

SBCH322: UNIT 5

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Important notice

The questions and answers provided in this file are only for students' practice purposes. The intention of providing this information is purely to educate and make students aware of the correct way of answering the questions. All the sources used in the preparation of this material are properly cited at the end of this document. Students are requested not to regard this material as a reference, but as guidance on how to answer questions. However, ultimately the onus rests on the student to work hard and to read the books and other material on the topics listed in the module.

1. What is obesity?

Obesity is a condition where a person has accumulated so much body fat that it might have a negative effect on their health. If a person's bodyweight is at least 20% higher than it should be, he or she is considered obese. If your Body Mass Index (BMI) is between 25 and 29.9 you are considered overweight. If your BMI is 30 or over you are considered obese.

1.1. Factors responsible for obesity

The balance between calorie intake and energy expenditure determines a person's weight. If a person eats more calories than he or she burns (metabolizes), the person gains weight (the body will store the excess energy as fat). If a person eats fewer calories than he or she metabolizes, he or she will lose weight. Therefore, the most common causes of obesity are overeating and physical inactivity. Ultimately, body weight is the result of genetics, metabolism, environment, behavior, and culture.

- **Genetics:** A person is more likely to develop obesity if one or both parents are obese. Genetics also affect hormones involved in fat regulation. For example, one genetic cause of obesity is leptin deficiency. Leptin is a hormone produced in fat cells and in the placenta. Leptin controls weight by signaling the brain to eat less when body fat stores are too high. If, for some reason, the body cannot produce enough leptin or leptin cannot signal the brain to eat less, this control is lost, and obesity occurs. The role of leptin replacement as a treatment for obesity is under exploration.
- **Overeating:** Overeating leads to weight gain, especially if the diet is high in fat. Foods high in fat or sugar (for example, fast food, fried food, and sweets) have high energy density (foods that have a lot of calories in a small amount of food). Epidemiologic studies have shown that diets high in fat contribute to weight gain.
- **A diet high in simple carbohydrates:** The role of carbohydrates in weight gain is not clear. Carbohydrates increase blood glucose levels, which in turn stimulate insulin release by the pancreas, and insulin promotes the growth of fat tissue and can cause weight gain. Some scientists believe that simple carbohydrates (sugars, fructose, desserts, soft drinks, beer, wine, etc.) contribute to weight gain because they are more rapidly absorbed into the bloodstream than complex carbohydrates (pasta, brown rice, grains, vegetables, raw fruits, etc.) and thus cause a more pronounced insulin release after meals than complex carbohydrates. This higher insulin release, some scientists believe, contributes to weight gain.
- **Frequency of eating:** The relationship between frequency of eating (how often you eat) and weight is somewhat controversial. There are many reports of overweight people eating less often than people with normal weight. Scientists have observed that people who eat small meals four or five times daily, have lower cholesterol levels and lower

and/or more stable blood sugar levels than people who eat less frequently (two or three large meals daily). One possible explanation is that small frequent meals produce stable insulin levels, whereas large meals cause large spikes of insulin after meals.

- **Physical inactivity:** Sedentary people burn fewer calories than people who are active. The National Health and Nutrition Examination Survey (NHANES) showed strong correlations between physical inactivity and weight gain in both sexes.
- **Medications:** Medications associated with weight gain include certain antidepressants (medications used in treating depression), anticonvulsants (medications used in controlling seizures such as carbamazepine [Tegretol, Tegretol XR, Equetro, Carbatrol] and valproate [Depacon, Depakene]), some diabetes medications (medications used in lowering blood sugar such as insulin, sulfonylureas, and thiazolidinediones), certain hormones such as oral contraceptives, and most corticosteroids such as prednisone. Some high blood pressure medications and antihistamines cause weight gain. The reason for the weight gain with the medications differs for each medication. If this is a concern for you, you should discuss your medications with your physician rather than discontinuing the medication, as this could have serious effects.
- **Psychological factors:** For some people, emotions influence eating habits. Many people eat excessively in response to emotions such as boredom, sadness, stress, or anger. While most overweight people have no more psychological disturbances than normal weight people, about 30% of the people who seek treatment for serious weight problems have difficulties with binge eating.
- **Diseases:** Diseases such as hypothyroidism, insulin resistance, polycystic ovary syndrome, and Cushing's syndrome are also contributors to obesity. Some diseases, such as Prader-Willi syndrome, can lead to obesity.
- **Social issues:** There is a link between social issues and obesity. Lack of money to purchase healthy foods or lack of safe places to walk or exercise can increase the risk of obesity.
- **Ethnicity:** Ethnicity factors may influence the age of onset and the rapidity of weight gain. African-American women and Hispanic women tend to experience weight gain earlier in life than Caucasians and Asians, and age-adjusted obesity rates are higher in these groups. Non-Hispanic black men and Hispanic men have a higher obesity rate than non-Hispanic white men, but the difference in prevalence is significantly less than in women.
- **Childhood weight:** A person's weight during childhood, the teenage years, and early adulthood may also influence the development of adult obesity. For example,

