ROLE OF PHYSIOTHERAPY IN DIABETES REHABILITATION

Dr. Anand Chandra Sahoo, Assistant Professor,
Abhinav Bindra Sports Medicine & Research Institute, BBSR

Diabetes is a term that dates back to ancient Greece and means "passing through; a large discharge of urine." The significance is connected to frequent urination, a sign of diabetes.

The Latin word ***insipidus*** means lacking taste or flavor whereas the Latin word ***mellitus*** means pleasant taste, like honey/sugar.

Blood glucose, commonly known as blood sugar, is too high when you have diabetes mellitus. The additional glucose is attempted to be eliminated by your kidneys by being excreted in urine. But people with diabetes insipidus the blood glucose levels are normal, while their kidneys struggle to appropriately concentrate the urine.

❍ **Diabetes Insipidus**: The incidence is very rare 1 in 25,000 in general population which mostly occur in adult but can occur at any age, cause is due to hormonal abnormality known as Arginine Vasopressin (AVP) which also known as anti-diuretic hormone (ADH). This hormone's main function in our bodies is to keep the fluid balance and blood volume in check.

Ø Types of Diabetes Insipidus:[1]

❍ Central / Cranial Diabetes Insipidus

❍ Nephrogenic Diabetes Insipidus

❍ Dipsogenic Diabetes Insipidus

❍ Gestational Diabetes Insipidus

❍ **Diabetes Mellitus:** The majority of the world's population is affected by diabetes mellitus, a chronic metabolic illness that is defined by high blood sugar levels. The American Diabetes Association (ADA) classified diabetes into four categories which are:2

❍ Type 1Diabetes mellitus (5% to 10% of all cases of diabetes)occurs from absolute deficiency of insulin due to auto immune destruction of â cells found in the pancreas. This also includes latent autoimmune diabetes in adulthood.

❍ Type 2 Diabetes mellitus (90% to 95% of all cases of diabetes) is an insulin resistance and a progressive reduction in insulin secretion & largely attributed to physical inactivity and excess body weight known as obesity.

❍ Gestational Diabetes is diagnosed in the second or third trimester of pregnancy and was not present before the pregnancy.

❍ Specific types of diabetes are due to other causes such as monogenic diabetes syndromes, diseases of the exocrine pancreas, and drug or chemical-induced induced.

According to the American Diabetes Association, previous assumptions of Type 1 Diabetes occurring only in children and Type 2 Diabetes in adults are now outdated as the two conditions can be expressed both in adults and children alike.[2]

❍ In **Diabetes Insipidus**, the blood glucose level will be normal, but the patient will have severe dehydration due to greater fluid loss from the body, which could lead to an electrolyte imbalance and weakness. In Diabetes Insipidus, the blood glucose level will be normal, but the patient will have severe dehydration due to greater fluid loss from the body, which could lead to an electrolyte imbalance and weakness.

❍ **Diabetes mellitus**, a chronic metabolic disorder caused by a deficiency in the pancreatic hormone insulin, damages a number of bodily systems, most notably the cardiovascular, neurological, musculoskeletal, and integumentary ones. It also has an impact on a number of specific organs, including the eyes, kidneys, nerves, and heart, which raises the risk of comorbidities

❍ **Acute complications of diabetes Mellitus**[3]

· Hypoglycemia

- Diabetic ketoacidosis
- Hyperosmolar nonketotic coma

❍ **Chronic complications of diabetes Mellitus**[4]

❍ **Microvascular complications include**:

- Retinopathy
- Nephropathy
- Neuropathy

❍ **Macrovascular complications include:**

- Cardiovascular disease
- Peripheral vascular disease
- Stroke

In medical interventions, oral medications & insulin therapy play a significant role in diabetes Mellitus management but a multidisciplinary approach that includes collaboration between physiotherapists, endocrinologists, dietitians, and other healthcare professionals is very much crucial to prevent complications, enhancement of overall well-being, and improving the quality of life in the context of diabetes as a holistic approach.

