Juvenile diabetes mellitus: An overview of Nursing care

Mr. Naveen Kumar. MR,
Associate Professor,
Arun College of Nursing,
Tumkur.

Asso. Prof. V. Suganya,
Dept. of Paediatric,
Narayana College of Nursing,
Chinthareddypalem,
Nellore.

Abstract: Childhood diabetes also referred as juvenile diabetes or growth onset diabetes, is characterized by wide range of metabolic abnormalities of carbohydrates, protein and fats in the body. Is an endocrine cum metabolic disorder of childhood and adolescence with far reaching effect on child’s physical and emotional development. Childhood diabetes is usually rapid onset and first presenting as diabetic coma and need injectable insulin to control diabetics. Trends of new case of diabetes is increasing gradually. Key words: Juvenile diabetes Nursing Care.

Introduction: Diabetes is an acquired heterogeneous group of disorder that share glucose intolerance in common. Type 1 diabetes is one of the most common endocrine diseases in children. Worldwide, an estimated 65 000 children under 15 years old develop the disease each year, and the global incidence in children continues to increase at a rate of 3% a year. The current incidence in the UK is around 26/100 000 per year. Between 10% and 70% of these diagnosed children present in diabetic ketoacidosis, a metabolic derangement characterized by the triad of hyperglycaemia, acidosis, and ketonuria. The current criteria for diagnosis published by the International Society for Paediatric and Adolescent Diabetes is blood glucose >11 mmol/L, venous pH <7.3 or bicarbonate <15 mmol/L, and ketonaemia and ketonuria.

The rising prevalence of type 2 diabetes mellitus (T2DM) in children and adolescents was initially recognized in the United States in the 1990s. Type II DM, which 15 years ago accounted for less than 3% of all cases of new-onset diabetes in children and adolescents, today accounts for up to 45% of new-onset cases among adolescents. Though the diagnosis was initially regarded with skepticism, T2DM is now a serious diagnostic consideration in all young people who present with signs and symptoms of diabetes. Subsequent studies conducted in Asia and Europe revealed a similar pattern, and, more recently, reports on T2DM in children and adolescents have begun to mount worldwide.

About 10-20% of all known case of Diabetes are Insulin dependent. This may occur at any age, but the peak incidence at puberty (between 11-12 years) and with smaller rise at 5-8 years. These two peak indicate a variation in the number and type of environmental factor such as viruses and 2 types of insulin dependent diabetes mellitus.

Twin studies indicate the 50% of identical twin of Type I diabetes parents develop the disease. If the parent has insulin dependent diabetes mellitus, the risk to the child is 1-5%. If the child has insulin dependent diabetes mellitus, the risk to the sibling is 5-10%.

CASE REPORT:
Master Venkatesh 16 years old boy was admitted in hospital with the complaints of giddiness, Polyuria, and weight loss and diagnosed as type 1 diabetes mellitus.

**Diagnosis:**
- Fasting blood glucose 107 mg/dl.
- HbA1c 7%.
- Ketone bodies -Positive.

**Management:** Insulin

<table>
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<th>Time</th>
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<th>Afternoon</th>
<th>Night</th>
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<td>8 Unit</td>
<td>6 Unit</td>
<td>10 Unit</td>
</tr>
<tr>
<td>Insulated</td>
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<td>-</td>
<td>10 Unit</td>
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**DISCUSSION:**

**Causes:**
- **IDD:**
  - Unknown.
  - Genetic pattern: Autosomal dominant type of inheritance.
  - Auto immune diseases especially virus that attack the pancreas decreases the Beta cell.

- **NIDD:**
  - Genetic factor: Histocompatibility locus antigen (HLA) in 6th chromosome.

**RISK FACTORS:**

**Type 2 diabetes in children**

Children at risk of type 2 diabetes include those who,
- are overweight (weigh more than 85% of children of similar age, sex, and height or weigh more than 120% of the ideal weight for height).
- have a parent, sibling, aunt, uncle, or grandparent who has type 2 diabetes.
- have high blood pressure, high blood levels of lipids (fats), obstructive sleep apnea, dark and thick skin folds on the nape of the neck, fatty liver, polycystic ovary syndrome (PCOS), or a small-for-gestational-age birth weight.
- have a mother who had gestational diabetes or has a history of diabetes.
- are not physically active.

**TYPES:**

The types of diabetes in children are similar to those in adults. The types include:

- Prediabetes
- Type 1 diabetes
- Type 2 diabetes

**Prediabetes** is a condition in which blood glucose levels are too high to be considered normal but not high enough to be considered diabetes. Prediabetes is more common among obese adolescents. It is temporary in over half of adolescents, but the remainder develop diabetes, especially those who continue to gain weight.