- ✓ being mildly overweight in the early 20s was linked to a substantial incidence of obesity by age 35;
- ✓ being overweight during older childhood is highly predictive of adult obesity, especially if a parent is also obese;
- ✓ being overweight during the teenage years is even a greater predictor of adult obesity.

- **Hormones:** Women tend to gain weight especially during certain events such as pregnancy, menopause, and in some cases, with the use of oral contraceptives. However, with the availability of the lower-dose estrogen pills, weight gain has not been as great a risk.

1.2. Complications/risks of obesity

If you're obese, you're more likely to develop a number of potentially serious health problems, including:

- High triglycerides and low high-density lipoprotein (HDL) cholesterol
- Type 2 diabetes
- High blood pressure
- Metabolic syndrome — a combination of high blood sugar, high blood pressure, high triglycerides and low HDL cholesterol
- Heart disease
- Stroke
- Cancer, including cancer of the uterus, cervix, endometrium, ovaries, breast, colon, rectum, esophagus, liver, gallbladder, pancreas, kidney and prostate
- Breathing disorders, including sleep apnea, a potentially serious sleep disorder in which breathing repeatedly stops and starts
- Gallbladder disease
- Gynecological problems, such as infertility and irregular periods
- Erectile dysfunction and sexual health issues
- Nonalcoholic fatty liver disease, a condition in which fat builds up in the liver and can cause inflammation or scarring
- Osteoarthritis

1.3. What is the role of diet in the treatment of obesity?

One effective way to lose weight is to eat fewer calories. There is controversy in regard to carbohydrates (low carbohydrate diet) and weight loss. When carbohydrates are restricted, people often experience rapid initial weight loss within the first two weeks. This weight loss is due mainly to fluid loss. When carbohydrates are added back to the diet, weight gain often occurs, simply due to a regain of the fluid. Other diets such as low-fat diets all show a similar pattern of weight loss that is difficult to maintain if there are not additional general lifestyle changes.

General diet guidelines for achieving and (just as importantly) maintaining a healthy weight

- A safe and effective long-term weight reduction and maintenance diet has to contain balanced, nutritious foods to avoid vitamin deficiencies and other diseases of malnutrition.
- Eat more nutritious foods that have "low energy density." Low energy dense foods contain relatively few calories per unit weight (fewer calories in a large amount of food). Examples of low energy dense foods include vegetables, fruits, lean meat, fish, grains, and beans. For example, you can eat a large volume of celery or carrots without taking in many calories.
- Eat less "energy dense foods." Energy dense foods are high in fats and simple sugars. They generally have a high calorie value in a small amount of food. The United States government currently recommends that a healthy diet should have less than 30% fat. Fat contains twice as many calories per unit weight than protein or carbohydrates. Examples of high-energy dense foods include red meat, egg yolks, fried foods, high fat/sugar fast foods, sweets, pastries, butter, and high-fat salad dressings. Also cut down on foods that provide calories but very little nutrition, such as alcohol, non-diet soft drinks, and many packaged high-calorie snack foods.
- About 55% of calories in the diet should be from complex carbohydrates. Eat more complex carbohydrates such as brown rice, whole-grain bread, fruits, and vegetables. Avoid simple carbohydrates such as table sugars, sweets, doughnuts, cakes, and muffins. Cut down on non-diet soft drinks, these sugary soft drinks are loaded with simple carbohydrates and calories. Simple carbohydrates cause excessive insulin release by the pancreas, and insulin promotes growth of fat tissue.
- Educate yourself in reading food labels and estimating calories and serving sizes.
- Consult a doctor before starting any dietary changes. Your doctor or a nutritionist should prescribe the amount of daily calories in your diet.

