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Journal of Diabetes Education

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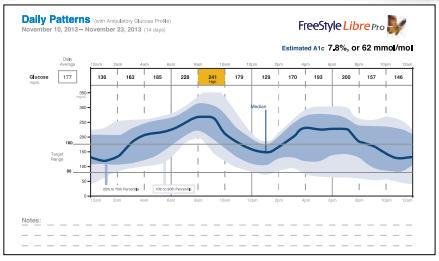

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JOURNAL OF DIABETES EDUCATION

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CONTENTS

YOGA: STRESS & DIABETES

Madhumita Tulli *

There is sufficient proof that stress leads to insulin resistance, obesity and type 2 diabetes mellitus and also hinders its management. In order to overcome the ill effects of stress, relaxation techniques are used as major preventive strategies. Evidence from real-world setting has showed that stress-management is cost-effective when applied to groups in providing clinically significant benefits for subjects with type 2 diabetes mellitus. It is essential to be reminded that these methods complement and do not replace conventional treatment of diabetes. Vigorous exercise increases the body's energy thus keeping the muscles in a state of constant readiness. Yoga asanas are a technique for retraining the muscles to be able to relax.

Yoga in Diabetes

Yoga is a term derived from Sanskrit, which means 'to join together.' It combines stretching, attaining good posture through various poses, controlling the breathing and meditation. A variety of yogic exercises practiced include relaxing and restorative formations, slow free-flowing movements (Anusara Yoga) and strenuous poses to improve the flexibility and agility. Considering that diabetes is increasing in India and its medical management is bound to be expensive, yoga has been included in the management of diabetes. The chief advantages are that it is an inexpensive, and more importantly a holistic approach to control diabetes. More recently several well-planned studies have demonstrated the beneficial effects of yogic practices in diabetes.

Various studies on yoga suggest that patients with diabetes experience a significant fall in fasting and post prandial blood glucose HbA1c value with reduction in the requirements of oral hypoglycemic agents and insulin. Some of these studies also claim beneficial effect of yoga on the lipid profile, with an increase in HDL cholesterol levels. Certain asanas have been identified to have beneficial effects in terms of glycemic control, reduction in requirements for medications, insulin kinetics and also producing a sense of well being. These asanas have also been shown to increase the lean body mass and decrease the body fat content. Long term follow up of subjects practising these asanas regularly has shown that these benefits are sustained and the drug requirements are lower with lower rates of infections, ketoacidosis, hypoglycemia and improvement in exercise tolerance.

Yogic practices have been shown to increase the number of insulin receptors, while bringing about a decline in insulin levels and improvement in insulin-glucose ratio. Plasma free fatty acid levels have also been shown to decrease. This suggests that the regular practice of yoga improves the insulin sensitivity and leads to better utilization of insulin.

A number of recent studies have demonstrated the beneficial effects of yogic practices in diabetes and obesity: yogic breathing (Pranayam) improved physical, psychological and social domains and quality of life. In comparison, physical training exercises also improve exercise tolerance with concomitant increase in oxygen consumption while yogic practices seem to do so without increasing the oxygen consumption. Thus yogic practices have a useful role in the control of diabetes and prevention of its long-term complications.

Role of Yoga in Prevention of Diabetes

Studies are being conducted to understand how yoga exerts its beneficial effects .Yoga postures for diabetes switch back and forth between asanas (poses) that contract specific areas of the abdomen and asanas that relax those areas. This alternation between abdominal contractions and release may stimulate the pancreas, increasing blood and oxygen supply although a clear proof of the same is lacking.

In addition to postures that may stimulate the pancreas and aid in insulin production, the soma yoga postures reduce blood sugar levels and helps relieve one of the main symptoms of diabetes treated with medications, which is hypoglycemia. Yogic exercise has also been shown to reduce LDL cholesterol and triglyceride levels, both of which are often coexist with diabetes.

In addition to breathing exercises and yoga postures

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for diabetes, the meditation segment included in most yoga for diabetes classes has been shown to encourage proper functioning of the endocrine glands through relaxing the sympathetic nervous system. In addition, yoga is reported to stabilize the sympathetic and parasympathetic nervous system, and down-regulate the hypothalamo-pituitary-adrenal axis.

Techniques Used For Stress Reduction

People who undergo regular yoga training experience improvements in their mental and physical health as regular practice of yoga can help reduce levels of stress, enhance mobility and improve overall wellbeing

- Progressive Muscle Relaxation

  Progressive muscle relaxation is a technique for reducing stress and anxiety by alternately tensing and relaxing the muscles. It was developed by American physician Edmund Jacobson who stated that since muscle tension accompanies anxiety; one can reduce anxiety by learning how to relax the muscular tension.

- Autogenic Training

  Autogenic Training is a self-relaxation procedure by which a psycho-physiological determined relaxation response is obtained. The Autogenic Training aims to achieve deep relaxation and reduce stress.

- Relaxation response

  Dr. Herbert Benson of Harvard University found that there is a counterbalancing mechanism to the stress response: just as stimulating an area of the hypothalamus can cause the stress response, so activating other areas of the brain results in its reduction. He defined this opposite state the Relaxation Response. It is a simple practice that once learned takes 10 to 20 minutes a day to achieve relaxation. The important characteristics of a relaxation program are:

  a. Repetition of a word, sound, prayer, thought, phrase or muscular movement, through which concentration is achieved

  b. Passive return to the repetition when other thoughts intrude.

