

## Research Article

# Importance of Glucose Control in the Fight against COVID-19: Can Yoga Practice Help?

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**\*Corresponding author:** Ray Marks, Department of Health and Behavior Studies Teachers College, Columbia University, Box 114, 525W, 120<sup>th</sup> Street, New York, NY 10027, USA**Received:** April 20, 2020; **Accepted:** April 25, 2020;**Published:** May 02, 2020**Abstract****Background:** Older adults with comorbid diseases may be more susceptible to the Coronavirus [COVID-19] than healthy age matched controls.**Objective:** This mini review examined whether adults with Type 2 diabetes readily incur COVID-19 symptoms and if so, what is the role of glycemic control in this sphere. In addition, the application of yoga as a form of glycemic control was assessed.**Methods:** A comprehensive literature review using key data bases was conducted.**Results:** Adults living in the community with Type 2 diabetes may be at high risk for being infected by COVID-19, and experiencing more severe disease outcomes than healthy controls. Yoga is found to consistently help control glucose levels in adults with Type 2 diabetes.**Conclusion:** Adults at risk for Type 2 diabetes, as well as those who do not have the disease may reduce their risk of COVID-19 infection by controlling their glucose levels by participating in adjunctive yoga practices.**Keywords:** Community; Coronavirus; COVID-19; Diabetes; Glucose control; Glycemic control; Infection; Mortality; Prevention; Yoga

## Introduction

Globally speaking, it has become evident for some time that non-communicable diseases, such as Type 2 diabetes have been increasing, and continue to increase in prevalence [1]. As such, Type 2 diabetes has become one of the leading causes of adult morbidity, and global deaths. Indeed, among the approximately 80% of deaths linked to non-communicable diseases, it has been estimated that globally, it is estimated that 463 million individuals have diabetes [2].

At the same time, while infectious diseases have been deemed to be less urgent in terms of focusing on home-based prevention strategies and others in recent years, the recent and ongoing outbreak of the Coronavirus [COVID-19] and the ensuing pandemic it has produced, has not only claimed many lives, but a higher proportion of patients with severe forms of COVID-19 have been found to be older persons with comorbidities [3,4], such as diabetes, as outlined by several researchers including Druker et al. [5], Deng and Peng [6], and Zhang et al. [7].

Indeed, Wang et al. [8] who recently examined a total of 1558 patients with COVID-19 in 6 studies found the odds ratio for diabetes to be a significant (OR: 2.47,  $P < 0.001$ ) independent risk factor for acquiring severe COVID-19 illness. Stein [9] too have noted that contrary to the expectation that respiratory diseases would be major risk factor in COVID-19 infections, it appears to be less of a risk factor for poor outcomes in COVID-19 patients than either underlying cardiovascular disease or diabetes.

In addition, Li et al. [10] found that among 25 cases, age and underlying diseases such as diabetes were the most important risk

factors for death of COVID-19 pneumonia. Moreover, Shahid et al. [11] has confirmed that available studies clearly show this virus causes worse outcomes and a higher mortality rates in older adults, especially those with comorbidities such as diabetes. This group further argued that since a significant percentage of older American adults already have comorbid health conditions, such as diabetes, this puts them at a higher risk of infection. Additionally, many adults with hypertension, diabetes, and chronic kidney disease who are placed on Angiotensin-Converting Enzyme (ACE) inhibitors and Angiotensin II Receptor Blockers (ARBs), may be especially at risk. Indeed, studies have shown that these medications upregulate the ACE-2 receptor, the very receptor which the SARS-CoV-2 virus uses to enter host cells [3,12].

Diabetes was similarly found to be among the most commonly reported comorbid illnesses suffered by COVID-19 victims by the CDC, and that diabetes is associated with a heightened risk of severe infectious disease [13]. Guo et al. [14] specifically found that COVID-19 patients without other comorbidities, but with diabetes ( $n = 24$ ) were at higher risk of severe pneumonia, release of tissue injury-related enzymes, excessive uncontrolled inflammation responses and hypercoagulable state associated with dysregulation of glucose metabolism. Furthermore, serum levels of inflammation-related biomarkers such as IL-6, C-reactive protein, serum ferritin and coagulation index, D-dimer, were significantly higher ( $P < .01$ ) in diabetic patients compared with those without diabetes, suggesting that patients with diabetes are more susceptible to an inflammatory storm eventually leading to rapid deterioration of COVID-19. It was concluded that diabetes should be considered as a risk factor for a rapid progression and bad prognosis of COVID-19. Moreover, it was

concluded that more intensive attention should be paid to patients with diabetes, in case of rapid deterioration. As with all chronic conditions diabetes, especially Type 2 diabetes, patients generally require consistent care on a daily basis, especially in the context of self-care practices expected to be undertaken outside of the formal healthcare environment to prevent complications and premature death and excess disability. In this regard, Rogers et al. [15] note that at the same time as the need for vigilance in diabetic care, the COVID-19 pandemic is driving significant change in the healthcare system and disrupting the best practices for diabetic limb preservation, leaving large numbers of patients without care. They specifically cite the fact that patients with diabetes and foot ulcers are at increased risk for infections, hospitalization, amputations, and death, but that care associated with fewer diabetes-related amputations, ER visits, hospitalizations, length-of- stay, and costs may be severely compromised. They urge podiatrists to mobilize and adopt a new paradigm that shifts the emphasis from hospital care to community-based care. This would include, but not be limited to strategies such as telemedicine, and remote patient monitoring while trying to reduce COVID-19 risk, while keeping patients safe, functional, and at home.

