

The Ketogenic diet for Epilepsy: A practical application





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Learning Objectives

 By the end of this presentation you will be able to:

 Understand the process of planning the KD diet including

 The selection criteria for choosing a specific KD version

 The dietetic and anthropometric assessment

 Education of carers

 The basic steps to calculate the diet (Classical and MCT)

 The meal plan construction

 Understand the steps in initiating, monitoring and stopping the KD

The Ketogenic diet and their variants

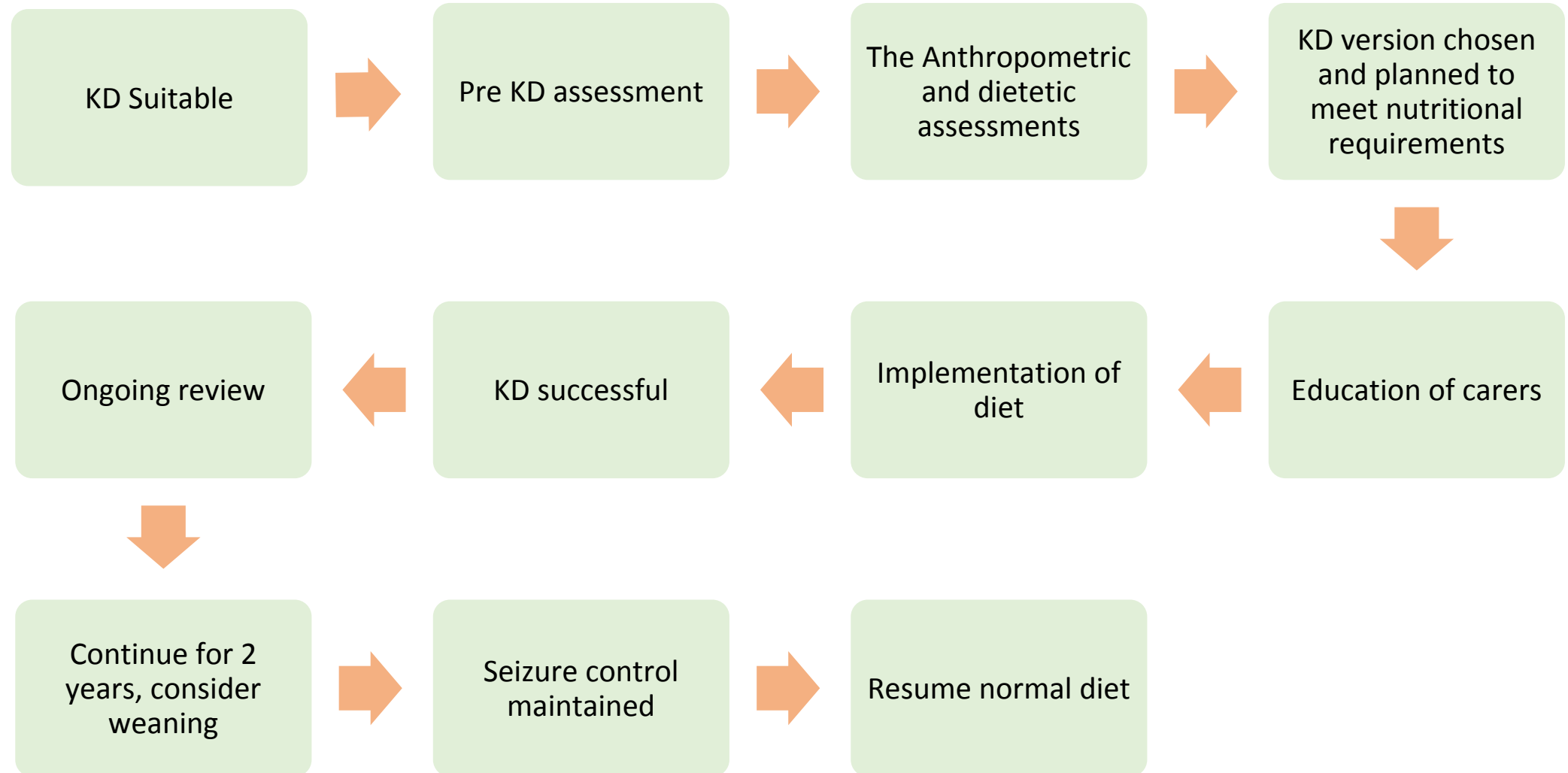
Classical

Medium
Chain
Triglyceride

Low
Glycaemic
Index

Modified
Atkins

The Process



Pre KD Assessment

- Discussion with carer
- Assessment and management of pre-existing clinical issues
 - Gastrointestinal disorders
 - Feeding problems –both physical and behavioural
 - Constipation
 - Nutritional deficiency
 - Poor fluid intake
 - Food allergies/intolerances
 - Feeding route
- Education for all carers (family/teachers etc.)
- Trial for 3 month (Kossoff et al 2008) (Kossoff et al 2018)

