EFFECTS OF YOGA AND EXERCISE ON JUVENILE DIABETIC PATIENTS: A REVIEW

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ABSTRACT

Juvenile diabetes is one of the most popular non-communicable chronic diseases in the whole world. It is also known as type 1 diabetic Mellitus. As compare to type 2 it spread more among children rather than adult people. Children from the age group of 10 to 16 get more affected by juvenile diabetes. In juvenile diabetes, the insulin level of the person gets increased that increased the blood sugar level of the person. It attacks to the eye vision as well as the nervous system of the people. Stress is the most common symptom found in this chronic disease. It is quite difficult to cure this disease with medicine as it can only be managed.

Yoga is an ancient Indian science that is used as a therapy for various diseases. Proper yoga and exercise help in managing juvenile diabetes. Performing various asana and pranayama helps in smoothing the function of the insulin as well as it helps in maintain the blood sugar level. Yoga therapy helps in improving the status of diabetes by reducing the drug doses and aerobic exercises help in the prevention of complications.

Keywords: Juvenile diabetes, type 1 diabetic Mellitus, Yoga, Aerobic exercise, and Insulin

I. INTRODUCTION

In the last five years, information on insulin-dependent onset diabetes has been rapidly increased. The development of juvenile-onset diabetes involves the association of a small number of viruses. Juvenile diabetes can be defined as an autoimmune disorder and it is also known as type 1 diabetes. Juvenile diabetes is mostly diagnosed in adolescence. In the present time, the increment in juvenile diabetes patients has been increased due to changing lifestyle as well as changing in food habits. Juvenile type 1 diabetes not only takes place in children however this kind of case is seen among adults too. In this type of condition, the blood sugar level of the person gets high with the presence of a high amount of sugar in the blood. The most common age found for juvenile diabetes has been found between 10 to 16 years old.

This is the age when puberty triggers and there is a chance of hormonal imbalance in this age. These hormones include estrogen and testosterone that affect the sugar level. Family history, toxins, and infections as well as rapidly changing the lifestyle of the people are responsible for causing type 1 juvenile diabetes. In this study, there will be a discussion of the effect of yoga and exercise on juvenile diabetic patients. Yoga and exercise help in reducing the blood sugar level among the patients and their positive significance has been discussed in the study. In the treatment of type 1, diabetes exercise play an important role and helps in the person active throughout life.

II. LITERATURE REVIEW

Juvenile diabetes

Causes of juvenile diabetes

Juvenile diabetes is most common among children from the age group between 10 to 16 years old. Juvenile diabetes is also caused among adult people however, the rate is less as compared to children. The exact cause of juvenile diabetes is not known, however, in most people, it is caused where the immune system of the people fights with the harmful bacteria and viruses that enter the body and destroy insulin. Insulin in the body is responsible for producing the pancreas cells. It is rapidly increasing in children and the changing of the style has...
been the most important reason for this disease (Thakur et al. 2021). In today’s time, the physical work of the children has been reduced and most of the time children get a buddy on a laptop, smartphone as well as playing computer games. Not having the physical movement increase weight gain, fat deposition in abdomen area that is responsible for causing juvenile diabetes.

Children have switched to junk food rather than eating a balanced diet has also created an adverse impact on their bodies. The reason for spreading juvenile diabetes among children is due to these two reasons. Apart from these two reasons various other factors are also responsible for cruising this disease such as family history, genetic, infection as well as race. As per Wang et al. (2020), most of the children genetically inherited this disease from their ancestors. The infection causes the body to destroy the islet cells that are responsible for developing pancreas cells into insulin. It also led to juvenile diabetes.

People of any age can get affected by juvenile diabetes due to the unhealthy environment as well as unhealthy food present in the market. Causing juvenile diabetes can attack the nervous system, kidney damage, eye damage as well as osteoporosis. Causing this diabetes can damage the blood vessels of the retina that causes vision problems among people.

**Symptoms of juvenile diabetes**

In type-1 diabetes of children production of hormone is disrupted significantly, children body is unable to produce insulin. The human body requires insulin to survive, to maintain this problem insulin pump is used. Type-1 diabetes of children is also called insulin-dependent diabetes. With the help of little effective information, it is noticed that it is impossible to overcome Type-1 diabetes properly; however, it is possible to manage this disease. Few effective symptoms are noticed in type-1 diabetes of children such as fatigue, irritability, behavior changes, fruity-smelling breath, cardiovascular changes, slow heart-rate, breathing trouble, extreme hunger, and increased thirst. On the other ad, frequent urination is a common symptom of this disease. Genetics and family history are the effective cause of this disease. The risk of type-1 diabetes is increased rapidly due to certain genes. On the other hand, few autoimmune destructive viruses are also responsible for this disease (Bimstein et al. 2019).