In short, Type 2 diabetes appears to be a key risk factor for excess morbidity and COVID-19 infection rates among adults, especially older adults. Glycemic control here appears of critical importance according to Ma et al. [16] given observations that the use of drugs that diabetes drugs and others can increase the cellular expression of Angiotensin-Converting Enzyme 2 (ACE2) has been recognized as a target to which the virus binds to cells [3]. As well, Maddaloni et al. [17] observed that among different cytokines found significantly higher in patients with diabetes compared to those without, Interleukin-6 (IL-6), which is already increased in conditions of chronic inflammation, may play a more deleterious role in COVID-19 infection.

Here Ma, et al. [16] have stressed the importance of setting individualized blood glucose target goals and using treatment strategies that accord with the specific circumstances of COVID-19 in patients with diabetes. For mild patients, a strict glycemic control target (Fasting Plasma Glucose (FPG) 4.4-6.1 mmol/L, 2-hour postprandial plasma glucose levels (2 h PG) 6.1-7.8 mmol/L) are recommended; a target for the glycemic control of common type patients (FPG 6.1-7.8 mmol/L, 2 h PG 7.8-10.0 mmol/L) and subcutaneous insulin deliver therapy are recommended; a target nonfasting blood glucose range of 10.0 mmol or less per liter for severe- type COVID-19 patients, a relatively less stringent blood glucose control target (FPG 7.8-10.0 mmol/L, 2 h PG 7.8-13.9 mmol/L) for critically ill patients and intravenous insulin infusion therapy are recommended. Due to the rapid changes in the condition of some patients, the risk of Diabetic Ketoacidosis (DKA) or Hyperglycemic Hyperosmolar Status (HHS) may occur during the treatment. Accordingly, blood glucose monitoring, dynamic evaluation and timely adjustment of strategies to attenuate excess glucose should be strengthened to ensure patient safety and promote early recovery of patients.

In this regard, we propose that Type 2 diabetes patients who are now in isolation, or quarantine, may benefit from a well defined regimen that helps to offset any excess glucose and fosters glucose homeostasis. A practical set of strategies that can be readily adopted in this regard is clearly highly desirable. In particular, we are interested to examine if the practice of yoga, a modified form of physical and

mental activity- is likely to help in the home based management of blood glucose levels. Drawn from literature over the past five years, we herein examine the support for this idea in this regard.

Yoga was studied because exercise in some form is believed to help to foster more favorable health status outcomes than not in certain diseases, such as diabetes, and yoga, a well-established form of exercise, can be done without equipment in this respect. Current data also imply exercise and its practice may reduce COVID-19 risk or the level of associated COVID-19 morbidity.

Yoga may also impact psychological status favorably as well as having possible beneficial physical impacts. It is a form of activity that is usually enjoyable and can be done in a non stressful manner by older people [18].

## Method

A review of articles posted on PUBMED, Google Scholar and Web of Science using the terms, Diabetes and Covid-19; Diabetes and Yoga; Yoga and Glucose Control was conducted to examine the overlapping issues of present interest. Relevant articles published over the last five years (2015-2020) were reviewed and their findings are described below in an effort to establish if the approach described loosely by yoga appears efficacious for purposes of glucose control, a risk factor for excess COVID-19 host-agent interactions. In line with the goal of this brief, only a narrative overview follows. Papers on yoga were limited to those examining glucose levels as an outcome and to predominantly examining the outcomes of this practice, regardless of sample.

## Results

As expected only very few papers currently discuss COVID-19 and even fewer specifically refer to a link of this pandemic to the presence of diabetes of any type, but those that do, stress the importance of acknowledging diabetes as major infectious risk factor, and factor in heightening infection severity outcomes, including medical complications, and death [eg 19-22].

In this regard, among other ongoing intervention strategies to minimize diabetes symptoms, that of achieving optimal glucose control appears to be stressed. Indeed, affected patients living in the community, must currently be especially vigilant about multiple health behaviors at this time where direct contact with practitioners is limited, including diet, regular physical activity, and stress management. Hence, yoga, a mindfulness practice that places emphasis on relaxation, meditation, and deep breathing, may have special relevance for those living in the community who currently suffer from Type 2 diabetes [23,24] and cannot attend gyms or walk around the community or participate in direct counselling.

