



Daffodil
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**“DIETARY MANAGEMENT OF DIABETES MELLITUS PATIENTS
AT AALOK HOSPITAL LTD. DHAKA, BANGLADESH”**

**AN INTERNSHIP REPORT BY,
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Submitted to the Department of Nutrition and Food Engineering in the partial fulfilment
of B.Sc. in Nutrition and Food Engineering

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**FACULTY OF HEALTH AND LIFE SCIENCES (FHLS)
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APRIL, 2024**

APPROVAL

This Internship titled “**Dietary management of Diabetes Mellitus patients at Aalok Hospital Ltd. Dhaka, Bangladesh**”, submitted by Biplob to the Department of Nutrition and Food Engineering, Daffodil International University, has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of B.Sc. in Nutrition and Food Engineering and approved as to its style and contents.

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DECLARATION

I hereby declare that, this internship has been done by me under the supervision of **Ms. Tasmia Tasnim, Assistant Professor, Department of Nutrition and Food Engineering**, Daffodil International University. I also declare that neither this internship nor any part of this internship has been submitted elsewhere for award of any degree or diploma.

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Finally, I must acknowledge with due respect the constant support and patients of my parents.

EXECUTIVE SUMMARY

During my internship at Aalok Hospital LTD. I gathered many positive experiences for one month log. Which were practical and professional. I logged in at 9:00 AM at hospital. From 9:30 AM round started at cabin and ward team lead by the hospital director and accompanied by nutritionist and a group of specialist doctors. I want to thank hospital authority as they gave me chance to take part in those rounds every day. During this round session I tried to listen patient's health complications, conditions, diagnosis, improvement. Also followed the advice of my supervisor ma'am. If necessary, I took of the patient's biochemical test reports. Rounds took more than one and half hours to complete. After completing rounds. I took a little break and then went to the chamber of my supervisor ma'am at hospital. We discussed about some complicated patients' diet which we got from that day's round. As Aalok is a general hospital so patients come with various types of disease and complications such as uncontrolled diabetes, CKD, gastrointestinal disease, cirrhosis, ulcer, CVD, fracture and injury, electrolyte imbalance, weakness etc. So, I got many types of patient condition and their related diet to discuss with her. Ma'am also gave me some disease condition and relatable diet as home work every day. After that I visited the kitchen area and follow-up the recommended diet with my supervisor. My day last activity was to check new admitted patient and follow their suggested diet according to their disease condition. The hospital is well organized as well as the authority and the staffs. I closely observed the professionalism of a healthcare professional there.

Keywords: Aalok Hospital, Cabin, Ward, Diabetes Mellitus.

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ACRONYMS

SL. No	Acronyms	Full Forms
1.	ICU	Intensive Care Unit
2.	HDU	High Dependency Units
3.	DM	Diabetes Mellitus
4.	CVD	Cardiovascular Disease
5.	HTN	Hypertension
6.	HbA1c	Glycated Hemoglobin
7.	CHO	Carbohydrate
8.	TDD	Total Daily Dose
9.	CIR	Carbohydrate to Insulin Ratio
10.	T1DM	Type-1 Diabetes Mellitus
11.	T2DM	Type-2 Diabetes Mellitus
12.	RA	Rheumatoid Arthritis
13.	NAIDs	Nonsteroidal Anti-Inflammatory Drugs
14.	DMARDs	Disease-modifying antirheumatic drugs
15.	LDL	Low Density Lipoprotein
16.	ACE	Angiotensin-Converting Enzyme
17.	CD	Celiac Disease
18.	PPIs	Proton Pump Inhibitors
19.	GORD	Gastro-Oesophageal Reflux Disease
20.	ESRD	End Stage Renal Disease
21.	VEGF	Vascular Endothelial Growth Factor
22.	AGEs	Advanced Glycation End products
23.	GI	Glycemic Index
24.	BMI	Body Mass Index
25.	BMR	Basal Metabolic Rate
26.	PAL	Physical Activity Level
27.	ARDS	Acute Respiratory Distress Syndrome
28.	F	Fasting
29.	ABF	After Breakfast
30.	WBC	White Blood Cell
31.	RBC	Red Blood cell
32.	ESR	Erythrocyte Sedimentation Rate
33.	CKD	Chronic Kidney Disease
34.	kg	Kilogram
35.	m	Meter
36.	gm	Gram
37.	mg	Milligram
38.	LTD	Limited

CHAPTER 1

INTRODUCTION

1.1. Overview of Aalok Hospital LTD.

Aalok Hospital is the hospital section of Aalok Healthcare LTD. Which is situated at Mirpur-6. Aalok Healthcare established at 1995 with the name Mirpur Diagnostic Center. Its main aim was to provide standard health care services to the people with affordable prices. After a long time, it seems that they are keeping their promises and providing health services with reputation. Aalok Healthcare LTD. Has total nine branches and Aalok Hospital is one of them. It's a general hospital with 130 bed capacity in total. It also has emergency unit, pharmacy, doctors chamber, pathology department, ICU, HDU, dialysis unit, operation theater, post operative unit, mother and child care and canteen. Admitted patients got their whole day food from that canteen. The canteen provided different types of diet according to nutritionist suggestion based on patient's condition. And they maintain the food quality. The hospital has a huge number of healthcare professionals' team. They are regularly giving their best services to patients.



Figure: 1.1 Aalok Hospital LTD.

1.2 Objectives

- Making the health service available for all aspects people of the society.
- Practicing an ethical environment to maintain patient's comfort.
- Reducing the out-pocket expenditure of patient.
- Establishing as a prominent healthcare center in country.

CHAPTER 2

BASICS OF DIABETES MELLITUS

Our body breaks down carbohydrates into glucose and release it into bloodstream, which gives our body energy. Pancreas produces an essential hormone which is called insulin. Insulin is the key to let the glucose enters into cell from bloodstream.

Diabetes Mellitus is chronic condition where pancreas cannot produce insulin or insulin can't works properly in body and the blood glucose levels increases or hyperglycemia. Diabetes is a risk factor for developing other chronic diseases such as, arthritis, CVD, obesity, HTN, neuropathy, nephropathy etc.

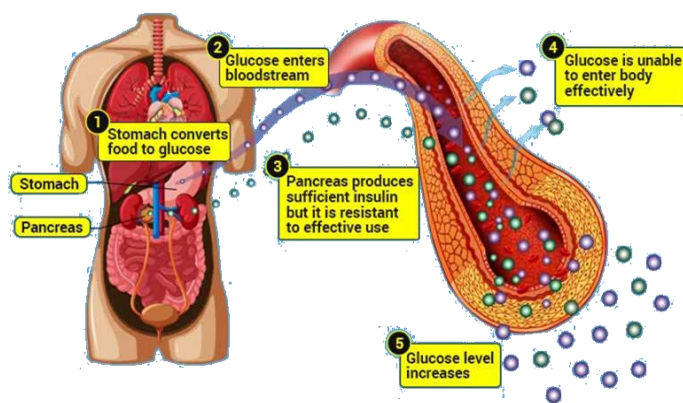


Figure: 2 Diabetes Mellitus Condition

Diabetes symptoms:

- a. Frequent urination
- b. Thirst
- c. Fatigue
- d. Weight loss
- e. Slow healing wounds