Production of insulin is decreased in the body due to the lack of proper activity of islet cells. With the help of few resources, it is noticed that 50-90% beta cell are destructed in this disease. Blood vessels are impacted poorly by this disease, blood vessels are shrieked surprisingly. Due to this problem risk of high blood pressure is increased rapidly. The risk of kidney damage is also increased due to type-1 diabetes in Children. Numerous tiny blood vessels are clustered due to this disease. This disease directly has an impact on the eye; blood vessels of the retina are destroyed by type-1 diabetes. Along with this, the immune system of the body is also impacted poorly by this disease. Due to lack of proper insulin sugar is build up in the bloodstream of children. Jasem et al. (2019) stated that, young people's diabetes rates are on the rise. Children and teens can benefit from early detection and treatment throughout their lives, improving their health and well-being.

**Prevention from Juvenile diabetes**

Total cure of type-1 diabetes is not possible. However, this disease is manageable. It is important to learn about this disease to prevent it. Preventing type 1 diabetes in those who are at high risk of developing the illness and it is important to find out at least one medication that may slow down the disease progression. This factor can help to prevent the destruction of islet cells. Due to this factor children's bodies can produce insulin hormone easily. To manage this disease it is important to maintain good blood sugar control of children. Providing a healthy diet for children can play a crucial role in managing this disease. Along with this, it is important to maintain regular visits with children's diabetes doctors. Initial diabetes treatment can manage this disease properly. On the other hand, it is important to maintain the regular physical activity of children. This prevention can control the growth and impact of this disease in children’s bodies. On the other hand, lifelong insulin use is common prevention for this disease (Klein 2020).

**Effect of exercise on juvenile diabetes patients**

Exercise plays an important role in controlling juvenile diabetes among people. Blood glucose regulation gets improved by performing exercises and helps in reducing the insulin dosage. The risk of diabetes associated with compliances in people decreases by performing exercises regularly. Aerobic exercise including walking, jogging, and running helps in decreasing the insulin level to maintain glycemic control in the body (Azami et al. 2019). Performing physical activities helps in improving lipid levels in juvenile diabetic patients. Aerobic exercise helps
in increasing the beta cells in the insulin levels. Exercise acts as a protective agent that reduces the damage of oxidative stress on beta cells. Vascular complications get improved by performing the exercise as it helps in reducing dyslipidemia and control oxidative stress. Heart rate variability among juvenile patients gets increased by performing low-level exercise and helps in early cardiac autonomic neuropathy abnormalities.

Figure 1: Changes in plasma levels of glucose and insulin during prolonged cycling at 65% to 70% of VO2 max. With the help of exercise gradual decline of insulin is shown. during prolonged effort sensitivity is increased in insulin.

Aerobic exercise is mostly preferred in juvenile diabetes that helps in improving oxygen consumption as well as helps in increasing the cardiovascular functioning and respiratory systems. In type 1 diabetic patients exercise helps in increasing the blood glucose as well as utilization of muscles that help in increasing the hepatic glucose production (Choudhary et al. 2019) Regular performance of exercise helps in raising the plasma catecholamine level that produces a surge in the glucose production. Swimming, walking, running, jumping rope are the common aerobic exercises that are performed in juvenile exercise. All the physiological parameters such as glycemic control, fasting blood glucose level and lipid profile get improved with Aerobic exercise. Arterial stiffness gets improved with the exercises and all the endothelial function gets restored. It reduces the risk of developing cardiovascular complications in juvenile diabetes. In type 1 diabetes it acts as a valuable therapeutic strategy (Singh et al. 2019).

Resistance exercise helps in developing the proper glucose control in the juvenile diabetes patient. These exercises are performed to enhance the resistance capability of the body and they are performed against the resistance. The proper management of blood glucose levels in juvenile diabetes can be done by the combination of resistance exercise as well as aerobic exercise. Muscle mass gets increased by resistance training and has a major contribution to blood glucose uptake. As per Solanki et al. (2020), aerobic exercise helps in reducing their insulin and they are independent of changes in the aerobic capacity as well as the muscles mass.

Endurance exercise, as well as passive exercise, are the various forms of exercise that help in controlling juvenile diabetes among people. In endurance exercises a group of muscles is used that depends on the delivery of oxygen through the cardiovascular system.

Effect of yoga and exercise on juvenile diabetes

Juvenile diabetes can be defined as an autoimmune condition that can not be cured by changing the lifestyle of the person. There is no proper diet as well as exercise that can restore the beta cells in the pancreas. Yoga and exercise help in the management of type 1 diabetes that is known as juvenile diabetes. Resistance exercises are the exercises that need equipment for performing exercises. Insulin sensitivity is as well by daily energy
expenditure gets enhanced by performing the exercises. Muscles strength, bone mineral density as well as daily expenditure gets increased with the resistance exercise. Functional status and glycemic control gets controlled with this kind of exercise and helps in the prevention of sarcopenia and osteoporosis.