1.4. Five possible remedies for tackling obesity in humans:

Drink lemon juice: Lemon juice improves digestion which is the first thing your body needs in order to burn fat and absorb nutrients. It aids detoxification and removes harmful toxins from the body thus boosting your metabolism. Drink the juice of lemon mixed with warm water and one table spoon of honey as the first thing in the morning.

Use olive oils: Olive oil is a much healthier substitute as it has more amounts of monosaturated fats which lower the LDL cholesterol and raise HDL cholesterol levels. In short, they increase good cholesterol. It has been found that two tablespoon of olive oil everyday are good for your body compared to vegetable.

Eat cabbage: Cabbages are very high in fiber and very less in calories. They are also rich in potassium, vitamin C and other essential nutrients. The tartaric acid present in cabbage does not allow your body to store sugar and carbohydrates as fats. Include cabbage in your meals as salads or cooked vegetables.

Drink green tea: Green teas are not only good for detoxification, but they also promote weight loss and help combat obesity. EGCG found in such teas limits fat absorption by the body and boosts metabolism. Drink about 3-4 cups of green tea daily to shed some weight.

Eat ginger: Ginger is a common herb and has been a staple spice in many Asian countries. It is known to treat various ailments such as cold, nausea etc. But ginger helps you to fight obesity too as it improves digestion by secreting digestive enzymes in the stomach. It helps your body utilize the stored fat and glucose. It also boosts your metabolism helping you lose weight fast. You can chew on ginger pieces or add them to your tea.

2. kwashiorkor

Kwashiorkor, also known as “edematous malnutrition” because of its association with edema (fluid retention), is a nutritional disorder. It is a form of malnutrition caused by a lack of protein in the diet. People who have kwashiorkor typically have an extremely emaciated appearance in all body parts except their ankles, feet, and belly, which swell with fluid. Treatment involves introducing extra calories and protein into the diet. Children who develop kwashiorkor may not grow or develop properly and may remain stunted for the rest of their lives. There can be serious complications when treatment is delayed, including coma, shock, and permanent mental and physical disabilities. Kwashiorkor can be life-threatening if it’s left untreated. It can cause major organ failure and eventually death.

2.1. Symptoms

The low protein intake leads to some specific signs: edema of the hands and feet, irritability, anorexia, a desquamative rash, hair discolouration, and a large fatty liver. The typical swollen

abdomen is due to two causes: ascites because of hypoalbuminemia (low oncotic pressure), and enlarged fatty liver.

2.2. Causes

Kwashiorkor is a severe form of malnutrition, caused by a deficiency in dietary protein. The extreme lack of protein causes an osmotic imbalance in the gastro-intestinal system causing swelling of the gut diagnosed as an edema or retention of water.

Extreme fluid retention observed in individuals suffering from kwashiorkor is a direct result of irregularities in the lymphatic system and an indication of capillary exchange. The lymphatic system serves three major purposes: fluid recovery, immunity, and lipid absorption. Victims of kwashiorkor commonly exhibit reduced ability to recover fluids, immune system failure, and low lipid absorption, all of which result from a state of severe undernourishment. Fluid recovery in the lymphatic system is accomplished by re-absorption of water and proteins which are then returned to the blood. Compromised fluid recovery results in the characteristic belly distension observed in highly malnourished children.

Capillary exchange between the lymphatic system and the bloodstream is stunted due to the inability of the body to effectively overcome the hydrostatic pressure gradient. Proteins, mainly albumin, are responsible for creating the colloid osmotic pressure (COP) observed in the blood and tissue fluids. The difference in the COP of the blood and tissue is called the oncotic pressure. The oncotic pressure is in direct opposition with the hydrostatic pressure and tends to draw water back into the capillary by osmosis. However, due to the lack of proteins, no substantial pressure gradient can be established to draw fluids from the tissue back into the blood stream. This results in the pooling of fluids, causing the swelling and distention of the abdomen.