- Biofeedback

  Biofeedback is a process that enables an individual to learn how to change physiological activity for the purposes of improving health and performance.

- Guided imagery

  Dr. Joseph Wolpe introduced several imagery-related techniques in behavior-modification therapy: systematic desensitization, aversive-imagery methods, symbolic-modeling techniques and implosive therapy.

- Diaphramatic Breathing

  The natural act of breathing has been used as a means of relaxation intuitively, has been traditionally part of different yoga traditions and is now incorporated in many relaxation programs.

- Transcendental meditation

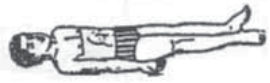
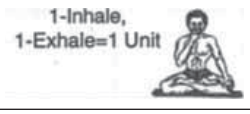
  The TM technique, a simple, psychophysiological stress reduction procedure, was introduced to the West by Maharishi Mahesh Yogi, a scholar of the ancient Vedic tradition of India.

- Emotional freedom technique

  Emotional freedom technique is a brief exposure therapy that combines a cognitive and a somatic element, is based on the discovery that emotional trauma contributes greatly to disease.

(An excerpt taken from Stress management techniques: evidence-based procedures that reduce stress and promote health)

Following are some easy to follow yoga exercise which are currently in use in a Type 2 diabetes prevention study sponsored by Research Society for the Study of Diabetes in India:

Sr No.	Yoga	Rounds	Approximate duration (secs)	
1.	Prayer- Omkar	3	60	
2.	Trikonasana	6	60	
3.	Katichakrasana	6	60	
4.	Surya Namaskaras	9	90	
5.	ArthaVakrasana/ Arthamastyendra Asana	Each side 90 sec	180 x 2	
6.	Pawan Muktasana	4 times	90	
7.	Bhujangasana		90 x 2	
8.	Dhanurasana	Once for 100 seconds	90 x 2	
9.	Padachakrasana	Clock/ Anti clock 15 each	120	
10.	Prashantha Asana		10 min	
PRANAYAM				
1.	Rechaka, Puraka	Units 20	60	
2.	Bhastrika	5	60	

3.	Nadi Shodhana (Alternative Breathings)	1-24 x 2	90	

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ROLE OF GLP1 ANALOGS AND DPP - 4 INHIBITORS

Shaival Chandalia *

GLP1 is an abbreviation for Glucagon like Peptide-1. Glucagon like Peptide-1 is a gastrointestinal hormone which helps in modulating blood sugars. When an individual eats food, this stimulates the secretion of GLP1 from intestinal endocrine cells. GLP1 travels to the pancreas where it stimulates the beta cells to secrete insulin and suppresses the alpha cells from producing glucagon. GLP1 also acts on various other parts of the body. It goes to the brain and suppresses appetite. It also delays stomach emptying, and produces satiety. As a result of this four-pronged action, it helps in controlling blood sugars. To reiterate, the four pronged action is as follows:

1. Stimulates beta cells to secrete insulin
2. Suppresses glucagon release from alpha cells
3. Suppresses appetite and promotes satiety
4. Delays gastric emptying

The GLP1 effect is also called the incretin effect and incretin is a term used for these gastrointestinal hormones. GIP is another hormone which belongs to the same group. The full form of GIP is gastric inhibitory polypeptide. This incretin effect was initially defined as follows:- It was found that oral glucose produces a greater stimulation of insulin release than intravenous glucose and this was postulated to be due to these incretin hormones. This incretin effect was found to be diminished in type 2 diabetes and hence it was postulated that medications which target this incretin axis would be useful in treating type 2 diabetics.

Once the structure of GLP-1 was known, the next logical question that arises is whether you can inject GLP-1 in type 2 diabetics to control their blood sugar. The problem with GLP-1 was that if injected it is rapidly degraded by an enzyme called DPP-4 or dipeptidyl peptidase- 4. Hence in order to produce a sustained effect, it would have to be infused continuously over 24 hours. As this is not feasible, it was determined that further innovation is required to produce a molecule that can be conveniently given to produce the incretin effect in type 2 diabetics. This molecule, the first in the group, (the prototype) was discovered by a biologist called John Eng. John Eng was studying an animal called the Gila Monster in California. He discovered that the saliva of this lizard had glucoregulatory properties. It was later confirmed that the molecule in the saliva of this lizard was an analog of human GLP-1 called exendin-4. Exendin-4 had 50% homology in structure to human GLP-1. Thus 50% of its structure was similar to human GLP-1 and 50 % was different. Exendin-4 was resistant to degradation by DPP-4. Hence it could be injected twice a day and did not require to be infused continuously. As 50% of its structure was similar to human GLP-1, it bound to the human GLP-1 receptor and activated it producing the incretin effect. Thus exendin-4, also called as exenatide and marketed by Eli Lilly as Byetta was the prototype or first of its class injectable GLP-1 analog.

On the other hand, there was also development of oral drugs that inhibited the enzyme DPP4 which is responsible for degrading GLP-1. Hence, these drugs enhance endogenous GLP1. These drugs also work on the incretin axis. The difference between the two groups of drugs, GLP-1 analogs and DPP-4 inhibitors, besides their mode of administration is that GLP1 analogs mimic

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human GLP1 while DPP-4 inhibitors enhance endogenous GLP1. Hence GLP1 analogs are also called incretin- mimetics and DPP-4 inhibitors are also called incretin enhancers. GLP1 analogs are injectable medicines while DPP-4 inhibitors are oral drugs.