Blood glucose level in diagnosis diabetes:

Plasma glucose	Normal	Prediabetes	Diabetes
Random	Below 11.1 mmol/L Below 200 mg/dL	N/A	11.1 mmol/L or more 200 mg/dL or more
Fasting	Below 5.5 mmol/L Below 100 mg/dL	5.5 to 6.9 mmol/L 100 to 125 mg/dL	7.0 mmol/L or more 126 mg/dL or more
2 hours postprandial	Below 7.8 mmol/L Below 140 mg/dL	7.8 to 11.0 mmol/L 140 to 199 mg/dL	11.1 mmol/L or more 200 mg/dl or more

Table: 2 Blood glucose level in diabetes diagnosis

HbA1c for diagnosis diabetes:

- Normal: Below 42 mmol/mol (6.0%)
- Prediabetes: 42 to 47 mmol/mol (6.0 to 6.4%)
- Diabetes: 48 mmol/mol(6.5% or over)

2.1 Types of Diabetes Mellitus

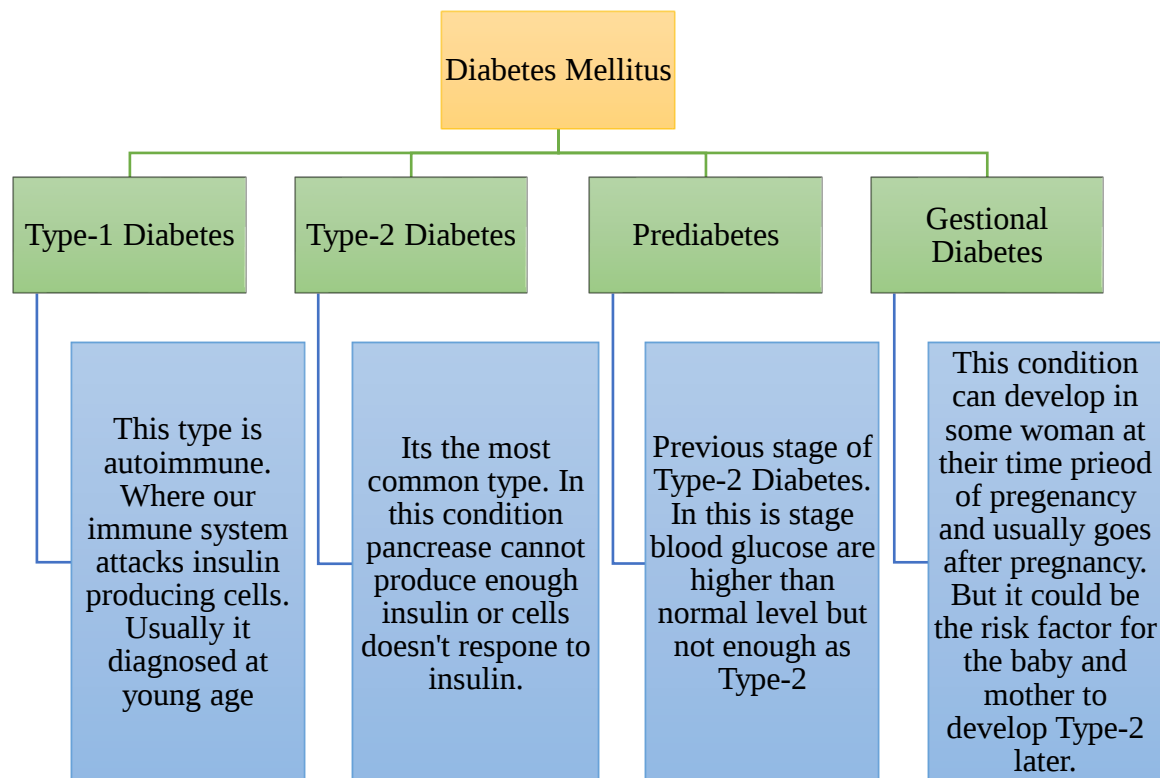


Figure: 2.1 Types of Diabetes Mellitus

CHAPTER 3

HYPO AND HYPERGLYCEMIA

3.1 Hypoglycemia

Is a condition where fasting blood glucose level is 4.0 mmol/L or below also called low blood sugar. It's a most common phenomenon for diabetic patients.

Symptoms:

- a. Looking pale
- b. Shakiness
- c. Sweating
- d. Headache
- e. Nausea
- f. Hunger
- g. Irregular heartbeat
- h. Fatigue

Treatment:

- a. Immediate intake of 15 to 20 grams of quick acting carbohydrate
- b. Glucose tablet
- c. Sugary drinks
- d. Four to five sugar lumps
- e. Four pieces of hard candy

3.2 Hyperglycemia

A condition where blood glucose level is higher than normal level also called high blood sugar. Commonly affects the patients with diabetes.

Symptoms:

- a. Urinating large amount
- b. Excessive thirst
- c. Feeling tired
- d. Frequent hunger

- e. Dry mouth
- f. Blurred vision
- g. Headache
- h. Stomach pain

Treatment:

- a. Insulin
- b. Glucose lowering medicine
- c. Glucose monitoring
- d. Lifestyle changes

CHAPTER 4

INSULIN AND DOSE CALCULATION

4.1 Insulin Therapy

Insulin used when a diabetic patient cannot produce as much insulin needed to control the blood sugar level. Insulin therapy is an important part of diabetic treatment. Depends on some condition and situation insulin therapy is provided for the patients in daily basis.

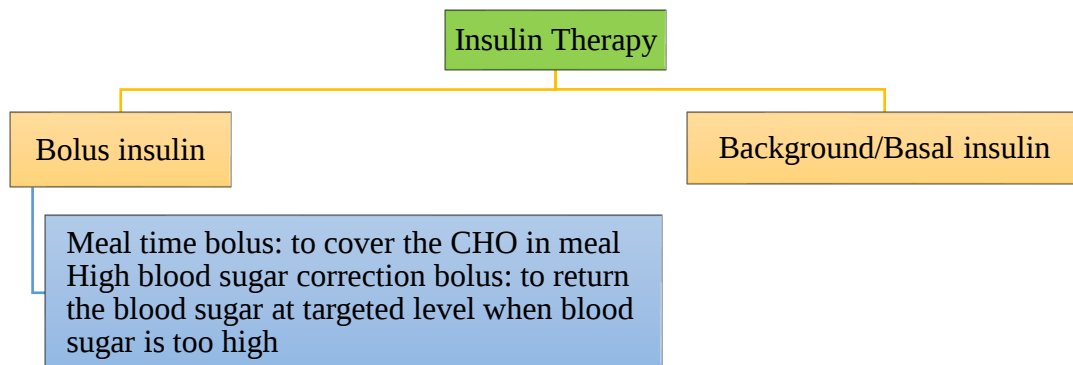


Figure: 4.1 Insulin Therapy

Daily insulin percentage:

- Bolus insulin dose: (40 to 50) % of total insulin dose
- Basal insulin dose: (40 to 50) % of total insulin dose