**Type 1 diabetes** occurs when the pancreas produces little or no insulin. Type 1 diabetes is the most common type among children. By age 18, 1 in 350 children has developed type 1 diabetes. The number of affected children has recently been increasing, particularly in children under age 5. Type 1 diabetes can develop at any time during childhood, even during infancy, but it usually begins between 4 to 6 years or between 10 to 14 years.

In type 1 diabetes, the pancreas does not produce enough insulin because the immune system attacks and destroys the cells in the pancreas that make insulin (islet cells).

Children who have type 1 diabetes are at higher risk of some other disorders in which the body’s immune system attacks itself (autoimmune disorders), particularly thyroid disease and celiac disease.

**Type 2 diabetes** occurs because the cells in the body do not respond adequately to insulin (called insulin resistance). Unlike in type 1 diabetes, the pancreas can still make insulin but cannot make enough insulin to overcome insulin resistance. This deficiency is often referred to as a relative insulin deficiency as opposed to the absolute deficiency seen in type 1 diabetes. Type 2 diabetes occurs mainly in adolescents but is becoming increasingly common among overweight or obese children. Until the 1990s, more than 95% of children who developed diabetes had type 1 diabetes, but now about one third of children newly diagnosed with diabetes have type 2 diabetes.
**PATHOPHYSIOLOGY:**

Due to etiological factors like genetic, environmental factor, viral infection and auto immunity

- Infiltration of islet with lymphocytes insulinitis
- Production of islet cell antibody
- Reaction of antibody with islet molecules such as insulin, IA-2/ICA-512
- Atrophy of islet cells
- Impairment of severe insulin secretion
- Destruction of beta cells of islets
- Development of symptoms like polyuria, nocturia, polydipsia, weight loss, polyphagia and fatigue

**CLINICAL MANIFESTATIONS**

**Type 1 diabetes**
- Excessive urination.
- Nocturia
- Glycosuria
- Unable to control their bladder during the day.
- Increase in thirst and the consumption of fluids.
- Lose of weight
- Impaired growth.
- Dehydration,
- Weakness,
- Fatigue,
- Lethargy
- Rapid visual pulse
- Nausea and vomiting.
- Blurred vision
- Abdominal discomfort mimics appendicitis or influenza or gastroenteritis

**Type 2 diabetes**
- Increase in thirst and urination
- Fatigue.

- Ketoacidosis
- Severe dehydration than those with type 1 diabetes.

**DIAGNOSTIC EVALUATION:**
- Fasting glucose level 126 milligrams per deciliter (mg/dl) or more.
- Random glucose level 200 milligrams per deciliter (mg/dl) or higher.
- Hemoglobin A1c (glycosylated hemoglobin) test: A1C level is 6.5% or higher are considered to have diabetes.
- Sometimes an oral glucose tolerance test: measurement of blood glucose level 2 hours later, if the level is 200 milligrams per deciliter (mg/dl) or higher.

**MANAGEMENT:**
- For type 1 diabetes, injections of insulin 0.2 units/kg/day.
- For type 2 diabetes, metformin by mouth and sometimes injections of insulin

**Nutrition:**

Children with either type of diabetes need to
- make healthy food choices, eating fruits and vegetables, whole grains, and high-fiber foods (for example, foods that have at least 3 grams fiber or more per serving).
- lose weight if overweight
- food should not contain many highly processed (refined) carbohydrates, particularly candy, baked goods (such as cookies, donuts, and pastries), and sugary drinks.
- avoid regular soda, sweetened iced tea, lemonade, fruit punch, and sports drinks. Foods with saturated fats, such as baked goods, snack foods (such as potato chips and corn tortilla chips), deep-fried foods (such as french fries), and fast food.
- increasing fiber by eating more fruits and vegetables.
- provide meals between every hour

**Exercise regularly:** Regular exercise is important because it improves glucose control and makes it easier to lose weight. Vigorous exercise can cause a significant drop in blood glucose, some children with type 1 diabetes may need to consume some extra
carbohydrates before and/or during a workout.

**Type 1 diabetes treatment**

To control blood glucose, children with type 1 diabetes take injections of insulin. There are several types of insulin regimens:

- Basal–bolus insulin regimen.
- Multiple daily injections (MDI) regimen.
- Premixed insulin regimens.

A **basal–bolus insulin regimen** involves taking one or two injections of a long acting insulin (basal dose) every day and then separate supplemental injections (bolus dose) of a short-acting insulin immediately before meals.

