventions with 261 patients
  - DASH diet (SUCRA 82.07%) was the most effective intervention
  - No statistically significant difference between the interventions
- Total Cholesterol
  - 10 studies, 8 interventions, 306 patients
  - Low-carb diet (SUCRA 69.68%) as the most effective intervention
  - No statistically significant difference between the interventions

Dietary approaches		Lipid factors			
		TC	TG	HDL	LDL
DASH	SUCRA %	61.8	**82.1**	61.8	44.4
High-P		43.9	53.6	23.6	54.9
Low-calorie		51.8	38.7	56.8	41.5
Low-carb		**69.7**	46.7	55.2	22.5
Low-fat		52.5	43.6	–	–
Low-GI		53.8	64.1	–	–
Low-P		–	–	–	–
Mediterranean		–	–	–	–
Low-calorie + M		–	–	–	–
Metformin		23.7	28.5	36.6	**78.1**
Normal		42.6	42.6	**65.7**	58.4

Hormonal Parameters

- Total Testosterone
  - 10 studies, 8 interventions, and 359 patients
  - Metformin (SUCRA 71.28%) ranked as the most effective
  - No significant statistical difference between the interventions
- LH and FSH
  - No significant differences in FSH and LH values after the treatment in most studies
  - No significant differences between the intervention and control groups.

Dietary approaches		**Hormonal parameters TT**
DASH	SUCRA %	54.5
High-P		18.4
Low-calorie		61.9
Low-carb		67.4
Low-fat		51.4
Low-GI		44.8
Low-P		–
Mediterranean		–
Low-calorie + M		–
Metformin		**71.2**
Normal		30.1

Overall Ranking

Dietary approaches		Anthropometric measurements		Glycemic factors			Lipid factors				Hormonal parameters	Summary ranking
		BMI	Weight	HOMA-IR	FBG	FI	TC	TG	HDL	LDL	TT	All outcomes combined
DASH	SUCRA %	57.1	53.3[2]	**80.4**[2]	**76.6**	**79.7**	61.8	**82.1**	61.8	44.4	54.5	64.8
High-P		29.6	17.9	–	50.0	39.3	43.9	53.6	23.6	54.9	18.4	36.8
Low-calorie		**73.6**	69.9	59.1	20.1	67.5	51.8	38.7	56.8	41.5	61.9	54.1
Low-carb		–	–	50.7	73.4	52.9	**69.7**	46.7	55.2	22.5	67.4	54.8
Low-fat		60.1	60.6		51.1	61.2	52.5	43.6	–	–	51.4	54.4
Low-GI		36.6	35.3	32.6	40.4	34.8	53.8	64.1	–	–	44.8	42.8
Low-P		–	–	–	–	16.0	–	–	–	–	–	16.0
Mediterranean		65.6	–	–	–	–	–	–	–	–	–	65.6
Low-calorie + M		–	**74.4**	59.6	31.4	64.5	–	–	–	–	–	57.5
Metformin		38.5	–	30.9	54.5	37.9	23.7	28.5	36.6	**78.1**	**71.2**	44.4
Normal		38.8	35.8	36.6	52.5	46.1	42.6	42.6	**65.7**	58.4	30.1	44.9

Implications and Considerations

The DASH Diet

- A statistically significant, superior effect on reducing **HOMA-IR** and **weight** compared to the control normal diet
- HOMA-IR as a more reliable indicator of insulin resistance
- Increase **in β-cell function**, decrease in **high glucose** and **HbA1c** levels, and improvement in **insulin sensitivity**
- Effective in treating several diseases aside from hypertension

The Calorie-Restricted Diet

- An effective option for losing weight
- Decreased fat mass and preserved lean body mass
- Abdominal fat has a strong association with insulin resistance, hyperandrogenism, and PCOS

The Mediterranean Diet

- An effective dietary intervention for reducing BMI

- Only one trial evaluated the effects of the Mediterranean diet

For Patients with Insulin Resistance

- Diets preferred in which the ratio of macronutrients is the same as that of normal dietary recommendations:
    - High protein diet (SUCRA 36.8%), Normal diet (SUCRA 44.93%), DASH diet (SUCRA 64.78%)

- Changing the ratio of macronutrients (for example low-carbohydrate diet, low-fat diet) did not achieve a statistically significant difference compared to other dietary interventions.

Limitations

- Small number of direct comparisons
- Low number of patients participating in the trials
- Different durations of the interventions

Limitations

- PCOS may present differently in different ethnicities and populations
- No mention of the specific PCOS phenotype of the patients
- DASH diet can be difficult to implement in some countries

AI Assistance Disclosure

This presentation was developed with the assistance of ChatGPT (OpenAI) for:

- Search Strategy Refinement
- Statistical Interpretation
- Visual and Placeholder Suggestions
- PowerPoint Troubleshooting and Help

thank you