4.2 Different types of insulin

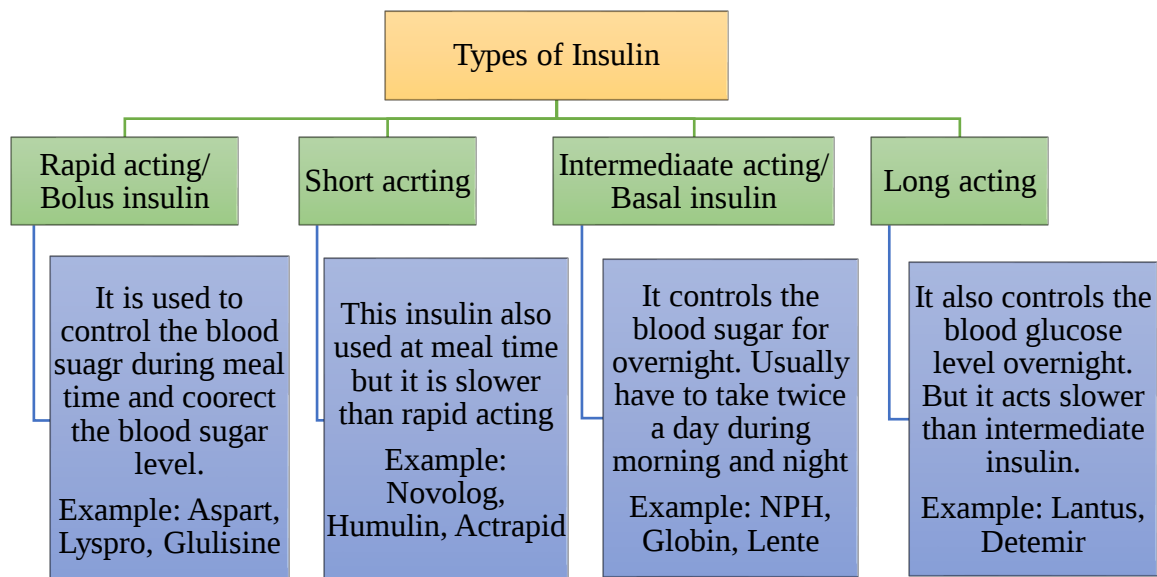


Figure: 4.2 Types of Insulin

4.3 Calculation for insulin dose

Daily insulin requirement:

- Total daily dose (TDD) = 0.5 insulin dose $\times$ per kg body weight

Carbohydrate to insulin ratio (CIR):

- 1 unit of insulin covers that much grams of carbohydrates = $500 \div \text{TDD}$

Carbohydrate coverage dose:

- CHO insulin dose = Total grams of CHO in the meal $\div$ Grams of CHO disposed by 1 unit of insulin

Meal insulin bolus:

- Carbohydrates in meal $\div$ CIR

High blood sugar correction factor:

- Insulin Selectivity Factor (Correction Factor) = $1700 \div \text{TDD}$

Correction dose:

- (Current blood sugar – Target blood sugar) $\div$ Correction factor

Total bolus dose:

- Correction dose + Meal insulin dose

CHAPTER 5

DAILY ACTIVITY

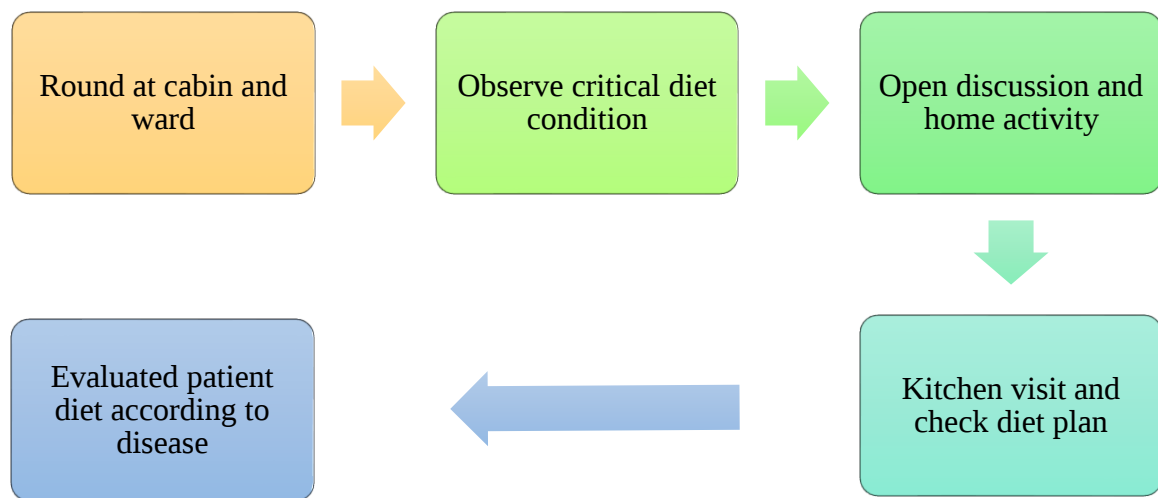


Figure: 5 Daily Activity

- From 9:30 AM round started at cabin and ward team lead by the hospital director and accompanied by nutritionist and a group of specialist doctors. All patients are checked thoroughly at this time. Round takes almost 2 hours.
- The patients who are facing problem with their diet because of their critical disease condition, their diet observed and revised carefully by my supervisor and me.
- After 11:30 AM my supervisor started to discuss some critical cases and the recommended diet from that day's patients as well as some other disease conditions. She also gave some home tasks and check previous home tasks.
- At 12:30 generally we visited the kitchen area and cross check the diet plan for the patients. Sometimes we have to change the diet.
- Day last activity was to check new admitted patient and follow their suggested diet according to their disease condition and inform it to my supervisor.

CHAPTER 6

LEARNING OUTCOME

6.1 Associated diseases with Diabetes Mellitus

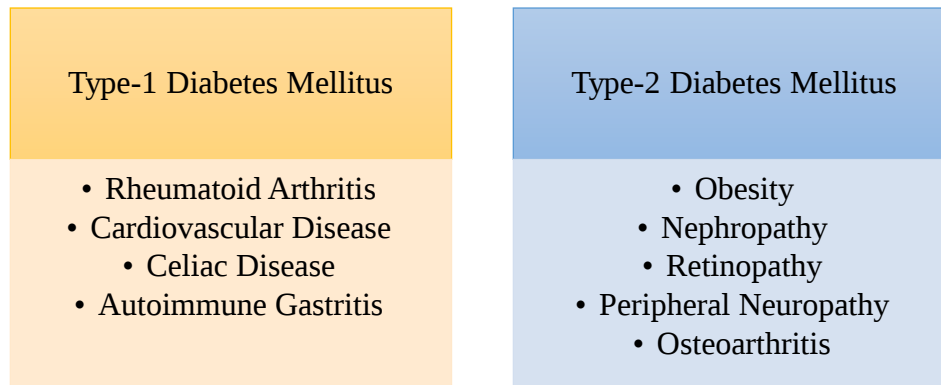


Figure: 6.1 Associated disease of DM

6.2 Disease, symptoms, treatment and diet of Type-1 Diabetes

Rheumatoid Arthritis

It's an autoimmune arthritis where our own immune system attacks the body joints mostly hands, wrist, knees. It is a chronic disease condition. Inflammation and pain of joints always happens.

