Diabetes Mellitus Case Study

Medical Nutrition Therapy

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

Type 1 Diabetes mellitus is characterized by pancreatic beta cell destruction normally leading to “absolute” insulin deficiency. Type 2 diabetes Mellitus is characterized by “relative” insulin deficiency as a result of insulin resistance or defiant insulin secretion.

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

Type 1 Diabetes is normally genetically or environmentally linked and usually is an immune response. The body will not produce insulin. Type 2 Diabetes is usually linked to a patient being overweight or obese and being physically inactive. Their body is producing insulin but the insulin receptors are not working.

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

The risk factors for obesity are being overweight or obese, inactive, family history, and history of gestational diabetes. Mrs. Douglas presented with blurred vision, a cut on her heal that has not healed in months, she is obese with a BMI of 30.3, she is of African American descent, and her sister also has 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.**

Common complications with diabetes are hypoglycemia, hyperglycemia, retinopathy, nephropathy, peripheral polyneuropathy, and macrovascular disease (atherosclerosis). Hyperglycemia is when a person experiences high blood sugar and it can lead to polyuria, polydypsia, dry mouth, weight loss and can lead to diabetic ketoacidosis which leads to a coma and the person’s blood glucose is over 250 mg/dl.

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

Yes, Mrs. Douglas presented with early stages of retinopathy (blurred vision), neuropathy (tingling and numbness in the feet), and blood glucose levels of 325 mg/dL.

6. **Identify at least four 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.**

<table>
<thead>
<tr>
<th>Physical Finding</th>
<th>Physiological Change/Etiology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unhealed wound on her foot</td>
<td>Hyperglycemia can compromise the immune system and slow healing processes.</td>
</tr>
<tr>
<td>Retinopathy</td>
<td>Blood vessels begin to weaken due to hyperglycemia.</td>
</tr>
<tr>
<td>------------</td>
<td>--------------------------------------------------</td>
</tr>
<tr>
<td>BG level 325 mg/dL</td>
<td>Insulin resistance</td>
</tr>
<tr>
<td>Numbness and tingling in feet</td>
<td>Hyperglycemia compromises blood circulation</td>
</tr>
</tbody>
</table>

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

Mrs. Douglas most likely is unaware of the signs and symptoms of Diabetes Mellitus so she may have never thought to go to the doctor to be assessed.

8. Briefly describe hyperglycemic hyperosmolar nonketotic syndrome (HHNS). How is this syndrome different than ketoacidosis?

Hyperglycemic hyperosmolar nonketotic syndrome is being hyperglycemic without entering a phase of ketosis. Hyperosmolarity causes a shift of water in the cells to be moved into the blood. This is different from ketoacidosis because there are not ketones present in the blood with HHNS.

9. What are the symptoms of HHNS?

Symptoms of HHNS are normally a fasting blood glucose level of 600-3000 mg/ml of blood, dehydration and polyuria.

10. What factors may lead to HHNS? Is Mrs. Douglas at risk?

Factors that may lead to HHNS are undiagnosed diabetes, serious infection, burns, and pancreatic disorders that interfere with the production of insulin. Yes, Mrs. Douglas is at risk of HHNS because she had not been diagnosed with diabetes and her blood sugar is very high.

11. What is the immediate aim of treatment for HHNS? If HHNS is not treated, how would you expect the condition of HHNS to progress?

HHNS is treated by injections of insulin and fluids to aide with dehydration. If HHNS is not treated, the person may enter into a coma which can lead to death.

12. Calculate Mrs. Douglas’s body mass index (BMI).

\[ \begin{align*}
5'0" &= 60 \text{ inches} \\
&= 2.54 \text{ cm} = 152.4 \text{ cm} = 1.524 \text{ m} \\
155 \text{ lbs} &= 2.2 \text{ kg} = 70.45 \text{ kg} \\
70.45 / 2.32 &= 30.37 \\
\text{BMI} &= 30.4
\end{align*} \]

13. What are the health implications for a BMI in this range?
A BMI over 30 means that Mrs. Douglas is obese. Health implications to having a BMI this high are increased risk for Type 2 Diabetes, increased risk for cardiovascular disease and an increased stress on all parts of the body.

14. Calculate Mrs. Douglas’s energy needs using the Mifflin-St. Jeor equation. Should Mrs. Douglas's weight be adjusted for obesity?

9.99*70.45kg+6.25*152.5cm-4.92*71-161=
703.8+953.13-349.32-161=1,146.61 kcal/day
Yes, Mrs. Douglas’s weight should be adjusted for obesity. A better way to calculate the energy needs for her would be to use ideal body weight instead of actual body weight.

15. Calculate Mrs. Douglas’s protein needs.

Her protein needs would be calculated by the wound healing equation 1.3*wt(kg)
1.3*70.45=90.56g/day

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

No, a diet of 1,200 kcal/d is not appropriate

17. If yes, explain why it is appropriate. If no, what would you recommend? Justify your answer.

I would recommend a diet that is a bit higher in Calories due to the fact that Mrs. Douglas is healing a wound and overcoming an infection. Also, she needs to take in more Calories in order for her to get the correct amount of protein every day.

18. Does Mrs. Douglas’s “usual” dietary intake meet the USDA Food Guide/MyPyramid guidelines? Is she deficient in any food groups? If so, which ones?

Mrs. Douglas’s usual intake does not follow the dietary guidelines. All of her meals seem to contain a lot of fat and sodium. She is also barely taking in any fruits and vegetables and she doesn’t eat whole grains.

19. Using a computer dietary analysis program or food composition table, calculate the kcalories, protein, fat, CHO, fiber, cholesterol, and Na content of Mrs. Douglas’s diet.

