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DFM 484

Case Study 23: Type 2 Diabetes Mellitus

**1. What is the difference between type 1 diabetes mellitus and type 2 diabetes mellitus?**

Type 1 diabetes mellitus is an autoimmune disease where the body does not produce insulin since the beta cells in the pancreas have been destroyed. This results in blood sugar levels getting very high. Insulin injections are the treatment. Type 2 diabetes mellitus is typically related to life-style, usually occurring with co-morbidities such as obesity or heart disease. Type 2 occurs when the body becomes insulin resistant. The body produces a lot of insulin to compensate, but the cells do not respond. Medication is needed in this instance, not insulin injections, however some type 2 diabetic patients may need insulin treatment later in life.

**2. How would you clinically distinguish between type 1 and type 2 diabetes mellitus?**

One would clinically distinguish between diabetes mellitus type 1 and 2 by looking at autoantibody counts. Since type 1 diabetes is an autoimmune disease, circulatory islet cell antibodies will be present in these patients, but not type 2 patients.

**3. What risk factors for the development of type 2 diabetes mellitus does Mrs. Douglas present with?**

Mrs. Douglas is obese, has a sister with type 2 diabetes, is African American, has a sedentary lifestyle, and is elderly. All of these factors are risks for the development of type 2 diabetes.

**4. What are the common complications associated with diabetes mellitus? Describe the pathophysiology associated with these complications, specifically addressing the role of chronic hyperglycemia.**

Diabetes can cause hypertension. This is due to the hyperlipidemia present with diabetics, and excess lipid levels tend to cause atherosclerosis (hardening of the arteries) which lead to high blood pressure (hypertension). Diabetes can also cause nerve damage (neuropathy), because high blood glucose (hyperglycemia) causes hyperosmolarity of the blood, which will damage nerves. This damage can cause tingling in the extremities, kidney damage, and difficulty with wound healing due to an inability to sense a wound. Additionally, retinopathy can occur, causing blurred vision due to damage of the blood vessels of the retina.

**5. Does Mrs. Douglas present with any complications of type 2 diabetes mellitus? If yes, which ones?**

Mrs. Douglas does present some complications with diabetes. She has numbness/tingling in her feet, hypertension, frequent bladder infections, blurry vision, and an unhealed wound on her foot.

**6. Identify at least 4 features of the physician's physical examination as well as her presenting signs and symptoms that are consistent with her admitting diagnosis. Describe the pathophysiology that might be responsible for each physical finding.**

<b>Physical Finding</b>	<b>Physiological Change/Etiology</b>
Blood glucose 326 mg/dL	Type 2 diabetes occurs when cells are unresponsive to insulin. If insulin is unable

	to work properly, counterregulatory hormones stimulate gluconeogenesis to produce more glucose, thus blood glucose levels will rise.
HTN	High blood glucose (hyperglycemia) will damage endothelial cells, which line blood vessels. This damage creates plaques and inflammation, which constricts the vessels and increases blood pressure.
Numbness in feet	Hyperglycemia can cause nerve damage, which leads to lack of sensation. Abnormal sorbitol and glycated proteins (as evident by HbA1c) lead to this cell damage, causing insufficient circulation.
2-3cm ulcer on lateral left foot	High blood glucose levels can cause numbness so cuts on feet may go unnoticed. After getting a cut, the hyperglycemia can cause hypertension, which inhibits white blood cells from moving quickly to an area of infection.
Retinopathy	Hyperosmolarity can damage the blood vessels in the retina, causing blurred vision.
Dry mucous membranes	Dehydration can cause dry mucous membranes. Hyperglycemia can cause dehydration due to high concentrations of blood glucose leading to hyperosmolarity. This risk is increased in the elderly due to their decreased thirst recognition.

**7. Prior to admission, Mrs. Douglas had not been diagnosed with diabetes mellitus. How could she present with complications?**

Type 2 diabetes can go undiagnosed for a long time. Often, by the time diagnosis is made, many complications can already be present from years of development without intervention.

**12. Calculate Mrs. Douglas's BMI.**

$$5' = 60 \text{ in} = 150\text{cm} = 1.5\text{m}$$

$$155 \text{ lb} = 70.5\text{kg}$$

$$70.5\text{kg}/(1.5\text{m})^2 = 31 \text{ BMI}$$

**13. What are the health implications for a BMI in this range?**

A BMI of 30 or higher indicates obesity. People who are obese are at higher risk for developing heart disease and diabetes.

