

Activity day rules in diabetes

Sanjay Kalra,¹ Jubbin Jacob,²

Abstract

This article presents simple 'activity day' rules for persons living with diabetes who wish to take part in exercise and sports. It describes basic precaution related to self-care, carbohydrate intake, insulin dosage, non-insulin drug medication, and multisystem health. The framework provides a template for individualized recommendations which will help ensure safe and enjoyable participation in exercise and sports.

Keywords: Exercise, hyperglycemia, hypoglycemia, sports, type 1 diabetes, type 2 diabetes.

Introduction

Physical activity is defined as all movement that increases energy use, whether structured or otherwise. Exercise is defined as planned, structured activity. Exercise can be classified as Strengthening (resistance), Aerobic, Flexibility and Endurance exercises which can be easily remembered by the mnemonic "SAFE" exercises.^{1,2} Sports and games, too, involve one or more of these type of exercises. Aerobic exercises include running, jogging, swimming and cycling. Weight lifting is a type of resistance exercise, while gymnastics corresponds to flexibility and balance exercises. Endurance exercises include the ability to perform low intensity, repetitive or sustained activities over a prolonged period of time and includes hiking, trail walking and marathon running.²

A large number of persons with diabetes undertake exercise and games to improve metabolic outcomes, lose weight, improve cardiorespiratory capacity or simply to enjoy the endorphin pleasure that accompanies sustained exercise. Exercises may range from low intensity events of short duration to those involving high intensity exercises of prolonged duration. While sick day guidelines are well established for persons with diabetes³, there has been no focus on "activity day" guidelines for this population. Recommendations on physical activity focus on persons with type 1 diabetes³, and do not explore the

cardiovascular facets of life of athletes/sportspersons or regular individuals who undertake exercise with type 2 diabetes⁴.

This brief communication lists activity day rules relevant for persons with type 2 diabetes who wish to take part in exercise sessions or sports events. The wide variation in physiology and individual needs, makes it difficult to offer prescriptive guidelines for every person with diabetes. However, the suggestions shared here in provide a useful template for patient-provider discussion. This should facilitate pragmatic informed decision making, regarding healthy participation in exercise and sports

Pre Exercise Care

- While persons with uncomplicated diabetes do not require pre-exercise medical screening, those with vascular or musculoskeletal complications may benefit from expert medical or surgical opinion prior to starting an exercise programme.
- Exercise is best performed in a period of relative eu-glycaemia, where hyper- or hypo-glycaemia is not anticipated.
- Gradual increase in exercise duration and intensity is strongly recommended; sudden indulgence in unusual forms, duration or intensity of exercise may be harmful.
- Exercise is contraindicated in persons with severe hyperglycaemia and/or ketonuria/ketonaemia. This is because lack of insulin will prevent glucose uptake into the exercising skeletal muscle and exacerbate ketogenesis. Patient should be instructed to avoid exercise when they are feeling unwell.

Musculoskeletal Health

- Proper foot care and selection of foot wear is necessary for all persons with diabetes. Ideal footwear for exercise should have proper arch support, a firm heel and thick but flexible soles to cushion and absorb shock.
- Attention must be paid to musculoskeletal and joint health prior to, during and after exercise. Patient should be instructed to stop exercise in case of any pain and avoid exercising through the pain.

¹Department of Endocrinology, Bharti Hospital, Karnal, ²Department of Medicine, Christian Medical College, Ludhiana, India.

Correspondence: Sanjay Kalra. Email: brideknl@gmail.com

- Patients with loss of protective sensations on the feet need to avoid repetitive weight bearing exercises like jogging, prolonged walking and step aerobics and should be encouraged to bicycle, swim, do rowing, seated and upper body non weight bearing exercises.

Cardiac Health

- Aspirin should be continued on the day of exercise.
- Beta blockers should be continued on the day of exercise.
- Other antihypertensives may be discontinued on the day of endurance physical activity.
- Statins may be discontinued a few days prior to prolonged physical activity (endurance exercises).
- Persons with high blood pressure, autonomic neuropathy or severe non proliferative and unstable proliferative retinopathy should avoid vigorous exercise. Exercises which increase intra-abdominal pressure with valsalva like manoeuvres (weight lifting) should be avoided. Patients with proliferative retinopathy should avoid rapid head movements.
- Patients with autonomic neuropathy have a reduced ability to regulate body temperature. So they should avoid exercises in extreme hot or cold weather.