Examples of GLP1 analogs are Byetta, Victoza (Liraglutide), Trulicity (dulaglutide) and Lyxumia (Lixisenatide). Victoza is a once daily injection while Trulicity is a once weekly injection. Trulicity may afford the convenience of a once weekly injection but does not produce as much weight loss as Victoza. Examples of DPP-4 inhibitors are Galvus (Vildagliptin), Januvia (Octagliptin), Trajenta (Linagliptin) and Onglyza (Saxagliptin).

To summarize, the advantages of these medications are that they can produce good glucose control without sufficient hypoglycemia and weight gain. In fact the injectable GLP1 analogs produce weight loss. A recently published trial, on Liraglutide has shown cardio protective effect. Hence these groups of medications have opened up a new avenue of treatment for type 2 diabetes.

POLYCYSTIC OVARY SYNDROME (PCOS): NUTRITIONAL GUIDELINES

Madhuri Gurav *

Polycystic ovary syndrome (PCOS) is a common endocrine system disorder among women of reproductive age. Women with PCOS usually have enlarged ovaries caused by multiple cyst formation in the ovaries.

Infrequent or prolonged menstrual periods, excess hair growth especially on the face, acne, and obesity which can be classified under hyperandrogenism can all occur in women with polycystic ovary syndrome. In adolescents, infrequent or absent menstruation (Anovulation) may raise suspicion for the condition.

The exact cause of polycystic ovary syndrome is unknown. Early diagnosis and treatment along with weight loss may reduce the risk of long-term complications, such as type 2 diabetes and heart disease.

Since the origin of most symptoms associated with PCOS is thought to be related to insulin resistance, nutrition guidelines and lifestyle recommendations are centered on treating insulin resistance and its long term health effects.

The following recommendations have proven successful in treatment:

- Weight Loss: even a 10% reduction in body weight will decrease insulin resistance. About 1200 kcal/day is a reasonable intake in these women.
- Balanced carbohydrate intake throughout the day is needed. Eat three meals with at least 30-35 grams carbohydrate /meal and two to three snacks of at least 15grams each.
- Do not skip meals. Try not to let more than four to five hours elapse between meals or snacks to maintain stable blood sugars and diminish extreme hunger.
- Gradually increase intake of high fiber carbohydrate foods, aiming for 30 to 35 grams/ day.
- Emphasize lean protein foods at 15 to 20% of total calories. (1200 kcal = 50 grams protein) Try to include protein with most meals and snacks.
- Consume about 25 to 28% of calories as fat – emphasizing low saturated fat foods and increased monounsaturated and omega-3 fatty acid food choices. Avoid foods containing Trans fats.
- Include two to three servings of low fat dairy foods per day, such as skim or 1% milk, yogurt, lite cheese or cottage cheese.
- Vitamin D deficiency has been associated with insulin resistance and reduced pancreatic beta cell function. Supplementation with Vitamin D3 (cholecalciferol) may be beneficial. Consider taking 1500 IU of vitamin D3 per day.
- Control portions, especially from restaurants or fast food places. Most restaurant portions are 50% more than needed. Ask for the (carry along / to go) container when the meal arrives and put aside part of the meal.

Complex carbohydrate foods include: whole grain breads, rolls, bagels; whole wheat pasta, brown and wild rice, high fiber cereals, oats, barley, legumes (peas, beans and lentils), corn, bran, seeds, nuts; fresh and dried fruit and most vegetables.

- B12 absorption may be affected by long term use of metformin. A multivitamin supplement with B12 is recommended, especially for strict vegetarians.

Monounsaturated fat containing food choices include: avocado, canola, olive and peanut oils;

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olives, nuts such as almonds, cashews, peanuts and pecans; peanut butter, nut butters, sesame oil, seeds and paste.

Omega-3 fatty acid (specifically EPA and DHA) containing food choices include: fishes such as salmon, mackerel, Bombay Duck. Two to three servings of fatty fish/week will provide the 220 mg each of EPA and DHA that is recommended. Fish oil supplements containing 220 mg each of EPA and DHA per day. Typically, a 1000 mg fish oil capsule contains 180 mg EPA and 120 mg DHA.

- Flax seed is high in fibre and Omega- 3 fatty acids so flax seed supplementation is beneficial.

Limit foods containing trans fatty acids, especially deep fried restaurant foods and commercial products not labeled trans fat free.

Lean protein food choices include: white meat of chicken, Fish and shell fish; egg whites, skim and 1% milk, soy milk, low-fat yogurts, cottage cheese, low-fat or lite cheese, dried beans, lentils, peas, hummus, soy products. Nuts and seeds are higher in fat but contain healthy monounsaturated fats.

