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Mini Review
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Diabetes and co-occurring osteoarthritis, and yoga 2023

Abstract

Persons diagnosed as having Type 2 diabetes, one of the common chronic diseases affecting older adults, may also suffer from multiple adverse health conditions such as disabling osteoarthritis. In a search for low cost approaches to mitigate these health conditions, this mini review updates selected facts concerning the association between Type 2 diabetes and osteoarthritis and their possible mitigation using yoga to control excess glucose levels. Drawn from data posted between January 2020-mid October 2023 using PUBMED and PubMed Central data bases, a qualitative overview shows adults living in the community with Type 2 diabetes may be at high risk for disabling osteoarthritis, and those who are obese alongside osteoarthritis may incur Type 2 diabetic manifestations. Yoga, an ancient from of therapeutic exercise, and its applications appears to have the ability to help control or normalize blood glucose levels in older adults with Type 2 diabetes and may thus have some degree of benefit for reducing prevailing osteoarthritis pathological and pain processes, as well as for enhancing overall life quality. Fostering the ability to reduce stress levels and to move more ably appears to underpin the heightened ability of yoga practices to control blood sugar and obesity levels. Understanding the possible utility of one or more forms of yoga for decreasing excess diabetes and osteoarthritis morbidity has considerable potential and should be explored more intently.

Keywords: diabetes, glucose control, obesity, osteoarthritis, yoga

Volume 10 Issue 2 - 2023

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Received: October 03, 2023 | **Published:** October 20, 2023

Introduction

A wealth of past and current evidence continues to reveal that non-communicable diseases, such as Type 2 diabetes and the disabling joint disease osteoarthritis are generally increasing in prevalence in all parts of the globe.[1] In many cases the two disabling conditions occur simultaneously and interactively,[2–4] and although inactivity is a common risk factor, new evidence shows that the presence of osteoarthritis may increase Type 2 diabetes risk on the basis of genetics,[5] while obesity leading to Type 2 diabetes may increase the risk for inflammatory and degenerative arthritis.[6] This not only challenges the degree to which each health condition can be reversed, but can have widespread health impacts on other body systems along with chronic pain, thereby possibly increasing the rate of progression of both these chronic disabling diseases[7] and their enormous societal costs.[8] Current reports stress furthermore that this dual association of Type 2 diabetes and osteoarthritis while not commonly recognized as an extremely debilitating one, does require very careful thought to advance its amelioration[4] and in order to obviate excess debility, and a low life quality, including possible muscle degeneration and disease worsening,[9] and its oftentimes common linkage of obesity.[10,11]

As a result of the complex interplay between the increasing prevalence of diabetic and arthritic conditions in an aging society this current mini overview appears of high relevance to public health policy makers in multiple realms.[12] This is because as with all chronic conditions, diabetes, especially Type 2 diabetes, and incurable disabling osteoarthritis generally require considerable multipronged care strategies to be enacted on a daily basis, especially in the context of preventing the accumulation of excess blood sugar or hyperglycemia and complications that enhance excess disability, such as the possible degree of muscle fibrosis that could possibly lead to stiffness[13] as well as pain and inflammation and an unwillingness to move. Those patients whose blood sugar is consistently high and who need to undergo joint replacement surgery for painful osteoarthritis may also be more susceptible to postoperative infections, prolonged hospitalizations, length-of-stays, costs and even death and are thus potentially severely compromised.[14]

In short, Type 2 diabetes appears to be a key risk factor for excess morbidity in its own right and more so when present in cases with osteoarthritis, especially older adults deemed to be obese.[10] Among other approaches, that of glycemic control appears critical at present because according to Ma et al.[15] if controlled safely so as to avoid or limit the use of diabetes drugs and others that have now been found to increase the cellular expression of the angiotensin-converting enzyme 2 (ACE2), the target to which the COVID-19 virus tends to bind to cells can potentially be averted.[16] As well, Maddaloni et al.[17] observed that among different destructive cytokines or inflammatory agents these may be significantly elevated due to an apparent imbalance of the molecular pathways associated with their normal anti-inflammatory role.[18] Interleuken-6 or 10 or similar potent destructive cytokine variants, commonly already increased in conditions of chronic inflammation, such as osteoarthritis, may be affected adversely and significantly as a result.[18,19]