These are the numbers I got using MyPlate to assess Mrs. Douglas’s diet:

Kcal: 1,345
Pro: 45 g
Fat: 77 g
Saturated fat: 28g
CHO: 123 g
NA: 3,900 g
Fiber: 19 g
Cholesterol: 330 mg

20. How would you compare Mrs. Douglas “usual” dietary intake to her current nutritional needs?

Mrs. Douglas’s usual intake is not a huge amount of Calories, but the majority of them are high in fat and sodium. She should be eating more nutritionally dense foods with more protein, carbohydrate and fiber.

21. Compare the patient’s laboratory values that were out of range on admission with normal values. How would you interpret this patient’s labs? Make sure explanations are pertinent to this situation.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Normal Value</th>
<th>Patient’s Value</th>
<th>Reason for Abnormality</th>
<th>Nutritional Implications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glucose (mg/dL)</td>
<td>70-110</td>
<td>325</td>
<td>Insulin Resistance</td>
<td>Hypoglycemia, Restrict fat in diet, increase physical activity</td>
</tr>
<tr>
<td>HbA1c (%)</td>
<td>3.9 - 5.2</td>
<td>8.5</td>
<td>Constant hypoglycemia</td>
<td>Monitor blood glucose, increase physical activity, increase fruits and vegetables in diet</td>
</tr>
<tr>
<td>Cholesterol (mg/dL)</td>
<td>120 – 199</td>
<td>300</td>
<td>Obesity, high intake of fat in diet</td>
<td>Increase fiber, decrease saturated fat</td>
</tr>
<tr>
<td>LDL-cholesterol (mg/dL)</td>
<td>&lt; 130</td>
<td>140</td>
<td>Obesity, high intake of saturated fat, low fiber diet</td>
<td>Decrease saturated fat, increase fiber, increase physical activity</td>
</tr>
<tr>
<td>HDL-cholesterol (mg/dL)</td>
<td>&gt;55</td>
<td>35</td>
<td>Inadequate intake of fruits and vegetables, low intake of fiber, high fat diet</td>
<td>Weight loss, increase physical activity, increase intake of fruits, vegetables and whole grains</td>
</tr>
<tr>
<td>Triglycerides (mg/dL)</td>
<td>35 - 135</td>
<td>400</td>
<td>High fat diet with a lot of saturated fat, refined CHO</td>
<td>Increase physical activity, decrease refined CHO, weight loss</td>
</tr>
</tbody>
</table>
22. Identify two lab values that should be monitored regularly.

Glucose levels and cholesterol need to be monitored regularly.

23. Why wasn’t HbA1c measured at discharge?

HbA1c was not measured at discharge because this would have shown her blood glucose levels for the past 2-3 months, not her current HbA1c level.

24. Why is regular insulin used to correct hyperglycemia in patients with HHNS?

Regular insulin is used for patients with HHNS because it is fast acting and more effective in a situation where a person’s blood glucose needs to be adjusted quickly.

25. When HHNS is treated the initial target serum glucose level is typically set at the 250 mg/dL range instead of a normal blood glucose level. Why?

The glucose level would be set to 250 mg/dL because you don’t want to over treat and then have the patient become hypoglycemic. It is better to set their blood glucose higher and then monitor it every 15 minutes and give more insulin if it is needed.

26. Compare the pharmacologic differences among the oral hypoglycemic agents.

See Table on back page.

27. Avandia is often used to help control blood glucose levels. Describe the (medication) action of Avandia.

Avandia increases the body’s sensitivity to insulin.

28. The goal for healthy elderly patients with diabetes should be near normal, fasting plasma glucose levels without hypoglycemia. Although acceptable glucose control must be carefully individualized, the elderly tend to be predisposed to hypoglycemia. List five factors that predispose elderly patients to hypoglycemia.

5 factors that predispose elderly patients to hypoglycemia are poor nutrition intake, drug-nutrient interactions, dependence on nurses, isolation from people and noncompliance with medications.

29. Identify at least three factors that may interfere with Mrs. Douglas’s compliance and success with her diabetes treatment.
3 factors limiting Mrs. Douglas from success from her diabetes is that her sister has Diabetes and Mrs. Douglas is caring for her as well, she may not be able to exercise as much as she should due to her age, and she may have a hard time affording the foods she should be eating.

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

- Excessive fat intake related to diet as evidenced by obesity, and signs of Diabetes Type 2.
- Inadequate protein intake related to diet as evidenced by unhealed wound on foot.

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 her blood glucose level.

32. What additional information does the dietitian need to collect before he or she can mutually develop clinical and behavioral outcomes with the patient and health care team?

The dietitian needs to talk with all other doctors that have seen Mrs. Douglas to make sure there is a good line of communication on what they are going to do as a team to help Mrs. Douglas.

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

An ideal goal for both of my PES statements would be to educate Mrs. Douglas on how to eat nutritiously and teach her how to exercise so she can begin to lose weight and manage her diabetes.

34. Mrs. Douglas was d/c with instructions for a non-kilocaloric-restricted, low fat (less than or equal to 30% total kcal), high CHO (greater than or equal to 50% total kcal) diet, in combination with a walking program, and a prescription for captopril to control her HTN. Glucose levels were well controlled for 6 months, but she became unable to afford the necessary supplies to check her BG or urine acetone levels. After 6 months, she was readmitted with a BG of 905 mg/dL, a slight temperature, BP of 68/100 mmHg, tachycardia, and shallow, tachypneic breathing (Kussmal respirations). She was Dx with pneumonia, dehydration, and hyperglycemic hyperosmolar nonketonic syndrome (HHNS). What is the MNT for patients with HHNS?

To treat patients with HHNS insulin is given to the patient and they need to be rehydrated because they are dehydrated.