2.3. Treatment

In order to avoid problems, the person must be rehabilitated with small but frequent rations, given every two to four hours. During one week, the diet, hyperglucidic, is gradually enriched in protein as well as essential elements: sweet milk with mineral salts and vitamins. The diet may include lactases so that children who have developed lactose intolerance can ingest dairy products and antibiotics to compensate for immunodeficiency. After two to three weeks, the milk is replaced by boiled cereals fortified with minerals and vitamins until its mass is at least 80% of normal weight. Traditional food can then be reintroduced. The child is considered healed when their mass reaches 85% of normal.

3. Marasmus

Malnutrition is a condition in which a lack of nutrients in the body causes health problems. This is most often the result of a very poor diet that doesn't contain all the vitamins and nutrients needed for the body to function properly. Marasmus is one form of malnutrition. It can occur in

anyone with severe malnutrition but usually occurs in children. A child with marasmus looks emaciated. Body weight is reduced to less than 62% of the normal (expected) body weight for the age.

3.1. Symptoms

- Thin face
- Ribs and shoulders clearly visible through the skin
- Very loose skin that sometimes hangs in folds in the upper arms, thighs, and buttocks
- Persistent dizziness
- Sunken eyes
- Diarrhea
- Active, alert, or irritable behavior
- Frequent dehydration
- Frequent infections that don't show external signs like fever or lesions

3.2. Causes

Marasmus is caused by a severe deficiency of nearly all nutrients, especially protein, carbohydrates and lipids, usually due to poverty and scarcity of food. Viral, bacterial and parasitic infections can cause children to absorb few nutrients, even when consumption is adequate. Marasmus can develop in children who have weakening conditions such as chronic diarrhea.

3.3. Treatment

Not only the causes, but also the complications of the disorder must be treated, including infections, dehydration, and circulation disorders, which are frequently lethal and lead to high mortality if ignored. Initially, the child is given dried skim milk powder mixed with boiled water which is then followed by mixing it with vegetable oils and finally sugar. Refeeding must be done slowly to avoid refeeding syndrome. Once children start to recover, they should have more balanced diets which meet their nutritional needs. Infections are also common in children with marasmus. So, they are also treated with antibiotics. Ultimately, marasmus can progress to the point of no return when the body's ability for protein synthesis is lost. At this point, attempts to correct the disorder by giving food or protein are futile.

3.4. Kwashiorkor vs Marasmus

Kwashiorkor	Marasmus
Edema is present	Edema is absent
Subcutaneous fat is preserved	Subcutaneous fat is not preserved
Enlarged fatty liver	Fatty liver is absent
Ribs are not very prominent	Ribs are very prominent
Muscle wasting mild or absent	Severe muscle wasting

4. Diabetes

A group of disorders characterized by an inability of the body to regulate its blood sugar (glucose) levels, either because insulin production is inadequate, or because the body's cells do not respond properly to insulin, or both. Patients with high blood sugar will typically experience polyuria (frequent urination); they will become increasingly thirsty (polydipsia) and hungry (polyphagia).

4.1. Types & causes

There are two types of chronic diabetic conditions:

Type 1 Diabetes - the body does not produce insulin. Approximately 10% of all diabetes cases are type 1. Type I diabetes is a multifactorial autoimmune disease, which is characterized by T cell mediated destruction of the insulin secreting β cells of the islets of Langerhans in the pancreas. The rate of β cell destruction varies from patient to patient, but tends to be more aggressive in infants and young children. Hence, type I diabetes usually presents during childhood or adolescence, although it may develop much later in life.

Type 2 Diabetes - the body does not produce enough insulin for proper function or the cells in the body do not response to insulin (insulin resistance). Approximately 90% of all cases of diabetes worldwide are of this type. An early abnormality in the disease is insulin resistance; a

defective state in which insulin is unable to exert its biological effects at circulation concentrations that are effective in normal subjects.