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GOLDEN RULES: INJECTION TECHNIQUE

Frid A, Kreugel G, Halmi S, Hicks D, Hirsch L, Smith M, Well hoener R, Bode B, Hirsch I, Kalra S, JiL, Strauss K

Injection Technique in Adults [1-4]

1. Insulin and GLP 1 receptor agonists must be deposited into healthy subcutaneous fat tissue, avoiding the intradermal and intramuscular spaces as well as scars and lipohypertrophy.
2. 4mm pen needles inserted at 90 degrees are recommended for all adults regardless of age, gender or BMI. If patients need to use needle lengths >4mm or a syringe (or where the presumed skin surface to muscle distance is less than the needle length) they must use a correctly-lifted skinfold to avoid IM injections.
3. Recommended sites for injection are abdomen, thighs, buttocks, upper arms:
   a. Abdomen within the following boundaries:

      ~1 cm above symphysis pubis, ~1 cm below lowest rib,~ 1 cm away from umbilicus and laterally at the flanks
   b. Upper 3rd anterior lateral aspect both thighs
   c. Posterior lateral aspect of both upper buttocks and flanks
   d. Mid 3rd posterior aspect of upper arms.
4. Detect and avoid injection into areas of lipodystrophy.
5. Rotation of injection sites is critically important and can be correctly performed by:

a. Spacing injections within a site approximately 1 finger's breadth apart

b. Using a single injection site no more frequently than every 4 weeks.

Injection Technique in Children[1,2]

1. Insulin must be deposited into healthy subcutaneous fat tissue, avoiding the intradermal and intramuscular spaces as well as scars and lipohypertrophy.
2. Injection should avoid bony prominences by one to two adult finger widths. Preferred sites are:
   a. Abdomen, two adult finger widths away from umbilicus
   b. Upper 3rd anterior lateral aspect of both thighs
   c. Posterior lateral aspect of both upper buttocks and flanks
   d. Mid 3rd posterior aspect of upper arms
3. Consideration should be given to the type of insulin and the time of (injection) day when selecting injection sites.
4. Correct rotation of injection sites must be followed at all times to prevent lipohypertrophy and 4mm pen needles should be used for all children and young adults regardless of age, gender or BMI.
5. Children and young adults are at risk of accidental IM injection. A two-finger lifted skinfold usually prevents IM injection except in the thigh. Lean children should use a lifted skinfold when the presumed skin surface to muscle distance is less than the needle length plus 3mm.

Treating and Preventing Lipohypertrophy [1,2,3]

1. All patients who inject or infuse insulin must have their Sites checked at every regular visit, or at least every Year:
   a. HCPs in diabetes must be trained to correctly screen for lipohypertrophy and other site complications.
   b. All persons who self-inject/infuse insulin

Fitter 2015, Forum for Injection Technique & Therapy Expert Recommendation.

or other injectables must be taught to self-inspect sites and be able to distinguish healthy from unhealthy tissue.

2. Clinicians must monitor and record evolution of lipohypertrophy, possibly using photography (with patient's consent), body maps with descriptors for size, shape, texture or transparent graduated recording sheets.
3. With patient consent clinicians should mark the border of all lipohypertrophy and other site complications with skin-safe single-use markers and instruct patients to avoid using marked areas until instructed otherwise
4. Patients with lipohypertrophy who have been instructed to stop injecting/infusing into affected tissue must be:
    a. Allowed to experience the actual metabolic difference it makes to use normal tissue instead of lipohypertrophy (as this is a key to long-term adherence)
    b. Informed that some pain may be experienced when injecting into normal tissue
    c. Supported by a HCP to monitor glucose levels frequently due to the risk of unexpected hypoglycemia
    d. Assisted in the reduction of their insulin doses in line with glucose results, knowing that reductions often exceed 20% of their original dose.
    e. Optimized to 4mm Pen Needles/6mm Insulin Syringes or the shortest needle length available to minimize accidental IM risk due to using larger zones.
    f. Optimized to advanced tip geometry including thin gauge and extra thin wall needles (if available) to minimize pain and discomfort and to maximize ease of dosing when injecting into healthy tissue.
5. All patients must be supported to correctly rotate injection/infusion sites and cautioned of the risks of reusing needles in order to minimize risk of injection site complications.
    a. Principles of correct rotation technique must be taught to patients and rotation technique assessed at least every year and more frequently if required.
    b. Correct rotation ensures that injections are spaced out approximately 1 cm (a finger breadth) from each other and that a single injection site is used no more frequently than every 4 weeks.

Psychological Issues around Insulin Delivery [3]

1. All patients and care givers should be offered general as well as individualized education/ counseling which will facilitate optimal care.
2. Ensure all patients and care givers are supported by their HCP using patient-centered evidence-based psychological educational tools / strategies to achieve mutually-agreed goals.
3. Diabetes care HCP should be skilled in identifying psychological issues which impact insulin delivery.
4. HCPs must have a range of therapeutic behavioral skills to minimize the psychological distress and the impact of insulin therapy.
5. Various methods of minimizing pain and/or fear of injection should be utilized in order to reduce psychological impact.

Needle stick injuries and Sharps disposal [3]

1. All HCP, employers and employees must comply with relevant international, national and local legislation for the use of sharps.
2. Sharp medical devices present a potential risk for injury and transmission of disease. All HCP, employers and employees must ensure the safest possible working environment by
    a. Conducting regular risk assessment and providing continuing education and training
    b. Providing and using a means of safe disposal of used sharps
    c. Prohibiting needle recapping (except by the self-injector)
    d. Encouraging reporting of incidents.