Cause:

Immune system mistakenly attacks own body cells thinking as a foreign invader and release inflammatory chemicals. RA mainly attacks the synovium tissues around the joints that produces liquid to make the joint movement easier. Exact cause of RA is unknown. Some individual's thoughts that certain genes activated the immune system trigger by some factors. T1DM could be a cause of RA.

Symptoms:

- a. Pain, tenderness, stiffness, swelling in joints that lasts for a long time.
- b. Morning stiffness for 30 minutes or more.
- c. Pain in more than one joint.
- d. Mainly small joints are affected.
- e. Some person can develop fatigue or low-grade fever.

Treatment:

There is no exact treatment or cure for this. But treatment can lower the progression or comorbidities.

- a. Nonsteroidal Anti-Inflammatory Drugs (NAIDs)
- b. Steroids
- c. Conventional DMARDs
- d. Biologic agents
- e. Targeted synthetic DMARDs
- f. Painkiller
- g. Therapy

Dietary Recommendation:

- a. Brown rice and wheat, oats
- b. Fresh fruits and vegetables
- c. Poultry, egg, small fish, fish
- d. Plenty of water
- e. Dairy product (if patient can tolerate)
- f. Supplements if needed.

Dietary Restrictions:

- a. High fatty food: red meat
- b. Processed food: sausage, nuggets, meat ball
- c. Extra salt
- d. Excess sugar
- e. Food that produces uric acid: Dal
- f. Carbonated beverage

Cardiovascular Disease

Cardiovascular disease is a condition where heart or blood vessel or both are affected. Sometimes high blood sugar can harm the blood vessels or nerves of heart. People with T1DM are most susceptible to grow CVD.

Cause:

- a. High blood pressure
- b. Diabetes
- c. Smoking
- d. Obesity
- e. Unhealthy diet
- f. Physical inactivity
- g. High LDL

Symptoms:

- a. Chest pain
- b. Pain, weakness or numbness at legs and hands
- c. Palpitation
- d. Feeling faint
- e. Feeling fatigue

Treatment:

- a. Bisoprolol
- b. Diuretics
- c. Carvedilol
- d. ACE inhibitors
- e. Valve or coronary artery surgery

Dietary Recommendation:

- a. Brown rice and wheat, oats
- b. Fresh fruits and vegetables
- c. Poultry, egg, small fish, fish

- d. Plenty of water
- e. Chia seeds, nuts, garlic
- f. Green tea
- g. Low fat milk (if person can tolerate)

Dietary Restrictions:

- a. High fatty food: red meat
- b. High fat milk or milk product
- c. Processed food: sausage, nuggets, meat ball
- d. Extra salt
- e. Excess sugar
- f. Food that produces uric acid: Dal
- g. Carbonated beverage

Celiac Disease

Celiac disease is an auto immune condition. Eating gluten activates the immune response. Long time reaction damages our small intestine and hampers nutrient absorbing. T1DM and CD both have same classes of genes. So, T1DM increase the chance of CD five to seven times.

Causes:

Exact cause is unknown. Some genetic factors combined with eating habit can develop this condition.

- a. Infant feeding practice
- b. Gastrointestinal infections
- c. Gut bacteria
- d. T1DM

Symptoms:

- a. Diarrhea
- b. Weight loss
- c. Fatigue
- d. Abdominal pain

- e. Nausea and vomiting
- f. Constipation
- g. Bloating and gas

Treatment:

There are no perfect medications for treat CD. But some medication helps to make the progression slow.

- a. Steroids
- b. Supplements

Dietary Recommendation:

- a. Gluten free cereal or cereal products: rice and rice-based products
- b. Fresh vegetable and fruits
- c. Poultry, egg, fish
- d. Lots of water
- e. Potato
- f. Milk (if patient can tolerate)

Dietary Restrictions:

- a. Cereals with gluten or their products: wheat, rye, barely and products
- b. Processed food
- c. Ice-cream
- d. Candy bar

Autoimmune Gastritis

It is a chronic inflammatory disease where corpus and fundus cells of the stomach are damaged. T1DM and autoimmune gastritis both have same classes of genes.

Causes:

In this condition own immune systems attacks the cells. Actual cause is unknown. Some factors can trigger the immune system.

Symptoms:

- a. Pain in upper abdomen
- b. Nausea and vomiting
- c. Bloating or gas
- d. Malabsorption of iron and vit-B12

Treatment:

- a. Proton pump inhibitors (PPIs)
- b. Vit-B12 and iron supplement

Dietary Recommendation:

- a. Brown rice and wheat, oats
- b. Fresh fruits and vegetables
- c. Poultry, egg, small fish, fish
- d. Plenty of water
- e. Probiotics
- f. Supplements if needed.

Dietary Restrictions:

- a. High fatty food: red meat
- b. Milk or milk-based products
- c. Citrus fruits
- d. Caffeine
- e. Processed food: sausage, nuggets, meat ball
- f. Excess sugar
- g. Carbonated beverage

6.3 Disease, symptoms, treatment and diet of Type-2 Diabetes

Obesity

A chronic disease condition that occurs when someone got too much body fat which can lead to poor health. Excess makes cells and tissues more resistant to insulin and T2DM can be initiate.

Cause:

- a. Eating pattern
- b. Genetics
- c. Insufficient physical activity
- d. Sleeping routine
- e. Medication
- f. Hormonal
- g. Stress
- h. Health condition
- i. Age

Symptoms:

- a. Breathlessness
- b. Snoring
- c. Fatigue
- d. Difficulty exercise
- e. Joint and back pain
- f. Infection in skinfold
- g. CVD
- h. HTN
- i. T2DM
- j. Osteoporosis
- k. Gastro-oesophageal reflux disease (GORD)

Treatment:

Lifestyle modification is beneficial for manage obesity problem. Some medication can be also helpful.

- a. Liraglutide
- b. Orlistat
- c. Bupropion-naltrexone
- d. Semaglutide
- e. Phentermine-topiramate

Dietary Recommendation:

- a. Brown cereals
- b. Fresh fruits and vegetables
- c. Poultry and fish without fatty portion, egg
- d. Salad
- e. Plenty of water

Dietary Restrictions:

- a. High fatty food: red meat
- b. Cereals in low amount
- c. Starchy vegetables
- d. Excess sugar and sugar-based products
- e. Deep fried product
- f. Processed food: sausage, nuggets, meat ball
- g. Carbonated beverage

Nephropathy

A disease condition where kidney function deteriorate. And the final stage is kidney failure or end stage renal disease (ESRD).

Cause:

High blood sugar in blood can make damage to the blood vessels that filter bloods and make urine.

Symptoms:

- a. High blood pressure
- b. Swelling of ankles, feet, hand or eyes
- c. Foamy urine
- d. Loss of appetite
- e. Shortness of breath
- f. Nausea and vomiting
- g. Itching
- h. Fatigue

Treatment:

- a. Medication to control blood sugar
- b. Medication to control creatinine
- c. Management of hypertension

Dietary Recommendation:

- a. White rice, wheat
- b. Fresh fruits and vegetables after peeling
- c. Poultry, egg, fish
- d. Water (1.5 to 2 liter)

Dietary Restriction:

- a. High sodium and potassium foods
- b. High fatty food: red meat
- c. Starchy vegetables
- d. Sugar and sugar-based product
- e. Legumes
- f. Sweet beverages

Retinopathy

It's a complication of eyes where light sensitive tissues (retina) blood vessels are affected.