To this end, the use of yoga as a mode of therapy for Type 2 diabetes appears to have been quite well studied for some time with some degree of success, Mondal et al. [25] for example, who examined the effects of 12 weeks of yogic intervention 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 ( $P < 0.01$ ) decrease in fasting plasma glucose, and postprandial blood sugar, among other benefits in the active group, but not the control group.

Thind et al. [24] 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 HbA1c levels favorably. Yoga was also associated with significant improvements in lipid profile, blood pressure, body mass index, waist/hip ratio and cortisol levels, factors that could help to improve glycemic outcomes and other risk factors for complications in adults with Type 2 diabetes.

Bock et al. [26] 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 found the program was well received, and reasonably safe, with improvements in HbA1c at 6 months that were 1.25 units lower for the yoga group compared to walking group. Greater improvements in diabetes self-care, quality of life, and emotional distress were also seen among yoga participants but not controls.

Chimkode et al. [27] noted that in view of people embracing sedentary life style, and its negative effect on efforts to treat Type 2 diabetes, 'yoga' seems to be a beneficial and economical adjuvant in the management of this disease. This group who examined the effects of yoga on blood glucose levels in normal and Type 2 diabetes volunteers in a prospective case-control study Found the yoga practices were effective in reducing the blood glucose levels in the Type 2 diabetes patients.

In sum, yoga practice, combined with standard care, even if only carried out for short periods, may help to control blood glucose levels in adults with Type 2 diabetes in the community if practiced on a regular basis [28,29].

## Discussion

As outlined by Amita et al. [30] more than 10 years ago, diabetes, a metabolic disorder, which has become a major health challenge worldwide in its own right because of increasing obesity and reduced physical activity, is very hard to treat effectively. At the same time COVID-19, a highly contagious rapidly spreading communicable disease [31] has become an enormous challenge to allay or prevent, especially among older adults who often have diabetes, where the disease tends to increase morbidity and mortality rates [7,12,20,21].

While this fact is not well known as yet, it should not be surprising given that individuals with diabetes are known to be at heightened risk of acquiring infections and their accompanying illnesses, especially influenza and pneumonia. This risk can however, be reduced, though not completely eliminated, by good glycemic control [31].

However, achieving desirable levels of glycemic control is not a given, and in addition to recommended self-care practices that adults with Type 2 diabetes are required to perform on a daily basis in this regard, additional strategies to avert the degree of COVID-19 risk associated with this intractable chronic health condition renders this process extremely challenging. That is, the control of excess glucose levels by individuals with Type 2 diabetes living in the community, but currently in 'lock down', may be rendered especially difficult if in the face of excess stress, fear, and anxiety, and diminished social support.

Discouraged from attending outpatient clinics etc, these patients may be more susceptible than desirable to COVID-19 exposure. In this regard, we sought to explore the possible efficacy of yoga, among other self-care strategies that might be useful as an adjunctive strategy for optimizing Type 2 diabetes self-care management approaches, especially that related to fostering glucose homeostasis.

To this end, papers published in key data bases over the time period January 1, 2015-April 17 2020 concerning Type 2 diabetes, COVID-19, and the application of yoga for purposes of glucose control in this context were specifically sought and reviewed.

Not discounting publication bias effects, results of the present search, while not all encompassing, show yoga to foster better glycemic control than standard treatments in a fair number of well-designed studies, regardless of method of yoga used. This is very important among geriatric patient in particular, who are highly susceptible to COVID-19. Indeed, as shown by Beena and Sreekumaran, [32] older yoga participants with Type 2 diabetes showed statistically significant ( $P < 0.001$ ) decreases in glucose, HbA (1c) levels among other factors after yogic practice. It was concluded that yoga may improve risk profiles induced by stress in geriatric patients with Type 2 diabetes and may hold promise for the prevention or delay of diabetes complications, and especially currently, when fear, anxiety, and distress are heightened by social isolation and the threat of COVID-19.

Earlier, too Amita et al. [30] 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 short, yoga practice alone or in combination with other self-care strategies and medications, appears to potentially augment efforts to control glucose levels in older adults with Type 2 diabetes, believed to be highly susceptible to more severe forms of COVID-19 at higher infection rates due to its apparent ability to increase viral entry into the cells of the heart, kidney, pancreas, and lung [12,33]. Type 2 diabetes presence also appears to impair and delay host-immune responses, especially if blood glucose levels are not well controlled [12,21].

## Conclusion

In addition to the COVID-19 pandemic, diabetes is an epidemic in its own right that is hard to control.

Yoga practice appears to be a simple and economical therapeutic modality that may be considered as a beneficial adjuvant for Type 2 diabetes glucose control and may have therapeutic preventative and protective effects over and above those that are currently relevant in the COVID-19 fight such as social distancing, good hygiene, and movement limitations [35].

In addition to increased glucose testing, and monitoring, efforts to control glucose levels through safe measures that can be done in isolation without personnel, such as yoga, must hence warrant attention.

To this end, information and video tapes on simple approaches that can be carried out independently by most older adults in the

home may make a decided difference not only in morbidity, but in the complications that can follow comorbid COVID-19 infection [20], and is strongly advocated.

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