Improving Insulin Administration and Digestion *Gupta et l. 2020*

Performing yoga regularly will help in increasing the blood supply to other parts of the body that will help in better absorption of insulin in the injection site. Proper yogic asana helps in improving digestion that incorporates twisting. The body function of the person gets stress in the type 1 diabetes. It raises the level of glucagon, cortisol, and epinephrine which raise the blood sugar level by reducing insulin. Stress is the most common symptom found in type 1 diabetes due to a reduction in insulin. The effect of stress gets reduced by yoga as it helps in decreasing the level of cortisol (Taheri et al. 2018). The function of the endocrine glands gets better with yoga as it relaxes the sympathetic nervous system.

Proper yoga and exercise help to live a disciplined life as well as helps in developing the feeling of self-care and self-love. Yoga Experts help the patients to breathe through challenging poses. Yoga therapy consists of various sets of exercises that help in reducing the blood sugar level. These exercises are much simpler and can be done by everyone regularly. The asana performed in diabetes helps in balancing these muscles as well as provides strength to the one. Proper yoga will help in enhancing the posture as well as improving breathing. Asanas hold the muscles that help in relaxing them by gently stretching positions. Relaxations of muscles, autoimmune system, and mind will help to provide mental relaxations. Pranayama helps in linking the mind and body. Conscious and unconscious neural pathways are controlled through breathing and it acts as a bridge between the mind and the body. Health can be improved through the breathing pattern that helps in the maintenance of chronic ailments (Kumar 2021).

Stretching during yoga helps in the rejuvenation and regeneration of the pancreas beta cells and other cells of islets that increase the metabolism of glucose in the liver, peripheral tissues, and adipose tissues in the enzymatic process. Improvement of blood supply helps in enhancing the insulin receptor expression that causes in the increasing the glucose that reduces the blood sugar. Lipid levels get improved after yoga as hepatic lipase gets increased, which helps in the increment of triglycerides by adipose tissues (Singh and Teddy 2017). Sensitivity of the beta cell of the pancreas gets better that improves insulin secretion. Various inflationary and deflationary lungs get modified through pranayama and interact with the central neural element that helps in the body to bring new homeostasis. Yoga has a significantly positive impact on the health of juvenile diabetic patients.

III. MATERIAL AND METHODS

Assessment of biochemical parameters of juvenile diabetic patients has been done before and after 40 days. Sixty people were chosen for the assessment and classified into two groups based on their ages. The diagnosis of the patients was done according to the WHO criteria. In two groups the patients were divided in the first group children up to 10 or 16 years were taken and in the second group children above 5 years old were considered. In the first group, 30 patients were involved of which 20 were male as well as 10 belonged to female categories. Juvenile diabetic groups belonged to the yoga group and they performed Yogic asana for 40 days. With the yogic asana, they followed the proper diet plan and include diabetic medicines. These patients were allowed to perform pranayama as well as exercise for 30 minutes every day. The patients were placed under the supervision of a yoga expert for 40 days in the yoga laya. (Meyer et al. 2019)

The exclusion criteria involved in this study was the patients who were more than 20 years old did not participate. Patients whose BMI was greater than 25 were not allowed to participate as they faced difficulties in performing yoga and exercise. The patients who were involved in any kind of yoga or exercise were also not allowed to participate in this study.
Figure 2: Changes in glycosylated hemoglobin before and after 40 days in yoga group of juvenile diabetic patients
(Source: Sharma and Gupta 2014, p.543)

Out of 60 patients, 30 patients were provided a prescribed diet as well as antidiabetic medicines and they were allowed to perform pranayama and asana for 40 days. The baseline values before commencing the yoga as well as after completion of yoga were recorded. The observations help to know the results. Yoga experts were present to teach yoga as well as exercises to the patients (Shanthi et al. 2018). The duration from performing exercise was about 40 minutes in the morning. Patients were allowed to perform yoga in the morning on an empty stomach to get more positive results. Participants were allowed to perform savasana between the asanas that helped them to normalize their breathing.

Table 1: name and duration of Yogic exercise performed by Juvenile patients.