Cause:

Because of diabetes, high blood sugar damaged the blood vessels of eyes.

Symptoms:

- a. Vitreous hemorrhage
- b. Floaters or small object floating in vision
- c. Blurred vision
- d. Fluctuating vision
- e. Dark or empty areas in vision
- f. Vision loss

Treatment:

- a. Anti VEGF medicine
- b. Laser treatment
- c. Eye surgery

Dietary Recommendation:

- a. Brown rice and wheat, oats
- b. Fresh fruits and vegetables
- c. Poultry, egg, small fish, fish
- d. Plenty of water
- e. Dairy product (if patient can tolerate)
- f. Antioxidant rich foods

Dietary Restrictions:

- a. High fatty food: red meat
- b. Processed food: sausage, nuggets, meat ball
- c. Sugar and sugar-based products
- d. Carbonated beverage

Peripheral Neuropathy

A disease condition where outside nerves of brain and spinal cord are affected. High blood sugar can blood supplying vessels of the nerves.

Cause:

- a. Diabetes
- b. Nerve compression
- c. Lifestyle
- d. Health conditions

Symptoms:

- a. Muscle weakness
- b. Cramps
- c. Muscle twitching
- d. Loss of muscle and bone
- e. Change in hair skin and nails
- f. Loss of balance
- g. Numbness

Treatment:

- a. Painkiller
- b. Mexiletine
- c. Antiseizure
- d. Antidepressants

Dietary Recommendation:

- a. Brown rice and wheat, oats
- b. Fresh fruits and vegetables
- c. Poultry, egg, small fish, fish
- d. Salad without salt
- e. Plenty of water
- f. Dairy product (if patient can tolerate)

Dietary Restrictions:

- a. High fatty food: red meat
- b. Starchy vegetables
- c. Excess sugar and sugar-based products
- d. Deep fried product
- e. Processed food: sausage, nuggets, meat ball
- f. Carbonated beverage

Osteoarthritis

It is a joint disorder where cartilage of the joint's breakdown. It affects mainly the hands, knees, hips and spine joints.

Cause:

High blood sugar can damage the nerves of joints. T2DM patients have direct impact of hyperglycemia that promotes Advanced Glycation End products (AGEs). Where protein and lipids glycated in sugar exposure at joints.

Symptoms:

- a. Numbness, loss of sensation in the affected joints.
- b. Joints become warm, red, swollen become unstable or deformed.
- c. Stiffness
- d. Loss of flexibility
- e. Pain in affected joint

Treatment:

- a. Nonsteroidal Anti-Inflammatory Drugs (NSAIDs)
- b. Painkiller
- c. Medication for diabetes

Dietary Recommendation:

- a. Brown rice and wheat, oats
- b. Fresh fruits and vegetables
- c. Poultry, egg, small fish, fish

- d. Salad without salt
- e. Plenty of water
- f. Dairy product (if patient can tolerate)

Dietary Restrictions:

- a. High fatty food: red meat
- b. Saturated fat
- c. Deep fried product
- d. Excess sugar and sugar-based products
- e. Processed food: sausage, nuggets, meat ball
- f. Carbonated beverage

6.4 Dietary Fiber

Type of carbohydrate mostly founds in plant-based food that body can't digest. It's an essential element for our regular health diet.

Working Procedure:

It increases the stool size and softness. Bowel movement becomes more easier when it is bulk and soft. Dietary fiber also helps to keeps the fullness of the stomach for long period. So, it is helpful for diabetic patient for reducing carbohydrate requirements. Also prevent blood sugar spikes, high blood pressure and balance cholesterol level.

List of cereal-based foods items with high and low in dietary fiber

Cereals	Fiber (g)	Cereals	Fiber (g)
Kaon	3.3	Bhat (atop)	0.1
Bajra	2.3	Bosa bhat	0.2
Pawruti	2.1	Semai (siddha)	0.3
Chira	2.0	Chal (atop)	0.4
Muri	1.8	Bhat (siddha)	0.4
Bun	1.7	Khoi	0.4
Gom	1.6	Maida	0.6
Bhutta (shukna)	1.6	Semai	0.7
Khichuri	1.6	Bhutta (kacha)	0.8
Ata	1.5	Ruti	1.1

Table: 6.4.1 Cereal based food items with high and low dietary fiber

List of fish-based foods items with high and low in dietary fiber

Fish	Fiber (g)	Fish	Fiber (g)
Shutki	11.9	Pangas	1.0
Punti	4.9	Chital	1.0
Chanda	4.8	Magur	1.1
Chapila	4.4	Rupchanda	1.1
Taki	4.0	Ayre	1.2
Tengra	4.0	Common carp	1.2
Parshe	3.5	Rui	1.2
Kakila (cokh saho)	3.4	Kalibaush	1.2
Chela	3.0	Chingri	1.3
Bele	2.7	Katla	1.3
Mola (cokh saho)	2.7		
Shing	2.5		

Table: 6.4.2 Fish based food items with high and low dietary fiber

List of vegetable-based foods items with high and low in dietary fiber

Vegetables	Fiber (g)	Vegetables	Fiber (g)
Palong shak (siddha)	3.6	Chalkumra	0.3
Notay shak (siddha)	3.3	Jhinga	0.3
Bok ful shak	3.1	Bandhakopi	0.4
Malancha shak	2.6	Shosa	0.4
Beet shak	2.3	Kancha tomato	0.5
Sobuj kochu shak	2.1	Mula	0.6
Sajna data	1.9	Helencha shak	0.8
Data	1.8	Mula shak	0.8
Kancha pepe siddha	1.4	Kolmee shak	0.9
Rosun	1.3	Pui shak	1.2

Table: 6.4.3 Vegetable based food items with high and low dietary fiber

List of fruit-based foods items with high and low in dietary fiber

Fruits	Fiber (g)	Fruits	Fiber (g)
Khorma	3.4	Apple	0.2
Kodbel	1.8	Taal (kochi)	0.2
Khejur	1.7	Jamrul	0.3
Kathal	1.1	Tarmuz	0.3
Boroi	1.0	Komola	0.3
Dewa	1.0	Malta	0.3
Taal (paka)	0.9	Bangee	0.4
Atafof	0.9	Kamranga	0.5
Amra	0.9	Gab (bilati)	0.5
Kola	0.8	Lichu	0.6
Aam	0.8	Peyara	0.7

Table: 6.4.4 Fruit based food items with high and low dietary fiber

6.5 Glycemic Index (GI)

It's a measure of total blood glucose increase level after consuming food. GI depends on amount of carbohydrate, protein, fat and ash in food items. Food items are categorized in three classes depending on GI.

The food items containing high GI are more susceptible to raise the blood glucose level than low GI food items. Usually, diabetic patients are suggested to consume low GI foods to keep the blood glucose low.