Maintenance Of Glycaemic Equipose

- Glycaemic equipose (90-250mg%) should be maintained during and after physical activity.
- Persons with type 1 diabetes, and those with type 2 diabetes on intensive insulin therapy, should perform SMBG before and after the physical activity. In case of endurance exercises of over an hour duration they should perform SMBG at 1-2 hourly intervals.
- All therapeutic and titrating measures should be based upon results of glucose monitoring.
- Patients on treatment with insulin should avoid exercising when their insulin is at peak activity.
- Mixed forms of exercise offer better glycaemic stability than aerobic ones. Resistance exercise performed prior to aerobic exercise produces less hypoglycaemia than the other way round.
- Delayed hypoglycaemia may be prevented by ensuring regular meals, including bedtime snacks.
- Patients should be instructed to stop exercise if

they encounter symptoms of hypoglycaemia during exercise. It is a good idea to carry water and snacks with quick acting carbohydrates if exercising away from home. Patients should be encouraged to carry a medical identification tag for emergencies if exercising alone, however they should be encouraged to exercise with a friend or a family member as far as possible.

Maintenance Of Glycaemic Equipose

- Increased carbohydrate intake is usually required to maintain glycaemic equipose during exercise.
- Simple carbohydrates should be consumed prior to brief bouts of physical activity
- A mix of simple and complex carbohydrates should be consumed prior to endurance or prolonged (\geq 30 minutes) physical activity.
- Carbohydrate intake of 10-15g may suffice to prevent hypoglycaemia during low or moderate intensity aerobic exercise of 30-60 minutes during fasting conditions.
- Carbohydrate intake of 30-60g/per hour of exercise may be needed to prevent hypoglycaemia after bolus insulin is taken

Insulin

- A 20% reduction in basal insulin may be indicated in persons on basal bolus regimen, both prior to and after exercise.
- A 25%-75% reduction in prandial insulin may be indicated if exercise is to be performed within 2-3 hours of its administration
- A 25-75% reduction of basal rate, carried out 30-60 minutes before planned exercise, may prevent hypoglycaemia in persons on continuous subcutaneous insulin infusion
- Insulin injection into sites that will exercise actively, such as thighs or upper limbs, is best avoided. The abdomen may be the preferred site of insulin administration prior to exercise.

Non Insulin Drugs

- No change in dose of insulin sensitizers, incretin based therapy or SGLT2i therapy is required on the day of unusually intense exercise⁵.
- Sulfonylurea or meglitinide dose may be down-titrated to half prior to exercise of high intensity and/ or endurance exercise, if hypoglycaemia is anticipated.

Fluid Electrolyte Balance

- Fluid and electrolyte balance must be maintained through adequate oral intake of water.

- Outdoor exercise should be avoided on hot/humid days, especially by older persons, and those with autonomic neuropathy, cardiovascular disease, advanced renal disease or pulmonary disease

SUMMARY

Physical activity, exercise and sports should be encouraged in all persons with diabetes. The basic "activity day rules" described above will assist in safe and enjoyable participation in these events, while ensuring that glycaemic as well as extra-glycaemic benefits are achieved.

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References

1. Colberg SR, Sigal RJ, Yardley JE, Riddell MC, Dunstan DW, Dempsey PC, Horton ES, Castorino K, Tate DF. Physical activity/exercise and diabetes: a position statement of the American Diabetes Association. *Diabetes care.* 20:2065-79.
2. Jacob JJ and Kumar SV. Chapter; Diabetes and Exercise, In: Thomas N, Kapoor N, Velavan J & Vasani SK (editors), *A Practical Guide to Diabetes Mellitus*, 8th Edition, New Delhi, JP Brothers Medical Publishers, 2018 pp 63-79, ISBN=978-93-5270-165-0
3. Laffel LM, Limbert C, Phelan H, Virmani A, Wood J, Hofer SE. ISPAD Clinical Practice Consensus Guidelines 2018: Sick day management in children and adolescents with diabetes. *Pediatr. Diabetes.* 2018 ; 19: S27:193-204.
4. Adolfsson P, Riddell MC, Taplin CE, Davis EA, Fournier PA, Annan F. SPAD Clinical Practice Consensus Guidelines 2018: Exercise in children and adolescents with diabetes. *Pediatr. Diabetes.* 2018;19:S27; 205-226.
5. Eckstein ML, Williams DM, O'Neil LK, Hayes J, Stephens JW, Bracken RM. Physical exercise and non-insulin glucose-lowering therapies in the management of Type 2 diabetes mellitus: a clinical review. *Diabetic Med.* 2018 . <https://doi.org/10.1111/dme.13865>