Numerous authors thus continue to stress among other factors the immense importance of setting individualized blood glucose target goals and using treatment strategies that accord with the specific circumstances of the patient with Type 2 diabetes. While critically ill patients may need intravenous insulin infusion therapy, and pharmacotherapy is both marketed intently and popular,[20] these approaches do not truly change the underlying modifiable or behavioral causes or contributors to the condition at all effectively.[21] Safer and available to all adults even in low income countries, the adoption of moderate exercise appears highly justified in this regard if one considers its value for both diabetes and osteoarthritis care, its wide ranging approaches, its simplicity, low cost, and the observation most cases of Type 2 diabetes can be managed by blood glucose monitoring, diet, and moderate exercise,[3,10,22] with exercise

as the most promising approach. It is also the preferred approach for countering osteoarthritis pain and for possible sustained weight control. In addition, among approaches to manage the presence of one or both of these diseases where they occur in parallel, those that can help to offset any excess blood glucose and promote glucose homeostasis, such as non-impact exercises may prove to have high degrees of benefit as far as stress and weight control, mobility, plus cardiovascular health. In particular, the possible practice of yoga, a modified form of physical and mental activity-appears to consistently help with the management of blood glucose levels, and can tangibly result in fewer dietary lapses, less stress and anxiety, heightened affect and possible better overweight control.[23] Drawn from literature over the past pandemic years [2020-2023], there is thus continuing support for exploring if more evidence has been forthcoming to this effect since the pandemic of COVID-19 in December 2019.

As outlined currently by ElSayed et al.[24] enacting positive health behaviors and the presence of high levels of emotional health appear essential for achieving diabetes Type 2 treatment goals, and should embrace routine physical activity practices, among others that foster health. Although exercise in any form appears to help to foster health status outcomes, yoga, a well-established form of exercise while not mentioned by Blonde et al.[25] is deemed of value to explore[26] in this respect. Current data imply this low energy form of exercise and its regular practice may reduce or even lead to diabetes Type 2 remission, as well as benefiting weight loss, one's metabolic profile and glycemic control ability.[27] Yoga practice may also impact the psychological status of the individual favorably as well as having possible beneficial physical impacts. It is considered a form of activity usually enjoyed and fun-as well as effect-for example participating in laughter yoga is found to improve glycemic control in cases with Type 2 diabetes[28] and can be done in a non-stressful manner[29] with positive measurable effects on multiple disease manifestations[29,30] and even for reducing intra ocular pressure in those with glaucoma.[31]

Methods

A limited review of articles posted on **PUBMED,** and **PubMedCentral** using the terms, Diabetes and Osteoarthritis; Diabetes and Yoga; Osteoarthritis; Yoga and Glucose Control was conducted. Relevant articles published over the post pandemic periods of 2019-2023 were reviewed. Those deemed noteworthy by the author were downloaded and explored and are described below in an effort to establish if the approach described loosely by yoga appears efficacious for purposes of glucose control in the older adult who may have co-occurring osteoarthritis. In line with the goal of this brief, only a narrative overview follows and papers on yoga were limited to those examining glucose levels as an outcome in those populations suffering from Type 2 diabetes and/or osteoarthritis. The term Type 2 diabetes was used throughout to describe the condition known as *diabetes mellitus*. All forms of osteoarthritis were considered, as well as all publication formats. Only data pertaining to older adults were extracted.

Key findings

As anticipated very few papers currently focus on the topics of Type 2 diabetes and osteoarthritis and their combined potential health impacts and solutions even though **PUBMED** houses the most extensive medical science literature in the world. However, many current articles mention the importance of continuing to seek for effective solutions to mitigate- if not - reverse either or both conditions.[32] In this regard, among other ongoing intervention strategies put forth to minimize diabetes symptoms, and possibly related osteoarthritis pain, that of achieving optimal glycemic control appears to be very key and can be favorably impacted by regular physical activity practices, glucose monitoring and stress control, wherein yoga appears highly effective.[33,34] Indeed, regardless of type of yoga practiced it appears favorable outcomes may be predictably anticipated due to its emphasis on relaxation, meditation, and deep breathing.[35,36] Measureable benefits on both patient anxiety and glucose levels for example following a single exercise session have remarkably been reported.[36,37] Moreover, these positive signs are magnified if yoga is pursued regularly and especially over long periods of time.[34] Mondal et al.[38] who examined the effects of 12 weeks of yoga practice on blood sugar and lipid profiles in 20 older women with Type 2 diabetes divided into two groups, namely, a yogic intervention group and a control group, showed a significant decrease in fasting plasma glucose, and postprandial blood sugar in the active group, but not the control group. Thind et al.[39] who conducted a meta-analysis to examine the effects of yoga for glycemic control among adults with Type 2 diabetes using 23 studies with 2473 participants (mean age=53years; 43% women) showed that compared with controls, yoga participants were successful in improving their blood sugar level indicators. Results showed yoga practice can consistently yield associated favorable changes in lipid profiles, blood pressure, body mass index, waist/hip ratio and blood cortisone levels.