An early abnormality in the disease is insulin resistance; a defective state in which insulin is unable to exert its biological effects at circulation concentrations that are effective in normal subjects. Insulin resistance leads to profound decreases in glucose uptake and glycogen synthesis in peripheral tissues. Insulin resistance yields to defective suppression of hepatic glucose output. Resistance to the antilipolytic action of insulin also favors triglyceride breakdown in adipose tissue and the generation of free fatty acids, which interfere with insulin receptor signals. Changes in serum adipokine concentrations are also part of the insulin resistant state. At the pre-onset of type-2 diabetes, resistance to the glucose-lowering action of insulin tends to lead a slight increase of blood glucose concentration, which stimulates insulin secretion and causes hyperinsulinemia. Initially hyperinsulinemia is able to overcome insulin resistance. The diabetic state develops when insulin secretion cannot longer be sustained to compensate insulin resistance, and it is at this stage that fasting and post-prandrial hyperglycemia is apparent. Plentiful efforts have been made to understand the molecular basis of type 2-diabetes. It is now well accepted that defective postreceptor insulin signaling is the main feature involved in insulin resistance of type-2 diabetes. As a result the metabolic insulin actions are affected. Several mechanisms such as insulin receptor tyrosine dephosphorylation, imbalance of serine/threonine phosphorylation, or insulin receptor internalization impair insulin signaling. A number of molecules associated to insulin resistance such as free fatty acids, interleukin-6, TNF-alpha, affect insulin receptor signaling, interestingly most of them are related to adipose tissue. Transcriptional factors such as peroxisome proliferator activated receptor gamma (PPAR gamma) and peroxisome proliferator activated receptor gamma coactivator 1 alpha (PGC-1 alpha) have also been found to be associated with insulin resistance. Beta-cell function plays a pivotal role in determining progress to type-2 diabetes. Beta-cell gene expression defects, as seen in the monogenic diabetes forms (MODY) or secondary beta-cell defects, caused by glucotoxicity, increased free fatty acids, cytokines and/or mitochondrial dysfunction may be implicated in the physiopathology of type-2 diabetes

Gestational Diabetes - this type affects females during pregnancy. Gestational diabetes is a temporary type of diabetes and is one of the most common health problems for pregnant women. Some women have very high levels of glucose in their blood, and their bodies are unable to produce enough insulin to transport all of the glucose into their cells, resulting in progressively rising levels of glucose.

4.2. Symptoms

The most common diabetes symptoms include frequent urination, intense thirst and hunger, weight gain, unusual weight loss, fatigue, cuts and bruises that do not heal, male sexual dysfunction, numbness and tingling in hands and feet.

4.3. Treatment

Type 1 Diabetes

All people with type 1 diabetes must take insulin to live because damage to the pancreas is permanent. There are different types of insulin available with different times of onset, peak, and duration.

Insulin is injected just under the skin. Your doctor will show you how to properly inject and rotate injection sites. You can also use an insulin pump, which is a device worn outside your body that can be programmed to release a specific dose. There are now continuous blood glucose monitors as well that check your sugar 24 hours a day.

You'll need to monitor your blood sugar levels throughout the day. If necessary, you may also need to take medication to control cholesterol, high blood pressure, or other complications.

Type 2 Diabetes

Type 2 diabetes is managed with diet and exercise, and can also be treated with a variety of medications to help control blood sugar. The first-line medication is usually metformin (Glumetza, Glucophage, Fortamet, Riomet). This drug helps your body use insulin more effectively. If metformin doesn't work, your doctor can add other medications or try something different. You'll need to monitor your blood sugar levels. You may also need medications to help control blood pressure and cholesterol.

Gestational Diabetes

The majority of gestational diabetes patients can control their diabetes with exercise and diet. Between 10% to 20% of them will need to take some kind of blood-glucose-controlling medications.

5. Dietary fibre

Dietary fibre is a type of carbohydrate that cannot be digested by our bodies' enzymes. Unlike other food components, such as fats, proteins or carbohydrates — which your body breaks down and absorbs — fiber isn't digested by your body. Instead, it passes relatively intact through your stomach, small intestine and colon and out of your body.

Fiber is commonly classified as soluble, which dissolves in water, or insoluble, which doesn't dissolve.

- **Soluble fiber.** This type of fiber dissolves in water to form a gel-like material. It can help lower blood cholesterol and glucose levels. Soluble fiber is found in oats, peas, beans, apples, citrus fruits, carrots, barley and psyllium.

- **Insoluble fiber.** This type of fiber promotes the movement of material through your digestive system and increases stool bulk, so it can be of benefit to those who struggle with constipation or irregular stools. Whole-wheat flour, wheat bran, nuts, beans and vegetables, such as cauliflower, green beans and potatoes, are good sources of insoluble fiber.

Most plant-based foods, such as oatmeal and beans, contain both soluble and insoluble fiber. However, the amount of each type varies in different plant foods. To receive the greatest health benefit, eat a wide variety of high-fiber foods.