REHABILITATION FOR DM:

- **Peripheral Neuropathy:** This is a common complication of diabetes that affects the nerves, often leading to pain, numbness, tingling in the extremities, and balance problems. Physiotherapists provide neurodynamic techniques that include neural mobilization of peripheral nerves and sensory re-education to help manage symptoms and improve nerve function.[5] Balance training exercises are proven to be the most effective strategy for peripheral neuropathy patients with balance problems as well as gait disturbances.[6]
- **Diabetic Foot Ulcers and Neuropathic Foot:** Physiotherapists can educate patients about proper foot care techniques to prevent foot ulcers and infections. Physiotherapists can educate individuals about proper foot care and provide exercises to improve foot mobility, strength, and circulation. These measures can prevent complications and promote overall foot health. They may also provide exercises to improve foot strength and mobility, as well as guidance on appropriate footwear to minimize the risk of complications. Low-intensity laser therapy has been found to be very effective in the management of foot ulcers.[7]
- **Cardiovascular Complications:** Diabetes increases the risk of cardiovascular issues such as heart disease and peripheral vascular disease. Physiotherapists can design exercise programs like aerobics exercises (low to moderate intensity), progressive resistive exercises, endurance training, etc. to improve cardiovascular fitness & and overall heart health. Studies have shown that type 1 diabetes exercises play a vital role which can help to improve insulin sensitivity as well as regulate blood sugar levels[8], and manage blood pressure and cholesterol levels whereas in the case of type 2 diabetes, it helps to maintain a healthy weight with individuals having diabetes.[9]
- **Musculoskeletal Pain:** Diabetes can contribute to muscle and joint pain. Physiotherapists use different techniques in manual therapy to improve joint ROM, Progressive resistance exercises for maintenance/ improve muscle strength, and different modalities like TENS and static magnetic field therapy to alleviate neuropathic pain[10], and enhance overall musculoskeletal function.
- **Frozen Shoulder (Adhesive Capsulitis):** Diabetes is associated with an increased risk of frozen shoulder, a condition that causes stiffness and pain in the shoulder joint. Physiotherapists can provide mobilization techniques & strengthening exercises to improve shoulder mobility and reduce discomfort. Different electro modalities like transcutaneous electrical nerve stimulation (TENS), Interferential Current (IFT), Low-level laser therapy (LLLT) & therapeutic ultrasound are beneficial to adhesive capsulitis.
- **Balance and Gait Issues:** Peripheral neuropathy and other factors can affect balance and increase the risk of falls in individuals with diabetes. Physiotherapists can design balance training programs to improve stability and reduce fall risk thereby preventing injuries, and enhancing safety & confidence in daily activities.
- **Physical Inactivity:** Many studies have shown an association between physical inactivity and individuals with diabetes. Physiotherapists can develop exercise

plans tailored to an individual's abilities and preferences, encouraging regular physical activity.[11]

· **Obesity and Weight Management:** Obesity is a risk factor for type 2 diabetes and can exacerbate complications like hypertension and cardiovascular complications. Physiotherapists can contribute to weight management by designing exercise programs that support weight loss and improve metabolic health.

· **Stress and Mental Health:** Stress can negatively impact blood sugar control. Chronic stress, depression, and anxiety can increase glucose levels in the blood. Physiotherapists may incorporate relaxation techniques, breathing exercises, and mindfulness practices to help individuals manage stress and enhance overall emotional well-being.[12]

· **Circulation Issues:** Diabetes can affect circulation, leading to impaired wound healing and increased risk of infections. Physiotherapists can recommend mobility exercises and aerobics to improve blood flow and support wound healing. BFRT is a novel approach for type 2 diabetes which helps in protein synthesis and biogenesis of mitochondria.[13]

· **Lifestyle Modification:** Overall physiotherapists can provide education on healthy lifestyle behaviors, including proper nutrition, hydration, and sleep. This comprehensive approach can contribute to better diabetes management. Physiotherapists educate individuals about the importance of physical activity, proper footwear, and injury prevention strategies. They also assist in making necessary lifestyle modifications, such as maintaining a healthy weight and managing stress.[14]

REHABILITATION FOR DI:

Diabetes insipidus can have a variety of causes, and an interprofessional team composed of a pharmacist, nurse practitioner, and physician are the greatest resource for treating the condition. Education of patients is essential. Hydration, electrolyte replacement, and management of the underlying disease that is producing DI are the three critical steps.

Therefore, the physiotherapist's involvement in treating this problem symptomatically to improve quality of life, and if the condition is linked to other comorbidities, it becomes extremely important for the rehabilitation.

Conclusion:

Physiotherapy plays a significant role in managing diabetes because it addresses a variety of issues. In addition to its physical benefits, it also contributes to improved mental health and a higher standard of living.