A **multiple daily injections (MDI) regimen** can be used if the basal–bolus regimen is not an option. In this regimen, children usually receive insulin before eating breakfast and dinner and at bedtime and receive a form of insulin that works quickly before eating breakfast and dinner.

**Premixed insulin regimens** use a fixed mixture of two forms of insulin: one that works quickly and lasts for only a few hours, and one that takes longer to work but lasts longer. The usual ratios of insulin are 70/30 (70% longer-acting and 30% shorter-acting) or 75/25. Children are given one injection at breakfast and one at dinner.

**Methods of Insulin delivery**

Insulin can be injected in several ways:

- Vial and syringe
- Insulin pen
- Insulin pump

**Vial and syringe** method of insulin is drawn up into a syringe from a vial and is injected under the skin, usually in the arm, thigh, or abdominal wall. Young children often use syringes with 1/2 unit markings to allow for smaller doses of insulin to be used.

An insulin **pen** contains a cartridge that holds enough insulin for several doses. The dose delivered on each injection is adjusted by turning the top of the pen.

An insulin **pump** continuously from a reservoir through a small, flexible tube (catheter) that is left in the skin. The catheter site must be changed every 2 to 3 days. More and more children are using insulin pumps, even young children.

**Type 2 diabetes treatment**

**Antihyperglycemic drugs:**

- Metformin
- Insulin

**COMPLICATIONS**

**Immediate complication**

- Diabetic ketoacidosis.
- Hypoglycemia
- Infection

**Long-term complications**

- Social and psychological issues
- Blood vessel problems.
- Diabetic retinopathy.
- Diabetic nephropathy
- Diabetic neuropathy
- Heart attack.
- Stroke.

**PREVENTION**

- Dietary changes
- Increase in physical activity
- Weight loss

**NURSING MANAGEMENT:**

**Monitoring of**

- vital Signs
- cardiac status
- blood glucose level
- intake and output

**Diet and Nutrition:**

**Insulin management:** common site of injection for the children is two deltoid muscle (upper outer portion of the arm), and outer aspect of the thigh (4 inches below the hip and 4 inches above the knee). Abdominal area may not be appropriate injection site because of poor musculature (just above and below the waist) Common site for adolescent and
adult is deltoid muscle, abdominal muscle and outer aspect of the thigh.

**Psychosocial care:** identification and management of anxiety, loneliness, depression, stress and withdrawal.

**Nursing Diagnosis:**

1. **Health seeking behavior related to self administration of medication**

**Intervention:**
- Assess due level of knowledge on self administration of medication.
- Explore the interrelationship of medication and glucose control.
- Discuss the possible insulin protocol for the parents and children.
- Discuss the importance of rotating the site of insulin administration.
- Demonstrate the insulin administration.
- Review the signs and symptoms of hypoglycemia and its immediate management.

2. **Health seeking behavior related to exercise,**

**Intervention:**
- Explore the interrelationship of exercise and glucose control.
- Advice the parents to provide carbohydrate snack prior to practice exercise.
- Review the signs and symptoms of hypoglycemia and its immediate management.
- No type of exercise is restricted for the children.
- Provide supervision during exercise.
- Avoid using exercised part for insulin injection.
- Maintain the exercise schedule.
- Keep complex carbohydrate ready before exercise.
- Encourage the use of protective equipments.

3. **Health seeking behavior related to diet**

**Intervention:**
- Explore the interrelationship of diet and glucose control.
- Advice the parents to provide 50-60% of calories from CHO such as grains, breads, fruits, milk and vegetables.
- Advice the parents to provide 10-20% of calories from protein such as meat, egg, cheese, and legumes.
- Advice the parents to provide 20-30% of calories from fats such as butter oil.
- Provide 3 meals and snacks
- Avoid skipping meals

4. **Health seeking behavior related to hygiene**

**Intervention:**
- Explore the interrelationship of Hygiene and infection control.
- Advice on skin care.
- Advice the importance of foot care.
- demonstrate the importance of foot care.
- Encourage the proper fitting of shoes.
- Emphasis the good perineal care.

5. **Parental anxiety related to newly diagnosed diabetes mellitus in children**

**Intervention:**
- Explain the disease process to the parents.
- Explain the parental role in care of children.
- Explain the lifestyle modification.
- explain the potential problems of children and its management.
- provide the contact details of child health care facility.

**CONCLUSION:** Diabetes mellitus is a chronic disease that needs continuous care. Difficulty to control the blood glucose level through dietary management through diabetic diet due to impact on growth and development of children due to poor nutritional status. Behavioral modification and emotional problems are huge among children with diabetes mellitus

**References:**