3. Safety engineered devices must be used by all HCP and by all 3rd party care givers using sharps (e.g. injections, blood testing, infusion) in situations with a risk for disease transmission (i.e. HIV and hepatitis) and in risky environments such as schools and prisons.
4. Insulin delivery by 3rd party care givers or family member must be carried out using correct injection or infusion techniques and with safety-engineered devices which shield/ guard the patient end of the needle at a minimum. Best practice for pen needles requires that both ends of the needle be protected.
5. Safe disposal requires that:
    a. Correct disposal procedures and personal responsibility be taught to patients and care givers by the dispensing clinician (including pharmacists) and be regularly reinforced.
    b. Safe sharps disposal systems and processes be present and known to all persons at risk of sharps contact
    c. Environments where others are at risk (e.g. care homes, schools and prisons or around rubbish workers and cleaners) be highlighted to the patient
    d. Patients diagnosed with blood borne diseases such as HIV and Hepatitis be supported to use safety-engineered devices and dispose of them safely
    e. Sharps must never be placed directly in public or household rubbish.

Insulin Infusion[1],[3]

1. Insulin infusion cannula must be inserted into healthy subcutaneous fat tissue, avoiding underlying muscle as well as areas of skin irritation, scarring, lipohypertrophy and lipoatrophy.
2. If bleeding or significant pain occurs upon insertion, the set should be removed and replaced.
3. Preferred sites for infusion cannula should be individualized but include:
    a. Abdomen, avoiding bony prominences and umbilicus
    b. Posterior lateral aspect of both upper buttocks and flanks
    c. Mid 3rd posterior aspect of upper arms.
    d. Upper 3rd anterior lateral aspect of both thighs.
4. Infusion cannula sites should be rotated to avoid complications. This usually involves moving to a new location. In-site duration should be individualized but typically should not be more than 72 hours.
5. If kinking occurs consider a shorter cannula or an oblique or steel set. If silent occlusions or unexplained hyperglycemia occur, consider using a different type of infusion set, including a cannula with a side port, if available.

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WHAT'S NEW?

Priya Kotian *

What's the point of a new needle?

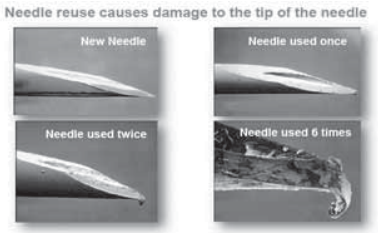
It matters more than you may realize.

A Needle Stick Injury (NSI) with diabetes needles or lancing devices are one of the highest frequency sharps injury in the healthcare setting.1

32% have suffered a NSI while giving a diabetic injection, with a conventional (non-safety) syringe and pen needle.[2]

Hepatitis B DNA was discovered in 11% of people with type 2 diabetes, compared to 3% of the control group. The small size of diabetes needles does not reduce risk significantly;[3]. **HBV is stable in dried blood for at least7 days and HCV for at least 16 hours],**[4] *thus NSI with devices used previously can still be infectious.*

29% of NSI injuries occurred while recapping a used needle.[1] Education on the seemingly innocuous practices of recapping needles, storing unprotected needles temporarily on a tray, trolley or cart and unscrewing used pen needles with one's hands would go a long way to reducing NSI risk.



Disadvantages of reuse of needles[5]

- Distorted and bent needle results in more painful injection during reusing.
- Needle cleansing with alcohol prior to use removes the silicone lubricant and results in painful injection with reuse.
- Breaking off and lodging of the needles can occur under the skin.
- Reuse results in damage to the tissues and levies an increased risk of LH.
- Reuse of needles increases the risk of contamination and infection.
- Reuse of needles may leads to NSI among HCPs in hospital settings.

Just **two small steps** can make a huge difference:
1. Do not recap
2. Do not re-use

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* Priya Kotian, Chinical Education Manager, BD Diabetes Care West

QUESTION & ANSWERS

Q) Why does your blood glucose level go down during and after exercise?

One of the most common causes of low blood glucose is too much or intense physical activity. In fact, moderate to intense exercise may cause your blood glucose to drop for the next 24 hours following exercise. This post-exercise hypoglycemia is often referred to as the "lag effect" of exercise.

Basically, when you exercise, the body uses two sources of fuel, sugar and free fatty acids (that is, fat) to generate energy. The sugar comes from the blood, the liver and the muscles. The sugar is stored in the liver and muscle in a form called glycogen. During the first 15 minutes of exercise, most of the sugar for fuel comes from either the blood stream or the muscle glycogen, which is converted back to sugar. After 15 minutes of exercise, however, the fuel starts to come more from the glycogen stored in the liver. After 30 minutes of exercise, the body begins to get more of its energy from the free fatty acids. As a result, exercise can deplete sugar levels and glycogen stores.

The body will replace these glycogen stores but this process may take 4 to 6 hours, even 12 to 24 hours with more intense activity. During this rebuilding of glycogen stores, a person with diabetes can be at higher risk for hypoglycemia.

Understanding Exercise

During exercise, the demand for fuel increases and the body responds accordingly.

- Glucose stored in the muscle is burned very quickly.
- At about the same time, glucose stored in the liver is released into the bloodstream (like fast fuel injection).
- Fat is released from special cells called adipocytes. This fat along with glucose makes its way through the bloodstream to the muscles to be used for fuel.
- Once the fuel reaches the muscle, it must enter through special pathways so that the muscles can use it for energy.