<table>
<thead>
<tr>
<th>S.No</th>
<th>Name of the Asanas</th>
<th>Total Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Pawanmuktasana</td>
<td>2 minute</td>
</tr>
<tr>
<td>2.</td>
<td>Suryanamaskar</td>
<td>2 minute</td>
</tr>
<tr>
<td>3.</td>
<td>Naukasana</td>
<td>1 minute</td>
</tr>
<tr>
<td>4.</td>
<td>Mandukasana</td>
<td>2 minute</td>
</tr>
<tr>
<td>5.</td>
<td>Shavasana</td>
<td>3 minute</td>
</tr>
<tr>
<td>6.</td>
<td>Anulom Vilom Pranayam</td>
<td>5 minute</td>
</tr>
<tr>
<td>7.</td>
<td>Om chanting</td>
<td>2 minute</td>
</tr>
</tbody>
</table>

30 juvenile patients were kept on diet as well as put on medical therapy that was prescribed by the doctors. The baseline for this group was biochemical parameters and get evaluated after 40 days. Fasting blood glucose (FBG), Glycosylated Hemoglobin (HbA), Post Prandial Blood Glucose (PBGB) and lipid profile were the parameters used in the biochemical investigation. Serum cholesterol, serum low-density Lipoprotein (LDL), serum very low-density Lipoprotein (VLDL) were considered in the lipid profile. SPSS programmed versions of 16.0 software were used for analyzing data related to the biochemical tests. As a form of Mean± S.D. these data were expressed. T-test was used for comparing the changes in the biochemical parameters at the starting of the test as well as after the completion of the test. An Independent t-test was done to compare the changes in both the parameters (Khedikar and Erande 2019).
Most of the juvenile diabetic patients come from the age group of 11 to 20 years. The yoga group contains 20 patients in this age group.

IV. RESULT WSXAND DISCUSSION

This study is about the effect of yoga and exercise on juvenile diabetic patients. In the study, it has been found that fasting blood glucose (F MG), Glycosylated Hemoglobin (HbA1C), Post Prandial Blood Glucose (PPBG) and lipid profile are the basal parameters that are included in the biochemical investigations. Results from the statistical analysis show that performing yoga helps in decreasing the blood sugar level among the children as well as helps in keeping diabetes in control. It has been found that the sensitivity of the B cells of the pancreas to the glucose signal increased due to performing asana. This study is important as it shows the mechanism that how yoga reduces the blood sugar level. There has been significantly fulfilling the glucose levels in the yoga group as has been seen in this study. Glycosylated hemoglobin in the patients was decreased in the yoga practices.

Figure 3: Effect of yoga therapy on serum lipid parameters in juvenile diabetics patients

(Source: Torness et al. 2020, p.234)

With the help of proper exercise, long-term complications can be avoided. It helps in controlling blood pressure as well as provides better control on the weight.
Figure 4: Juvenile patients involved in aerobic exercises
(Source: Jones et al 2019, p.765)

Reasons for decreasing the HbA1c have not been known. Reduction in glycosylated Hb is important as it saves the fast development of various macrovascular and microvascular complications of diabetes mellitus. LDL and VLDL present in the body helps to prevent the body from the development of hypertension in the early stage. Lipid profile gets improved after yoga and exercise that has a major impact on the metabolism of lipoprotein that increases the uptake of triglyceride by adipose tissue. Yoga helps to reduce the state of anxiety in the mind and helps to maintain a proper balance between sympathetic and parasympathetic systems. It helps in overcoming the stress that helps in improving the lipid profile. The metabolic activity of the patients increased through the meditation as well as it helps in reducing the adrenocortical activity (Sarma 2019). Without any side effects, the patient develops a sense of wellbeing and feels motivated. Yoga practices, as well as asana, helps in reducing obesity among the children as well as creating a better sense of activeness among them.

The status of diabetes gets improved among the children that decrease the drugs dose, prevention of complications as well as mental alertness. It has been found that yoga and exercise showed a positive response as therapy among juvenile patients. At the starting age due to genetic problems or the changing style and food habits of the children are responsible for creating diabetes among them. Having a proper diet with yoga and exercise helps in controlling the diabetes level. Both the primary and secondary prevention of diabetes can be done with the help of proper Yoga and exercise.

V. CONCLUSION

In this article, we have discussed the effect of yoga and exercise on juvenile diabetes patients. Yoga and exercise have a positive impact on the health of juvenile yoga patients. It has been concluded juvenile diabetes is more common among the children age group between 10 to 16 as compared to an adult. The reasons found for juvenile diabetes among the children are family history, changing lifestyle as well as bad food habits. Most of the children spent their time on the computer, smart phone, laptop as well as television. This has increased the blood sugar level of the children. Performing yoga and exercise helps in improving the metabolic activities among the children as well as reducing the blood sugar level.

In the study, it has been found that most of the patients who were performing yoga and exercise got a lot of benefits from the other group who were not performing yoga. Diabetes patients of type 1 feel more benefited from exercise and yoga as compared to the other patients.
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