Anthropometric assessment

Children and adolescents

- Weight
- Height
- Head circumference
- BMI
- Growth chart

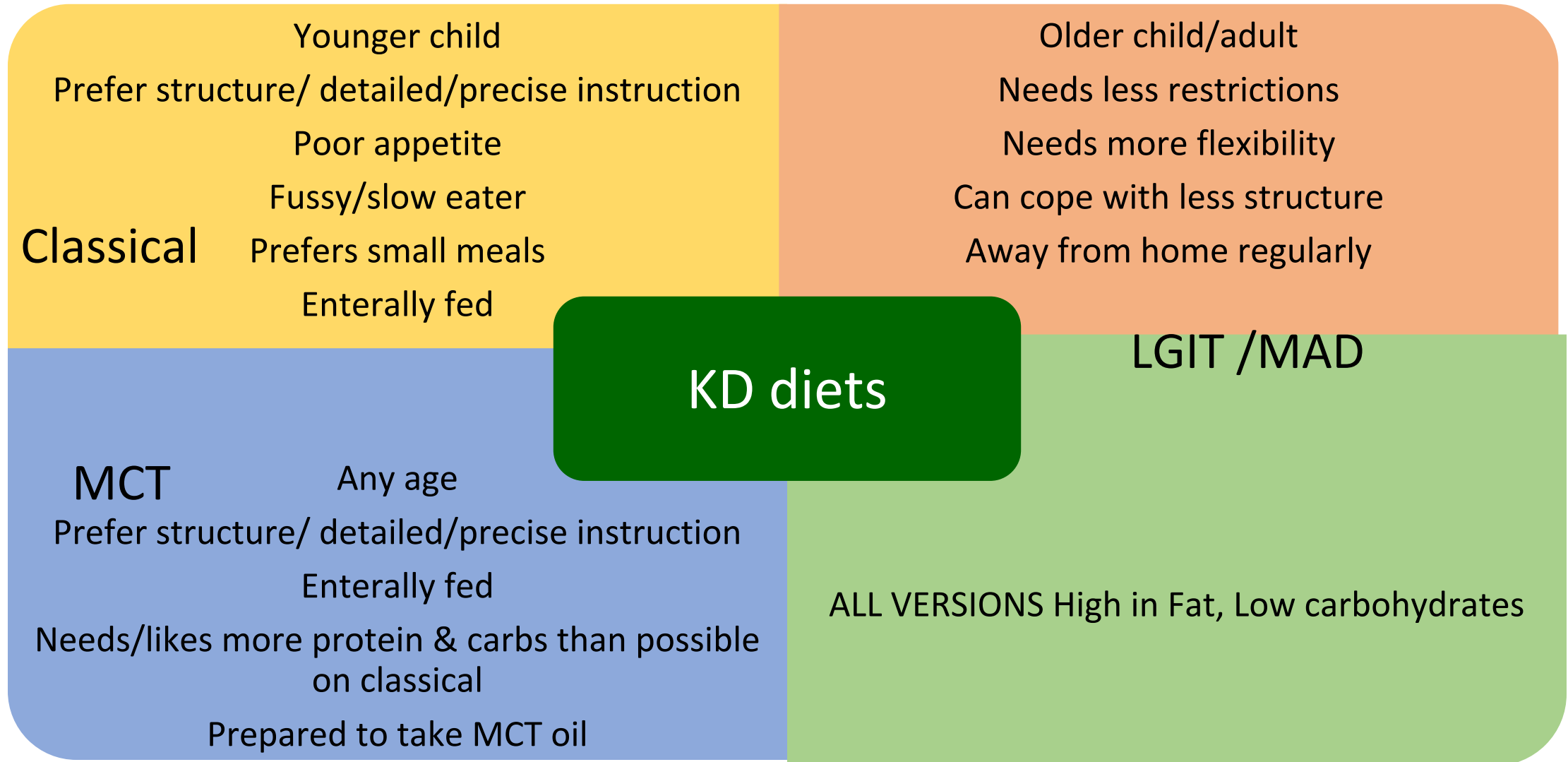
Adults

- Weight
- Height
- BMI

Dietetic assessment

- 3-4 day diet diary
- Verbal diet history
- Food frequency questionnaire
- Consider:
 - Age of child
 - What do they eat
 - Are there are food fads/allergies
 - Who prepares food
 - Are packed lunches needed
 - Any financial considerations
 - Does the family understand the diet rigidity?

Choosing the KD version of the diet



Basic steps to calculating the diet

- Calorie needs (used Scholfield equation):
- Protein needs : Traditionally 1g protein per kg of actual body weight used ..up to 1.5g
(rapid growth periods) (WHO Technical Report Series, 2007)
- Fluid needs : Holliday-Seger Method, Weight 10-20kg : 1000ml (for first 10kg) + 50ml/kg for 10-20kg
- Ketogenic ratio : CKD and MCT diet
- Calculate diet

Fluids to maintenance level

- 1-10 kg 100ml/kg
- 11-20 kg 1000ml + 50ml for each kg >10kg
- > 20 kg 1500ml 20ml/kg thereafter
- Usually need 85-100% maintenance; high fluid intake can dilute ketone detection