Insulin-Like Effect

On the wall of every muscle cell are special receptors, like doors, that allow glucose to pass from the bloodstream to the muscle. These doors do not open unless they are unlocked by insulin. The good news is that exercise has an insulin-like effect, making insulin work better in your body. During bouts of activity, the doors swing open easily, allowing more and more glucose to enter the muscle to be burned up for energy. Of course, the problem is that as you continue to exercise, and glucose continues to leave the blood, you may end up with low blood glucose.

Sometimes blood glucose continues to drop after exercise. That is because the glucose in the muscle that was used at the beginning of exercise needs to be replaced. The muscles, all revved up from exercise, continue to take glucose from the bloodstream to replace what was lost.

Jayshree Jain

Q) What is sick day routine to prevent Diabetic Ketoacidosis?

Diabetic Ketoacidosis is a condition that occurs when there is decreased insulin production or no insulin in the body. Due to the absence of insulin the glucose in the blood is not utilized by the body which hinders the process of producing energy for our body metabolism hence the body starts burning fat. Ketones are the byproducts which are formed during the breakdown of fat in our body.

When the level of Ketones increases in our body, the body gets more acidic in nature. Often the patient presents with symptoms such as, vomiting, excessive thirst or urination, fruity odor to the breath, drowsiness, dry mouth, breathlessness. If the condition is not treated then it can lead to coma.

When a diabetic patient is ill the body hormones and other metabolic process are disturbed. This can cause fluctuations in your blood sugar levels, hence it's important to take extra precautions during sick days for diabetic patients. The priority will be to control blood sugar levels by maintaining normal insulin level in the body so as to prevent diabetic Ketoacidosis.

- The way a person's body reacts to sickness is different for each individual hence it's a Type 1 diabetic who is totally dependent upon external supply of Insulin must check their blood sugar levels every one-two hours.
- Even if the patient is not on insulin, he/she should check blood sugar levels more often than they do it usually. Type 2 diabetics on oral medications must continue to take medicines though they can alter the dosage to prevent unnecessary fluctuations in blood sugar levels. They can discuss this with their physicians and decide a dosage suitable during sick days.
- Patients who are on insulin externally should note that they are not supposed to stop taking insulin during illness. If the food intake is low or even absent temporarily then they can modify the units of meal related bolus insulin but the basal insulin should be taken correctly. In some cases the basal insulin will need to be increased.
- Medicines which can cause hypoglycemia such as sulphonylureas should be taken with precaution if the patient is not consuming food at all. The physician should be informed so that they can guide you regarding these oral antidiabteic drugs.
- Check for urine ketones regularly when the diabetic patients are sick.
- In DKA one of the major risks is dehydration hence it is important to stay hydrated. Fluids containing sugar in any form must be avoided. Plain water can be consumed on an hourly basis to tackle dehydration caused by vomiting and diarrhea. If the patient is not consuming food at all then they can be excused and given some amount of sugar-free fluids or sugar containing fluids. In case of nausea due to fluid intake, they can have popsicles or ice cubes.
- If the patient is on insulin and has high blood sugar levels and/or ketones he/ she should take repeated 2 hourly fractional doses of insulin and if unrelieved immediately report to a doctor.
- Keep a note of the food you eat and symptoms you experienced during sick day or someone to note it for you. Note down blood sugar levels in every two or three hours.

Vandita Mohanan

PROBLEMS AND SOLUTIONS IN DIABETES EDUCATION

WHAT SHOULD WE DO BEFORE WE BEGIN AN EXERCISE PROGRAM IF WE HAVE DIABETES?

*Shruti Ankat**

While exercising, the body needs extra energy immediately from blood sugar and on prolonged exercise from fatty acids. When a person does some physical activity the muscle and liver glycogen would be used as fuel. This helps lower the blood sugar levels which will worsen with a strenuous activity.

Two types of physical activity are most important for managing diabetes: aerobic exercise and strength training.

1) Aerobic Exercise

Aerobic exercise helps our body use insulin better. It makes our heart and bones strong, relieves stress, improves blood circulation, and reduces risk for heart disease by lowering blood glucose and blood pressure and improving cholesterol levels.

Aim for 30 minutes of moderate to vigorous intensity aerobic exercise at least 5 days a week. Try not to go more than 2 days in a row without exercising.

Get Started

If the patient had not been very active recently and especially those beyond 40 years age should have a cardiovascular checkup before initiating an exercise program. They can start their out with 5 or 10 minutes a day. Increase activity sessions by a few minutes each week. Those already on a regular exercise plan or of young age can start a full exercise program.

Below are some examples of aerobic activities:

- Brisk walking (outside or inside on a treadmill)
- Bicycling/Stationary cycling indoors
- Dancing
- Swimming or water aerobics
- Playing tennis
- climbing stairs
- Jogging/Running
- Hiking
- Roller-skating
- Moderate-to-heavy gardening

2) Strength Training

Strength training (also called resistance training) makes our body more sensitive to insulin and can lower blood glucose. It helps to maintain and build strong muscles and bones. The more muscle a person has, the more calories they burn even when at rest.

Tip: Doing some type of strength training at least 2 times per week in addition to aerobic activity is highly recommended.