Bock et al.[40] who recently reported on a comparative study that examined the feasibility and acceptability of yoga as a complementary therapy for adults with Type 2 diabetes using Iyengar yoga and a supervised walking program showed the program was well received, and reasonably safe, with improvements in glucose measures. Greater improvements in diabetes self-care, quality of life, and emotional distress were also evidenced among the yoga participants rather than the controls. According to Sanogo et al.[41] mind and body practices are strongly associated with improvement in glycemic control in patients with Type 2 diabetes, and may hence prove to be an effective, complementary non pharmacological form of intervention for Type 2 diabetes. Additional analyses revealed that the mean decrease in glucose levels was greater in studies requiring larger numbers of yoga practice sessions each week. In sum, consistent yoga practice may help to control blood glucose levels in older adults with Type 2 diabetes and other health conditions in the community if practiced on a regular basis.[42]

Discussion

As outlined by Amita et al.[43] more than 10 years ago, diabetes, a metabolic disorder, which has become a major health challenge worldwide because of increasing obesity and reduced physical activity, is very hard to treat effectively, and more so if accompanied by disabling osteoarthritis. At the same time individuals with osteoarthritis may place older adults at risk for Type 2 diabetes if they are obese or fail to pursue activity and healthy diets. Type 2 diabetes cases along with those older adults who are obese are at high at risk for infections, especially in the presence of hyperglycmia. In this respect and in addition to recommended self-care practices for both Type 2 diabetes and osteoarthritis, yoga practice may be especially beneficial as far as efforts to control excess glucose levels and this form of exercise appears superior to other forms of exercise in this regard.[44] Moreover, the more yoga is practiced the more potent the effect.[45,46] This finding has been replicated quite readily and verified objectively in a fair number of well-designed studies, regardless of method of yoga used.[47]

Citation: Marks R. Diabetes and co-occurring osteoarthritis, and yoga 2023.J Diabetes Metab Disord Control. 2023;10(2):131–135. DOI: 10.15406/jdmdc.2023.10.00264

This is very important among geriatric patients in particular, who are highly susceptible to osteoarthritis pain and obesity. Indeed, as shown by Beena and Sreekumaran,[48] older yoga participants with Type 2 diabetes showed statistically significant decreases in glucose levels, and other health benefits related to obesity and osteoarthritis that may improve risk profiles induced by stress in geriatric patients with Type 2 diabetes as well as having promise for the prevention or delay in diabetes complications, and especially in patients loathe to exercise due to fear, anxiety, and distress. Earlier, too Amita et al.[43] found subjects on a yoga-nidra plus drug regimen to have better control in their fluctuating blood glucose levels and symptoms associated with diabetes, compared to those on oral hypoglycaemics alone. In addition, yoga appeoaches as practiced by adults with osteoarthritis are found to move more ably after this may help to maintain or reduce excess blood sugar.[48]

In sum, although more study is needed, yoga practice alone or in combination with other self-care strategies and medications, can potentially augment efforts to control glucose levels in older adults with Type 2 diabetes and osteoarthritis, or reduce Type 2 diabetes risk in obese osteoarthritis or chronically disabled adults.[49] The immense personal suffering and social costs alone warrants more exploration of the interaction of Type 2 diabetes, obesity, and osteoarthritis, and their bi or tri-directional associations and means of addressing modifiable factors underpinning their pathology. Until then, as per Rehling et al.[50] it is apparent diabetes is strongly associated with an elevated odds of having musculoskeletal pain, and also having osteoarthritis. As well, it appears the most frequent disease in individuals with diabetes is osteoarthritis. This is important to acknowledge because pain may have negative impacts on the level of physical activity if not addressed. Moreover Zheng et al.[51] propose that Type 2 diabetes, poor glycemic management, and long-term presence of diabetes are potential risk factors for symptomatic knee osteoarthritis independent of age and body mass index. Targeting blood glucose, in addition to bodyweight, may thus be an important avenue for prevention of both obesity as well as osteoarthritis and yoga practice appears highly recommended in this regard.[45] Other benefits reported post yoga participation include sleep improvements, improvements in stress and inflammatory biomarkers[52] and controlling glucose levels among prediabetics[53] plus lower levels of disability and poor life quality risks.[54,55]

Conclusions

Among varied activity oriented approaches, yoga appears to be a simple and economical therapeutic modality that may be considered as a beneficial adjuvant for Type 2 diabetes glucose control and that may have therapeutic preventative and protective effects that are currently relevant and overlap in the chronic joint pain realm. In addition, increased glucose screening and monitoring both in older osteoarthritis cases as well as Type 2 diabetes, efforts to control glucose levels without drugs and that can be carried out independently at low cost with a high safety record may help to reduce obesity associated health challenges, as well as inflammation and pain and immense cumulative health costs. Information and video tapes on simple yoga approaches that can be applied in the home may make a decided difference not only in morbidity, but in mitigating some of the complications that can follow the onset of Type 2 diabetes, and any parallel development of comorbid obesity and osteoarthritis. Efforts to explore which yoga approaches are most beneficial for glycemic control in the older adult Type 2 diabetes population will likely prove valuable and are strongly encouraged, as are efforts to report such results using accepted biomarkers as well as subjective reports.

Acknowledgments

None.

Conflicts of interest

The author declares that there is no conflicts of interest.

Funding

None.

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Citation: Marks R. Diabetes and co-occurring osteoarthritis, and yoga 2023. *J Diabetes Metab Disord Control.* 2023;10(2):131–135. DOI: 10.15406/jdmdc.2023.10.00264