(Holiday et al 1957)

The Ketogenic Ratio

- Ratio of Macronutrients

Grams of fat: grams of protein + carbohydrate

- Typically ranges from 2:1 –4:1

Calculating the diet

- Decide on ratio
- Calculate the dietary unit calories
- Calculate the percentage calories from fat for each ratio

RATIO	Fat calories	Carb and Protein calories	Calories per dietary unit	Percentage calories of fat
2:1	$2\text{g} \times 9\text{kcal/g} = 18$	$1\text{g} \times 4\text{kcal/g} = 4$	$18 + 4 = 22\text{kcal}$	82%
3:1	$3\text{g} \times 9\text{kcal/g} = 27$	$1\text{g} \times 4\text{kcal/g} = 4$	$27 + 4 = 31\text{kcal}$	87%
4:1	$4\text{g} \times 9\text{kcal/g} = 36$	$1\text{g} \times 4\text{kcal/g} = 4$	$36 + 4 = 40\text{kcal}$	90%

(Kossoff et al 2016)
(Lambert et al, 2018)

Diet Calculations using an example

- 18 month old male
- Weight 13.3kg
- Energy 1100kcal
- Protein (1.5g/kg) = 20g
- He is started on a 3:1 ratio
- Ratio of 3:1 (means 87%fat and 13% from protein + CHO)
- Fat 106.3g
- Protein is 20g (= 7.3% of total calories)
- Therefore CHO is 5.7% =62.7kcal of CHO = 15.7g