**14. Calculate Mrs. Douglas's energy needs using the Harris-Benedict equation. What is the appropriate weight to use in this calculation?**

$$\text{R.E.E.} = 655.1 + (9.563 \times 45.5\text{kg}) + (1.850 \times 150\text{cm}) - (4.676 \times 71\text{age}) = 1,036 \text{ kcals}$$

1,036 kcals x stress factor 1.4 = 1,450 kcals/day = TEE

The weight used in this equation is Mrs. Douglas's ideal body weight. Since she is obese and adipose tissue is relatively metabolically inactive, her ideal body weight is more of an indicator of her true calorie needs.

**15. Calculate Mrs. Douglas's protein needs.**

1.2g/kg x 45.5kg = 54.6 g protein needed per day.

**16. Is the diet order of 1,200 kcal appropriate?**

This diet order is not appropriate. Based on the patients calculated energy needs, she needs 1,450 calories per day to address her resting energy needs plus her needs for wound healing and mobility.

**19. Calculate the kcalories, protein, fat, and CHO content of Mrs. Douglas's diet.**

Food Item	Energy (kcal)	Protein (grams)	CHO (grams)	Fat (grams)
One egg fried in bacon fat	136	9.2	.5	10.4
2 strips of bacon	92	6.3	.2	7.1
1 C black coffee	0	0	0	0
½ C unsweetened orange juice	118	0	29.6	0
2 slices enriched white bread	160	6	28	2
1 oz bologna	96	3	1.5	8.6
1 oz American cheese	105	6.2	.4	8.8
Mustard	3	.2	.3	.2
8 oz unsweetened iced tea	0	0	0	0
1 C turnip greens seasoned with 1 oz fatback, salt, and peper	182	11.1	6.7	12.1
2 small boiled new potatoes with salt and pepper	200	2	28	9
2 inch square cornbread with tsp butter	154	2	22	6.8
¾ C great northern beans	157	11.1	28	.6

<b>1 oz ham</b>	30	5.1	1	.51
<b>Black coffee</b>	0	0	0	0
<b>2 vanilla wafers</b>	35	.3	5.5	1.3
<b>TOTAL</b>	1,468	62.5	151.7	67.41

\*nutrient information based off of CalorieKing.com data.

**20. How would you compare Mrs. Douglas’s “usual” dietary intake to her current nutrition needs?**

Mrs. Douglas is overconsuming protein and fat. Her overall kcalorie intake, though, is roughly similar to her current needs. However, the sources of her kcalories are nutrient-poor choices. Additionally, her CHO distribution is uneven throughout the day.

**22. Identify two lab values that should be monitored regularly.**

Blood glucose should be monitored multiple times per week, if not daily during the beginning stages of her adjustment to lifestyle changes and diabetic maintenance. HbA1c values should be monitored every three months to assess long-term changes in blood glucose levels.

**30. Select two high-priority nutrition problems and complete the PES statement for each.**

1. Overweight/obesity related to food and nutrition knowledge deficit as evidenced by weight of 70kg for 60” height, BMI of 31, LDL 140mg/dL, overall cholesterol of 300 mg/dL, and stated food record high in simple CHO and saturated fats.

2. Inconsistent carbohydrate intake related to food and nutrition related knowledge deficit as evidenced by patient’s food record with 30.1 grams CHO consumed in the morning, 30.2 grams CHO consumed in the afternoon, and 91.2 grams CHO consumed in the evening.

**31. What was the most important nutritional concern when the patient was originally admitted to the hospital (time of Dx)?**

The most important nutritional concern was abnormally high blood glucose levels related to obesity.

**33. For each of the PES statements, establish an ideal goal (based on the signs and symptoms) and an appropriate intervention (based on the etiology).**

**PES 1: Ideal goal:** Lower cholesterol to 120-199 mg/dL and lower body weight to 85% CBW in 6 months (1 pound loss per week for six months)

**Intervention:** Train patient to make healthy meal plans based on complex CHO, varied protein, and healthy fats; educate the importance of regular physical activity; educate nutrition needs for diabetic patients.

**PES 2: Ideal goal:** Patient will consume consistent CHO throughout the day: 45-60 grams per meal

**Intervention:** Train patient to count grams of CHO in meals, to monitor diet, and to check blood sugar; educate patient on the importance of physical activity in relation to diabetes maintenance and weight loss; educate patient on healthy food choices, meal planning, and self-monitoring techniques.