Low GI	≤ 55
Moderate GI	56-69
High GI	≥ 70

SL No.	Food item	GI	GI Class
1.	Glucose	100	High
2.	Puffed rice	90	High
3.	Oats	87	High
4.	Rice flaked	80	High
5.	Potato (boiled)	78	High
6.	Watermelon	76	High
7.	Wheat bread (white)	75	High
8.	Whole grain bread	74	High
9.	White rice (boiled)	73	High
10.	Biscuit	70	High
11.	Brown rice (boiled)	68	Medium
12.	Sucrose	65	Medium
13.	Pumpkin (boiled)	64	Medium
14.	Sweet potato (boiled)	63	Medium
15.	Wheat chapati	62	Medium
16.	Honey	61	Medium
17.	Pineapple	59	Medium
18.	Plantain	55	Low
19.	Popcorn	55	Low
20.	Taro (boiled)	53	Low
21.	Corn	52	Low
22.	Banana	51	Low
23.	Mango	51	Low
24.	Ice-cream	51	Low
25.	Orange juice	50	Low
26.	Sugarcane juice	43	Low
27.	Orange	43	Low
28.	Date	42	Low
29.	Carrot (boiled)	39	Low
30.	Milk	39	Low
31.	Apple	36	Low
32.	Soy milk	34	Low

33.	Lentil	32	Low
34.	Bengal gram	28	Low
35.	Soybean	16	Low
36.	Cauliflower	15	Low
37.	Eggplant	15	Low
38.	Radish	15	Low
39.	Spinach	15	low
40.	Fructose	15	Low
41.	Cabbage	10	Low
42.	Fish	0	Low
43.	Meat	0	Low
44.	Egg	0	Low

Table: 6.5 List and class of GI foods

5.6 Lifestyle Modification

Food:

- a. Healthy and balanced diet.
- b. Limited carbohydrate intake.
- c. Avoid sugar and sugar-based product.
- d. Reduce starchy vegetables and increase non starchy vegetables in diet.
- e. Eat brown rice, wheat.
- f. Avoid processed and high fat food.

Exercise

- a. Keep and maintain exercise schedule for at least 30 minutes per day.
- b. Maintain blood sugar during exercise.
- c. Take snacks before exercise if needed.
- d. Stay hydrated during exercise.

Medication:

- a. Take prescribed medicines regularly.
- b. If insulin dependent than store it properly.
- c. Diabetes mellitus has a lot of comorbidities, take medicines as prescription.

CHAPTER 7

CONCLUSION

From this internship I got better knowledge of managing and maintaining the patient nutritional fact associated with diabetics. Now I have no doubt about my potential to handle a diabetes mellitus patient. This one-month long internship period also helps me to revise and practice my academic knowledge in practical field. Which must be helpful for my professional life for sure.

Recommendation:

- a. The hospital needs to appoint one more nutritionist. Its quite impossible for a person to handle all patients diet and manage kitchen as well as.
- b. Authority should improve the kitchen section. There are lots of things to taken care of.
- c. They should follow the dietary advise of the nutritionist more carefully and seriously.
- d. Authority should start the internship system much more practically.

Learning outcome:

- a. Basics of diabetes mellitus.
- b. Types of diabetes mellitus
- c. Associated diseases with different types of diabetes mellitus
- d. Disease causes, symptoms, treatment and dietary management.
- e. Insulin effects on dietary patients and dose management
- f. High and low fiber food items and its effect on our diet.
- g. High and low GI food items and its effect on our diet

APPENDICES

APPENDIX 1: CASE STUDIES WITH FOOD CHART

Patient: 01

Admission Date: 30.03.2024

Age: 47 years

Gender: Female

Height: 152 cm

Weight: 56 kg

BMI: 23.3 (Normal)

PAL: Sedentary

BMR: 1133 kcal/day

Calorie requirement: 1586 kcal/day

- Admission reason: Acute Respiratory Distress Syndrome (ARDS) due to Pneumonia with Diabetes Mellitus.
- The patient gets steroids 2 times a day, so her blood glucose fluctuates.

Biochemical Test (Blood)	Result	Biochemical Test (Blood)	Result
Blood Glucose (F)	5.3 mmol/dl	Creatinine	0.65 mg/dl
Blood Glucose (ABF)	15.0 mmol/dl	Sodium	133.6 mmol/L
Hemoglobin	12.9 g/dl	Potassium	04.80 mmol/L
WBC	23.93 K/ μ L	Chloride	98.40 mmol/L
RBC	4.96 M/ μ L	Carbon dioxide	24.70 mmol/L
Platelets	574 K/ μ L	Bicarbonate	23.40 mmol/L
ESR	10 mm		

Calories distribution in macronutrients:

Macronutrients	% of Total kcal/day	kcal/day	gm
Carbohydrate	55%	872	218
Protein	22%	350	88
Fat	23%	365	41

Meal distribution:

Meal	Percentage	kcal/day
Breakfast	29 %	460
Mid-morning snacks	08 %	127
Lunch	25 %	397
Afternoon snacks	07 %	111
Dinner	22 %	349
Mid night snacks	06 %	95

Menu planning:

Item	Weight per piece (g) or (ml)	Piece/Cup	CHO (g)	Protein (g)	Fat (g)	Calories (kcal)
Breakfast						
Ruti	30 g	3 pieces	49.7	7.5	1.2	246
Mixed vegetable	100g		7-10	1.0-1.5	0.4-0.6	30-38
Egg	30 g	1 piece		7	2.7	80
Egg without yolk		1 piece		4		20
Milk	120 ml	1 cup	4.2	3.7	3.2	80
			64	24	8	461
Mid-morning snacks						
Lexus biscuit		4 pieces	14	1.4	3.6	93
Guava	50 g	1 piece	5	0.5	0.2	30
			19	2	4	123
Lunch						
Rice	120 g	2 cups	60	5.2	0.3	280
Fish	30 g	2 pieces		9.6	4	60
Dal	15 g	1 cup	6	4	0.3	50
Leafy vegetable	50 g		1	3	0.6	10
			67	22	5	400
Afternoon snacks						
Rice flaked	20 g	¼ cup	8	0.6		35
Apple	40 g	1 piece	6	0.1		40
Yoghurt (sour)	50 g		1.8	1.7	1.5	30
			16	2.4	1.5	105
Dinner						
Ruti	30 g	2 pieces	33	5	0.8	164
Chicken (leg,breast,liver)/ Beef (lean)/ Mutton (lean)	30 g	4 pieces		20-24	3-5	120-150
Dal	15 g	1 cup	6	4	0.3	50
			39	33	5	344
Mid night snacks						
Lexus biscuit		4 pieces	14	1.4	3.6	93
			14	1.4	3.6	93
Cooking oil	15 ml				15	135

Suggestion:

- a. Eat fresh vegetables and leafy vegetables in large amounts. Reduce starchy vegetables.
- b. Eat apples and guava mainly in fruits.
- c. Eat brown rice, wheat, flaked.
- d. Drink milk and tea without sugar and always after 30 minutes of meal.

Restrictions:

- a. Reduce consume of processed grains.
- b. Avoid sugar and sugar-based product.
- c. Try to avoid fruit juice.
- d. Avoid processed food
- e. Avoid starchy vegetables.

Patient: 02

Admission Date: 26.03.2024

Age: 56 years

Gender: Male

Height: 183 cm

Weight: 76 kg

BMI: 22.7 (Normal)

PAL: Sedentary

BMR: 1628 kcal/day

Calorie requirement: 1955 kcal/day

- Admission reason: Ischemic Heart Disease with Diabetes Mellitus.