References:

1.Christ-Crain M, Bichet DG, Fenske WK, et al. Diabetes insipidus. Nature Reviews. Disease Primers. 2019;5(1):54. doi: 10.1038/s41572-019-0103-2.

2.American Diabetes Association. "Diagnosis and Classification of Diabetes Mellitus." Diabetes Care 33, no. Supplement_1 (January 1, 2010): S62–69. https://doi.org/10.2337/dc10-S062.

3.Bagheri, Shahrokh C. "Medical Conditions." In Clinical Review of Oral and Maxillofacial Surgery, 489–538. Elsevier, 2014. https://doi.org/10.1016/B978-0-323-17126-7.00015-7.

4.Deshpande, Anjali D, Marcie Harris-Hayes, and Mario Schootman. "Epidemiology of Diabetes and Diabetes-Related Complications." Physical Therapy 88, no. 11 (November 1, 2008): 1254–64. https://doi.org/10.2522/ptj.20080020.

5. Domingues, Márcio. "Diabetic Peripheral Neuropathy and Neurodynamics." International Physical Medicine & Rehabilitation Journal 3, no. 1 (February 2, 2018). https://doi.org/10.15406/ipmrj.2018.03.00075.

6. Akbari, Mohammad, Hassan Jafari, Afsaneh Moshashaee, and Bijan Forugh. "Do Diabetic Neuropathy Patients Benefit from Balance Training?" The Journal of Rehabilitation Research and Development 49, no. 2 (2012): 333. https://doi.org/10.1682/JRRD.2010.10.0197.

7. Beckmann, Kathrin H., Gesa Meyer-Hamme, and Sven Schröder. "Low Level Laser Therapy for the Treatment of Diabetic Foot Ulcers: A Critical Survey." Evidence-Based Complementary and Alternative Medicine 2014 (2014): 1–9. https://doi.org/10.1155/2014/626127.

8. Lin, Yajuan, Rui Fan, Zhujing Hao, Jiatian Li, Xiaolei Yang, Ying Zhang, and Yunlong Xia. "The Association Between Physical Activity and Insulin Level Under Different Levels of Lipid

Indices and Serum Uric Acid." Frontiers in Physiology 13 (February 2, 2022): 809669. https://doi.org/10.3389/fphys.2022.809669.

9. Borghouts, L. B., and H. A. Keizer. "Exercise and Insulin Sensitivity: A Review." International Journal of Sports Medicine 21, no. 1 (January 2000): 1–12. https://doi.org/10.1055/s-2000-8847.

10. Nazeri, Armin, Ali Mohammadpour, Mohammad-Hadi Saeed Modaghegh, and Mojtaba Kianmehr. "Effect of Static Magnetic Field Therapy on Diabetic Neuropathy and Quality of Life: A Double-Blind, Randomized Trial." Diabetology & Metabolic Syndrome 15, no. 1 (July 4, 2023): 148. https://doi.org/10.1186/s13098-023-01123-9.

11. Brugnara, Laura, Serafín Murillo, Anna Novials, Gemma Rojo-Martínez, Federico Soriguer, Albert Goday, Alfonso Calle-Pascual, et al. "Low Physical Activity and Its Association with Diabetes and Other Cardiovascular Risk Factors: A Nationwide, Population-Based Study." Edited by Jose Vina. PLOS ONE 11, no. 8 (August 17, 2016): e0160959. https://doi.org/10.1371/journal.pone.0160959.

12. Sharma, Kapil, Shivani Akre, Swarupa Chakole, and Mayur B Wanjari. "Stress-Induced Diabetes: A Review." Cureus, September 13, 2022. https://doi.org/10.7759/cureus.29142.

13. Saatmann, Nina, Oana-Patricia Zaharia, Jeremy P. Loenneke, Michael Roden, and Dominik H. Pesta. "Effects of Blood Flow Restriction Exercise and Possible Applications in Type 2 Diabetes." Trends in Endocrinology & Metabolism 32, no. 2 (February 2021): 106–17. https://doi.org/10.1016/j.tem.2020.11.010.

14. Harris-Hayes, Marcie, Mario Schootman, Jeffrey C. Schootman, and Mary K. Hastings. "The Role of Physical Therapists in Fighting the Type 2 Diabetes Epidemic." Journal of Orthopaedic & Sports Physical Therapy 50, no. 1 (January 2020): 5–16. https://doi.org/10.2519/jospt.2020.9154.

AOPSA members attended a CPE Programme at AMRI Hospital, BBSR on the eve of World Physiotherapy Day