5.1. Benefits of a high-fiber diet

A high-fiber diet has many benefits, which include:

- **Normalizes bowel movements.** Dietary fiber increases the weight and size of your stool and softens it. A bulky stool is easier to pass, decreasing your chance of constipation. If you have loose, watery stools, fiber may help to solidify the stool because it absorbs water and adds bulk to stool.
- **Helps maintain bowel health.** A high-fiber diet may lower your risk of developing hemorrhoids and small pouches in your colon (diverticular disease). Some fiber is fermented in the colon. Researchers are looking at how this may play a role in preventing diseases of the colon.
- **Lowers cholesterol levels.** Soluble fiber found in beans, oats, flaxseed and oat bran may help lower total blood cholesterol levels by lowering low-density lipoprotein, or "bad," cholesterol levels. Studies also have shown that high-fiber foods may have other heart-health benefits, such as reducing blood pressure and inflammation.
- **Helps control blood sugar levels.** In people with diabetes, fiber — particularly soluble fiber — can slow the absorption of sugar and help improve blood sugar levels. A healthy diet that includes insoluble fiber may also reduce the risk of developing type 2 diabetes.
- **Aids in achieving healthy weight.** High-fiber foods tend to be more filling than low-fiber foods, so you're likely to eat less and stay satisfied longer. And high-fiber foods tend to take longer to eat and to be less "energy dense," which means they have fewer calories for the same volume of food.

Another benefit attributed to dietary fiber is prevention of colorectal cancer. However, the evidence that fiber reduces colorectal cancer is mixed.

5.2. Tips for fitting in more fiber

Need ideas for adding more fiber to your meals and snacks? Try these suggestions:

- **Jump-start your day.** For breakfast choose a high-fiber breakfast cereal — 5 or more grams of fiber a serving. Opt for cereals with "whole grain," "bran" or "fiber" in the name. Or add a few tablespoons of unprocessed wheat bran to your favorite cereal.
- **Switch to whole grains.** Consume at least half of all grains as whole grains. Look for breads that list whole wheat, whole-wheat flour or another whole grain as the first ingredient on the label and have least 2 grams of dietary fiber a serving. Experiment with brown rice, wild rice, barley, whole-wheat pasta and bulgur wheat.
- **Bulk up baked goods.** Substitute whole-grain flour for half or all of the white flour when baking. Try adding crushed bran cereal, unprocessed wheat bran or uncooked oatmeal to muffins, cakes and cookies.
- **Lean on legumes.** Beans, peas and lentils are excellent sources of fiber. Add kidney beans to canned soup or a green salad. Or make nachos with refried black beans, lots of fresh veggies, whole-wheat tortilla chips and salsa.
- **Eat more fruit and vegetables.** Fruits and vegetables are rich in fiber, as well as vitamins and minerals. Try to eat five or more servings daily.
- **Make snacks count.** Fresh fruits, raw vegetables, low-fat popcorn and whole-grain crackers are all good choices. An occasional handful of nuts or dried fruits also is a healthy, high-fiber snack — although be aware that nuts and dried fruits are high in calories.

High-fiber foods are good for your health. But adding too much fiber too quickly can promote intestinal gas, abdominal bloating and cramping. Increase fiber in your diet gradually over a period of a few weeks. This allows the natural bacteria in your digestive system to adjust to the change.

Also, drink plenty of water. Fiber works best when it absorbs water, making your stool soft and bulky.

5.3. Diseases associated with low-fiber diet

Constipation: Constipation means it is hard to have a bowel movement (or pass stools), they are infrequent (less than three times a week), or incomplete. Constipation is usually caused by inadequate “roughage” or fiber in diet, or a disruption of the regular routine or diet. Symptoms include strain during a bowel movement, small and hard stools and sometimes cause anal problems such as fissures and hemorrhoids.

Irritable bowel syndrome (IBS): Irritable bowel syndrome (IBS) (also call spastic colon, irritable colon, or nervous stomach) is a condition in which the colon muscle contracts more often than in people without IBS. Certain foods, medicines, and emotional stress are some

factors that can trigger IBS. Symptoms include abdominal pain and cramps, excess gas, bloating, change in bowel habits such as harder, looser or more urgent stools than normal and alternating constipation and diarrhea.

Sources

- **Thanks to students for providing excellent information as part of their assignments**

Video sources

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