Construct the meal plan

- Decide on number of meals and snacks
- Divide the energy content evenly throughout the day
- Keep same energy value at each meal then can interchange them

Meal Plan Construction

- Provide meal/snack ideas/recipes
- Each meal must retain ratio
- KetoDiet Calculator

www.ketodietcalculator.org/ketoweb/KetoStart

- EKM

www.matthewsfriends.org

- Use of food composition tables

Diet Prescription

	Calories	Fat	Protein	Carbohydrate
Daily	1100kcal	106.3g	20g	15.7g
Per Meal 3 meals per day	367kcal	35.4g	6.6g	5.2g

Supplements			
Multivitamin/minerals			
Vitamin D	RDA		
Calcium	RDA		

MEAL	MEAL ITEMS	Calories	Fat	Protein	Net Carbohydrates *
Breakfast	1 egg 45mls whipping cream 27g blueberries 21g Butter		4.24 13.9 0 17	5.03 0.89 0.2 0.18	0.45 1.25 3.26 0
		361kcal	35.14g	6.3g	4.96g
Lunch	45mls whipping cream 93g cherry tomatoes 20g Ham 26g mayonnaise		13.9 0.31 1.67 20	0.89 0.81 3.8 0.23	1.25 3.3 0.71 0.78
		370kcal	35.88g	5.73g	6.04g
Dinner	45mls whipping cream 40g Broccoli 16g Cooked cod 40g strawberries 26g Butter		13.9 0.16 0.13 0.12 21.09	0.98 0.95 3.65 0.27 0.22	1.33 1.55 0 2.27 0.02
		363.5kcal	35.40g	6.07g	5.17g

Supplementation

- **Universal recommendations:**
 - Multivitamin with minerals (and trace elements)
 - Calcium with vitamin D
- **Optional extra supplementations:**
 - Oral citrates (Polycitra K)
 - Laxatives: Movicol, mineral oil, glycerine suppository
 - Additional selenium, magnesium, zinc, phosphorus, vitamin D
 - Carnitine
 - MCT oil or coconut oil (source of MCT)
 - Salt (sodium to add to modular formulas if used for > age 1 year)
- All supplements listed should be provided as **carbohydrate free preparations** whenever possible.

Parent/Carer/Patient Education

- Overview of what the KD diet is
- How to weigh foods accurately
- Following the meal plan
- Importance of hydration
- Supplements
- Food shopping/meal preparation/reading food labels/eating away from home
- Sick day guidelines
- Using the ketogenic calculator

Initiation protocol

- 24 hr fast until large ketones present in urine

Day	Calories	Ratio
Day 1	1/3 calories	3:1
Day 2	2/3 calories	3:1
Day 3	Full strength diet	3:1

Monitoring in Hospital

- Blood glucose
- Acidosis
- Ketosis

Ongoing Monitoring and Follow up

- Medications are continued
 - Constant calculations –BE VERY PRECISE
 - Check Adherence
 - Fluid intake
 - Supplementations
 - Ketone levels
 - Manage side effects (constipation, raised lipids, poor growth etc)
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- Anthropometry
 - Any Nutritional requirement changes?
 - Any feeding problems
 - Changes in mobility

How long do they need to stay on diet?

- Trial of 3 months (Kossof et al 2008) (Kossoff et al 2018)
- No improvement: withdraw over Days/weeks
- If successful: Continue for 2 years or until seizure free without med for 1 yr (no formal studies of when/how to withdraw)
 - 4:1 for 6 months
 - 3:1 for 6 months

Discontinuing the diet

- Option 1: Gradually reducing the ketogenic ratio by 0.25, 0.5 or 1 at an agreed rate, e.g. daily, weekly or monthly, depending on individual seizure response and/or ketone levels,
- Option 2: Gradually swapping over ketogenic meals and snacks for regular ones over an agreed time period, e.g. daily

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