Biochemical Test (Blood)	Result	Biochemical Test (Blood)	Result
Blood Glucose (F)	6.6 mmol/dl	Creatinine	1.00 mg/dl
Blood Glucose (ABF)	10.4 mmol/dl	Sodium	133.6 mmol/L
Hemoglobin	14.3 g/dl	Potassium	03.90 mmol/L
WBC	8.99 K/ μ L	Chloride	98.60 mmol/L
RBC	4.86 M/ μ L	Carbon dioxide	23.60 mmol/L
Platelets	162 K/ μ L	Bicarbonate	22.30 mmol/L
ESR	8 mm	Plasma glucose random	13.28 mmol/L

Calories distribution in macronutrients:

Macronutrients	% of Total kcal/day	kcal/day	gm
Carbohydrate	55%	1075	269
Protein	22%	430	108
Fat	23%	450	50

Meal distribution:

Meal	Percentage	kcal/day
Breakfast	28 %	547
Mid-morning snacks	06 %	117
Lunch	29 %	567
Afternoon snacks	07 %	137
Dinner	17 %	332
Mid night snacks	06 %	117

Menu planning:

Item	Weight per piece (g) or (ml)	Piece/Cup	CHO (g)	Protein (g)	Fat (g)	Calories (kcal)
Breakfast						
Ruti	30 g	4 pieces	66	10	2.4	328
Mixed vegetable	100g		7-10	1.0-1.5	0.4-0.6	30-38
Egg	30 g	1 piece		7	2.7	80
Egg without yolk		1 piece		4		20
Milk	120 ml	1 cup	4.2	3.7	3.2	80
			79	24	8	543
Mid-morning snacks						
Lexus biscuit		4 pieces	14	1.4	3.6	93
Guava	50 g	1 piece	5	0.5	0.2	30
			19	2	4	123
Lunch						
Rice	120 g	3 cups	90	7.8	0.4	420
Fish	30 g	2 pieces		9.6	4	60
Egg without yolk		1 piece		4		20
Dal	15 g	1 cup	6	4	0.3	50
Leafy vegetable	100 g		2	6	1.2	20
			98	32	6	570
Afternoon snacks						
Rice flaked	20 g	¼ cup	8	0.6		35
Apple	40 g	1 piece	6	0.1		40
Yoghurt (sour)	100 g		3.6	3.4	3	60
			18	4	3	135
Dinner						
Ruti	30 g	2 pieces	33	5	0.8	164
Chicken (leg,breast,liver)/ Beef (lean)/ Mutton (lean)	30 g	4 pieces		20-24	3-5	120-150
Dal	15 g	1 cup	6	4	0.3	50
			39	33	5	344
Mid night snacks						
Lexus biscuit		4 pieces	14	1.4	3.6	93
Egg without yolk		1 piece		4		20
			14	5.4	3.6	113
Cooking oil	15 ml				15	135

Suggestion:

- a. Eat fresh vegetables and leafy vegetables in large amounts. Reduce starchy vegetables.
- b. Eat apples and guava mainly in fruits.
- c. Eat brown rice, wheat, flaked.
- d. Drink milk and tea without sugar and always after 30 minutes of meal.

Restrictions:

- a. Reduce consume of processed grains.
- b. Avoid sugar and sugar-based product.
- c. Try to avoid fruit juice.
- d. Avoid processed food
- e. Avoid starchy vegetables.

Patient: 03

Admission Date: 22.03.2024

Age: 64 years

Gender: Female

Height: 155 cm

Weight: 52 kg

BMI: 21.7 (Normal)

PAL: Sedentary

BMR: 1007 kcal/day

Calorie requirement: 1200 kcal/day

- Admission reason: Acute confusional state due to electrolyte imbalance with Diabetes Mellitus.

Biochemical Test (Blood)	Result	Biochemical Test (Blood)	Result
Blood Glucose (F)	7.2 mmol/dl	ESR	29 mm
Blood Glucose (ABF)	12.6 mmol/dl	Sodium	127.6 mmol/L
Hemoglobin	11.8 g/dl	Potassium	04.80 mmol/L
WBC	10.82 K/ μ L	Chloride	99.10 mmol/L
RBC	4.05 M/ μ L	Carbon dioxide	18.00 mmol/L
Platelets	392 K/ μ L	Bicarbonate	16.70 mmol/L

Calories distribution in macronutrients:

Macronutrients	% of Total kcal/day	kcal/day	gm
Carbohydrate	55%	660	165
Protein	22%	264	66
Fat	23%	276	31

Meal distribution:

Meal	Percentage	kcal/day
Breakfast	30 %	360
Mid-morning snacks	08 %	96
Lunch	26 %	312
Afternoon snacks	06 %	72
Dinner	23 %	332
Mid night snacks	05 %	60

Menu planning:

Item	Weight per piece (g) or (ml)	Piece/Cup	CHO (g)	Protein (g)	Fat (g)	Calories (kcal)
Breakfast						
Ruti	30 g	2 pieces	33	5	1.2	164
Mixed vegetable	100 g		7-10	1.0-1.5	0.4-0.6	30-38
Egg	30 g	1 piece		7	2.7	80
Milk	120 ml	1 cup	4.2	3.7	3.2	80
			45	16.7	7	359
Mid-morning snacks						
Apple	40 g	1 piece	6	0.1		40
Yoghurt (sour)	100 g		3.6	3.4	3	60
			18	4	3	100
Lunch						
Rice	120 g	1½ cups	45	3.9	0.2	210
Fish	30 g	1 piece		4.8	2	30
Dal	15 g	1 cup	6	4	0.3	50
Leafy vegetable	100 g		2	6	1.2	20
			53	18.7	3.7	310
Afternoon snacks						
Lexus biscuit		2 pieces	7	0.7	1.8	46.5
Guava	50 g	1 piece	5	0.5	0.2	30
			12	1	2	76.5
Dinner						
Ruti	30 g	2 pieces	33	5	0.8	164
Chicken (leg,breast,liver)/ Beef (lean)/ Mutton (lean)	30 g	2 pieces		10-12	1-3	60-75
Dal	15 g	1 cup	6	4	0.3	50
			39	20	3	280
Mid night snacks						
Lexus biscuit		2 pieces	7	0.7	1.8	46.5
Egg without yolk		1 piece		4		20
			7	4.7	1.8	60.5
Cooking oil	10 ml				10	90

Suggestion:

- a. Eat fresh vegetables and leafy vegetables in large amounts. Reduce starchy vegetables.
- b. Eat apples and guava mainly in fruits.
- c. Eat brown rice, wheat, flaked.
- d. Drink milk and tea without sugar and always after 30 minutes of meal.

Restrictions:

- a. Reduce consume of processed grains.
- b. Avoid sugar and sugar-based product.
- c. Try to avoid fruit juice.
- d. Avoid processed food.
- e. Avoid starchy vegetables.

Patient: 04

Admission Date: 21.03.2024

Age: 73 years

Gender: Male

Height: 170 cm

Weight: 65 kg

BMI: 22.4 (Normal)

PAL: Sedentary

BMR: 1354 kcal/day

Calorie requirement: 1624 kcal/day

- Admission reason: Acute confusional state due to Meningoencephalitis with Diabetes Mellitus.