Below are examples of strength training activities:

- Weight machines or free weights at the gym
- Using resistance bands
- Lifting light weights or objects like canned

* Shruti Ankat, Nutritionist at Diabetes Endocrine Nutrition Management and Research Center (DENMARC), Mumbai.

goods or water bottles at home

- Exercises that use your own body weight to work your muscles (examples are pushups, sit ups, squats, lunges, wall-sits and planks)

Ageing and exercise

It is a very well known fact that exercise is important for older adults with diabetes. The muscle strength declines by 15% per decade after age 50 and 30% per decade after age 70. By regularly participating in strength-building exercise, however, muscle tissue and strength can be restored. Exercise also makes it easier for older individuals to maintain their strength, balance, flexibility and endurance. Lastly, exercise improves insulin sensitivity and can improve a person's response to blood glucose medications.

Types of exercises for the older adults *(excerpts taken from Recommendation from the American College of Sports Medicine and the American Heart Association)*

There are different exercises for each part of the body and the first step in determining any exercise regimen is to consult with one's doctor. Once their doctor has given the go-ahead, the person's exercise program should include balance training because there is evidence that this can help to reduce the risk of falls.

- Balance exercises like side leg raises and knee flexions can help decrease the risk of falls. A variety of balance exercises can be done, as some build up the leg muscles, and others, like briefly standing on one leg, improve balance.
- Flexibility, or stretching, exercises lengthen the muscles and tissues that hold the body's structures in place. Over time, regular flexibility training may help keep the body limber, speed recovery from injuries and prevent future injuries and falls.
- Endurance exercises, like walking, jogging, rowing or swimming improve the health of the heart, lungs and circulatory system. They may also delay or prevent colon cancer, heart disease, osteoporosis, stroke and other serious diseases.

Remember that successful exercise programs are to be started gradually and by setting small, achievable goals.

In general, the longer, more vigorous, and more intense the exercise, the more likely that the exercise will lower the blood sugar. So when we are exercising, we may need to adjust the dose of medicines/ insulin, and include carbohydrates to prevent hypoglycemia. The converse also is true – brief, non-strenuous exercise may not require any medicine/ insulin dose or diet adjustment. To get started with exercise these go-to tips come in handy:

1. Get your doctor's OK. Let them know what you want to do. They can make sure you're ready for it regarding your cardiovascular fitness. They'll also check to see if you need to change your meals, insulin, or diabetes medicines. Your doctor can also let you know if the time of day you exercise matters.
2. Check your blood sugar. Ask your doctor if you should check it before exercise. If you plan to work out for more than an hour, check your blood sugar levels regularly during your workout, so you'll know if you need a snack. Check your blood sugar after every workout, so that you can adjust if needed.
3. Carry carbs. Always keep a small carbohydrate snack, like fruit or a fruit drink, at hand in case your blood sugar gets low.
4. Ease into it. If you're not active now, start with 10 minutes of exercise at a time. Gradually work up to 30 minutes a day.
5. Strength train at least twice a week. It can improve blood sugar control. You can lift weights or work with resistance bands. Or you can do moves like push-ups, lunges, and squats, which use your own body weight.

6. Make it a habit. Exercise, eat, and take your medicines at the same time each day to prevent or anticipate hypoglycemia.
7. Work out with someone who knows you have diabetes and knows what to do if your blood sugar gets too low. It's more fun, too. Also wear a medical identification tag, or carry a card that says you have diabetes, just in case.
8. Be good to your feet. Wear athletic shoes that are in good shape and are the right type for your activity. For instance, don't jog in tennis shoes, because your foot needs a different type of support when you run. Check and clean your feet daily. Let your doctor know if you notice any new foot problems.
9. Hydrate. Drink water before, during, and after exercise.
10. Stop if something suddenly hurts. If your muscles are mildly sore, that's normal. Sudden pain isn't. You're not likely to get injured unless you do too much, too soon.

WHAT'S COOKING ?

BAKED OATS PURI

INGREDIENTS	AMOUNT
Oats flour	30 gm
Whole wheat flour	30 gm
Dried fenugreek leaves	½ tsp
Black sesame seeds	½ tsp
Low-fat curds	½ tbsp
Garlic paste	¼ tsp
Green chilli paste	1 tsp
Chilli powder	¼ tsp
Oil	1 tsp
Salt	To taste

METHOD OF PREPARATION:

1. Combine all the ingredients in a deep bowl and knead into stiff dough using enough water.
2. Divide the dough into 10 equal portions and roll out each portion into a 75 mm (3") diameter circle using a little whole wheat flour for rolling.
3. Prick the rolled out puris with a fork at regular intervals.
4. Arrange them on a baking tray and bake in a pre-heated oven at 200°C (392°F) for 20 minutes, turning them once after 10 minutes or till they turn crisp.
5. Store in an air-tight container.

Serves - 2

NUTRITIVE VALUE FOR 1 SERVING:

Energy Total (Kcal)	CHO (gm)	Protein (gm)	Fat (gm)	TDF (gm)
115	19	4.05	2.5	1.4

BAKED NACHNI CHIVDA

INGREDIENTS	AMOUNT
Ragi (Nachni) flour	150 gm
Chilli powder	½ tsp
Turmeric powder	¼ tsp
Asafoetida	¼ tsp
Lemon juice	1 tsp
Garlic paste	¼ tsp
Oil	3 tsp
Chana dal (roasted)	½ tbsp
Curry leaves	4 leaves
Salt	To taste

METHOD OF PREPARATION:

1. Combine the nachni flour, chilli powder, turmeric powder, asafoetida, lemon juice, garlic paste, salt and 2 tsp of oil in a deep bowl mix well and knead into soft dough using enough water.
2. Shape the dough into a cylindrical roll, fill the dough into the "sev press" and press out thin strands onto a greased baking tray.
3. Bake in a pre-heated oven at 200°C (392°F) for 20 minutes, toss them after 7 minutes and then after every 3 minutes. Every time while tossing also keep breaking the sev into pieces. Keep aside.
4. Heat the remaining 1 tsp of oil in a broad non-stick pan, add the roasted chana dal and curry leaves and sauté on a medium flame for 30 seconds.
5. Switch off the flame, add the baked sev and toss well.
6. Cool, store in an air-tight container and use as required.

Serves - 1

NUTRITIVE VALUE FOR 1 SERVING:

Energy Total (Kcal)	CHO (gm)	Protein (gm)	Fat (gm)	TDF (gm)
182	29.4	3.5	6.7	1.4

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BOOK REVIEW

RSSDI text book of Diabetes Mellitus; Editor-in-Chief: H B Chandalia, Executive Editor: G R Sridhar, Editors: A K Das, S V Madhu, V Mohan, P V Rao

Jaypee Brothers Medical Publishers; New Delhi; 2014; pages 1457; Price Rs 2995

The third edition of RSSDI Text Book of Diabetes Mellitus (D M) has been published six years after the second edition. It is authored and edited by those clinicians and professors who have been teaching and practising diabetes over many years within the country. A few chapters are contributed by Non-resident Indians. As pointed out by the editor-in-chief, this edition has undergone considerable revision. The material published both within the country and outside till the end of 2013 has been critically analysed and included. A few topics which are paid scant attention in other books, like-the complexity of insulin resistance, the criteria applicable to metabolic syndrome in Asians,challenges in the management of children and elderly with diabetes,musculoskeletal manifestation of diabetes, malnutrition modulated diabetes, Latent Autoimmune Diabetes in Adults (LADA), neonatal diabetes and the role of Yoga and relaxation techniques are unique to this book.

The flow chart on the management of diabetic ketoacidosis available in this book should be in possession of all ICUs. The colour pictures of retinopathy, foot lesions, skin diseases and musculoskeletal manifestation are well presented. The role of alternate therapy is extensively discussed. The guidelines for the beginner to organise a diabetic clinic and optimal health care for diabetes amidst diversity of social, economic and regional food habits is noteworthy. The limitation of stem cell therapy as of now is a good reminder. Some controversial issues are discussed in individual chapters. Much alike the chapter on A Glimpse in the Future, I wish a full chapter was devoted to controversies in diabetes. New chapters added in this edition are valuable and discuss important current issues. These include Sleep and Type 2 diabetes-mellitus, Early-onset Type 2 DM, Nutrient blockers and Bromocriptine, Insulin Pump Therapy, Glycemic Management in Hospitalized Patients, Continuous Glucose Monitoring System, Vitamin D and DM, HIV in Diabetes, Diabetes and Cancer.

The appendix is retained from the previous edition and gives a wealth of information applicable to Indian subjects like BMI and waist circumference and laboratory values in S I and conventional units.The index has attained perfection.The novel feature of this edition is mentioning the chapter number on the right edge of each page.

The book will prove to be valuable to students, physicians, diabetologists, endocrinologists and providers of diabetes care. It should be on the shelf of every medical library. The availability of this book has made the Western text books redundant. The single volume covering so many topics is bulky and heavy. I wish it was brought out in two volumes.

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Prof (Dr) H B Chandalia's creative writing abilities & practical acumen has always been illustrated by his multiple contributions as an author of chapters in various textbooks. One such outstanding example is the book **'Conquest of Diabetes- by diet & exercise'** which is running its fourth edition in the English language and an edition in Hindi as well as in Gujarati. The Marathi version of the book is under preparation. It is a comprehensive, extensively illustrated two color book which is characterized by its brevity, clarity and offers a systematic approach towards the management of diabetes by diet and exercise.

The book highlights very important issues and controversies in the form of a large number of box inserts. Also, the scientific and technical words have been explained in the glossary, which appears throughout the book.

It also deals with recipes and an exercise plan for diabetics, which would prove helpful.

This book is directed to persons suffering from diabetes, health-care practitioners like doctors, nutritionists and diabetes educators and other health professionals involved in the care of diabetics.

Available at:

Dr. Chandalia's

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3. Bayer. Data on file

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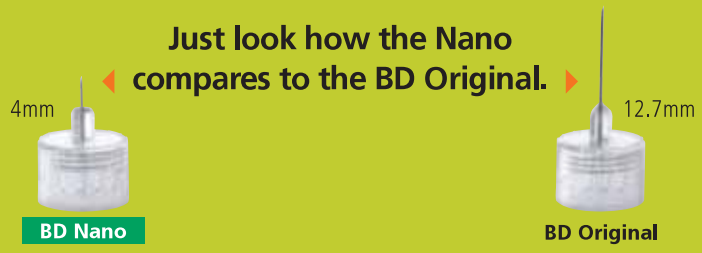

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