Biochemical Test (Blood)	Result	Biochemical Test (Blood)	Result
Blood Glucose (F)	12.5 mmol/dl	ESR	2 mm
Blood Glucose (ABF)	14.6 mmol/dl	Sodium	133.2 mmol/L
Hemoglobin	13.0 g/dl	Potassium	04.10 mmol/L
WBC	25.23 K/ μ L	Chloride	99.50 mmol/L
RBC	5.36 M/ μ L	Carbon dioxide	22.50 mmol/L
Platelets	266 K/ μ L	Bicarbonate	21.20 mmol/L
Creatinine	0.72 mg/dl	ADA	16.3 U/L

Calories distribution in macronutrients:

Macronutrients	% of Total kcal/day	kcal/day	gm
Carbohydrate	55%	893	223
Protein	22%	357	89
Fat	23%	374	42

Meal distribution:

Meal	Percentage	kcal/day
Breakfast	27 %	439
Mid-morning snacks	08 %	130
Lunch	25 %	410
Afternoon snacks	08 %	130
Dinner	21 %	341
Mid night snacks	07 %	114

Menu planning:

Item	Weight per piece (g) or (ml)	Piece/Cup	CHO (g)	Protein (g)	Fat (g)	Calories (kcal)
Breakfast						
Ruti	30 g	3 pieces	49.7	7.5	1.2	246
Mixed vegetable	100g		7-10	1.0-1.5	0.4-0.6	30-38
Egg	30 g	1 piece		7	2.7	80
Milk	120 ml	1 cup	4.2	3.7	3.2	80
			63	19	7.5	441
Mid-morning snacks						
Lexus biscuit		4 pieces	14	1.4	3.6	93
Guava	50 g	1 piece	5	0.5	0.2	30
			19	2	4	123
Lunch						
Rice	120 g	2 cups	60	5.2	0.3	280
Fish	30 g	2 pieces		9.6	4	60
Dal	15 g	1 cup	6	4	0.3	50
Leafy vegetable	100 g		2	6	1.2	20
			68	24.8	5.8	410
Afternoon snacks						
Rice flaked	20 g	¼ cup	8	0.6		35
Apple	40 g	1 piece	6	0.1		40
Yoghurt (sour)	100 g		3.6	3.4	3	60
			18	4	3	135
Dinner						
Ruti	30 g	2 pieces	33	5	0.8	164
Chicken (leg,breast,liver)/ Beef (lean)/ Mutton (lean)	30 g	4 pieces		20-24	3-5	120-150
Dal	15 g	1 cup	6	4	0.3	50
			39	33	5	344
Mid night snacks						
Lexus biscuit		4 pieces	14	1.4	3.6	93
Egg without yolk		1 piece		4		20
			14	5.4	3.6	113
Cooking oil	10 ml				10	90

Suggestion:

- a. Eat fresh vegetables and leafy vegetables in large amounts. Reduce starchy vegetables.
- b. Eat apples and guava mainly in fruits.
- c. Eat brown rice, wheat, flaked.
- d. Drink milk and tea without sugar and always after 30 minutes of meal.

Restrictions:

- a. Reduce consume of processed grains.
- b. Avoid sugar and sugar-based product.
- c. Try to avoid fruit juice.
- d. Avoid processed food.
- e. Avoid starchy vegetables.

Patient: 05

Admission Date: 21.03.2024

Age: 71 years

Gender: Female

Height: 145 cm

Weight: 45 kg

BMI: 21.5 (Normal)

PAL: Sedentary

BMR: 839 kcal/day

Calorie requirement: 1007 kcal/day

Calorie requirement increased to 1200 kcal/day

- Admission reason: Ureteric calculi with CKD with Diabetes Mellitus.

Biochemical Test (Blood)	Result	Biochemical Test (Blood)	Result
Blood Glucose (F)	11.9 mmol/dl	ESR	34 mm
Blood Glucose (ABF)	13.6 mmol/dl	Sodium	131.9 mmol/L
HbA1c	8.5 %	Potassium	04.30 mmol/L
Hemoglobin	10.80 g/dl	Chloride	99.50 mmol/L
WBC	08.90 K/ μ L	Carbon dioxide	21.40 mmol/L
RBC	4.12 M/ μ L	Bicarbonate	20.10 mmol/L
Platelets	266 K/ μ L	Creatinine	2.59 mg/dl

Calories distribution in macronutrients:

Macronutrients	% of Total kcal/day	kcal/day	gm
Carbohydrate	55%	660	165
Protein	15%	180	45
Fat	30%	360	40

Meal distribution:

Meal	Percentage	kcal/day
Breakfast	23 %	276
Mid-morning snacks	08 %	96
Lunch	23 %	276
Afternoon snacks	09 %	108
Dinner	19 %	228
Mid night snacks	07 %	84

Menu Planning:

Item	Weight per piece (g) or (ml)	Piece/Cup	CHO (g)	Protein (g)	Fat (g)	Calories (kcal)
Breakfast						
Ruti	30 g	2 pieces	33	5	1.2	164
Mixed vegetable	100 g		7-10	1.0-1.5	0.4-0.6	30-38
Egg	30 g	1 piece		7	2.7	80
			41	13	4.5	279
Mid-morning snacks						
Apple	40 g	1 piece	6	0.1		40
Yoghurt (sour)	100 g		3.6	3.4	3	60
			9.6	3.5	3	100
Lunch						
Rice	120 g	1½ cups	45	3.9	0.2	210
Fish	30 g	1 piece		4.8	2	30
Mixed vegetable	100 g		7-10	1.0-1.5	0.4-0.6	30-38
			53	9.7	2.8	275
Afternoon snacks						
Lexus biscuit		1 piece	3.5	0.3	0.9	23.5
Tea with Honey	15 ml	1 tea sp.	6			24.5
Egg without white		1 piece		2.5	4.5	55
			9.5	3	5.5	103
Dinner						
Ruti	30 g	2 pieces	33	5	0.8	164
Chicken (leg,)/ Beef (lean)/ Mutton (lean)	30 g	2 pieces		5-6	1-2	30-37
Mixed vegetable	100 g		7-10	1.0-1.5	0.4-0.6	30-38
			42	11	3.5	232
Mid night snacks						
Lexus biscuit		1 piece	3.5	0.3	0.9	23.5
Guava	50 g	1 piece	5	0.5	0.2	30
			8.5	1	1	53.5
Cooking oil	15 ml				15	135

Suggestion:

- a. Always peel fruits and vegetable very well.
- b. Eat fresh vegetables and leafy vegetables in large amounts. Reduce starchy vegetables.
- c. Eat apples and guava mainly in fruits.
- d. Eat white rice, wheat, flaked.
- e. Drink tea without sugar and always after 30 minutes of meal.
- f. Limit fluid intake (1.5 to 2 liters/day).

Restrictions:

- a. Avoid salt during eating.
- b. Always consume low potassium fruits and vegetables.
- c. Avoid sugar and sugar-based product.
- d. Do not consume any types of legumes and seeds-based food.
- e. Try to avoid fruit juice.
- f. Avoid processed food.
- g. Avoid starchy vegetables.

APPENDIX 2: PLAGIARISM REPORT

DIETARY MANAGEMENT OF DIABETES MELLITUS PATIENTS AT AALOK HOSPITAL LTD. DHAKA, BANGLADESH

ORIGINALITY REPORT

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