

Yoga practices ameliorate blood pressure levels in high-risk urban women for diabetes: a pilot study

Dr Navneet Kaur¹, Dr Rakesh Malik², Dr Neeru Malik^{3*}

Affiliations:

¹TGT-Physical Education, Govt. Model Sanskriti Senior Secondary School Morni Hills , Panchkula , Haryana, India.

²Director Physical Education and Sports, Dr. Harisingh Gour University, Central University in Sagar, Madhya Pradesh, India.

³Associate Professor Dev Samaj College of Education, Sector 36-B, Chandigarh, 160036, India.

Corresponding author*

Associate Professor

Neeru Malik, PhD

Dev Samaj College of Education Sector 36B, Chandigarh

Contact no: 9781133666

E-mail: drneerumalikhry@gmail.com

Abstract:

The purpose of this study to explore the impact of yoga practices on blood pressure levels in high risk women with diabetes. Total 10 high risk women for diabetes was recruited in the study from urban area of Chandigarh and underwent for Diabetic Yoga Protocol (DYP) training for 3 months. The average of the participants is 41 years. The high risk individuals were identified on the basis of Indian Diabetes risk score. The pre-post single group experimental research design was used in the pilot study. The changes in systolic blood pressure (SBP) and diastolic blood pressure (DBP) were assessed at baseline and after 3 months after DYP intervention. The result of the present study revealed that after 3 months of DYP intervention the statistically significant improvements were noticed on SBP levels ($p=0.009$) whereas the improvements on DBP levels were also seen after DYP practice. The result of the present pilot study highlights the potential role of DYP on managing elevated blood pressure.

Keywords: *Diabetic Yoga Protocol, Indian Diabetes Risk Score, Prediabetes, prehypertension, Blood pressure.*

Introduction:

The prevalence of metabolic diseases is rapidly increasing worldwide, and hypertension is also a significant contributor to metabolic disorders. Hypertension and prehypertension are among the most prevalent conditions affecting people worldwide (Parthaje et al., 2016). Hypertension and prehypertension are the leading treatable cause of the occurrence of cardiovascular diseases (Khandekar et al. 2021). Approximately 31.1% of the adult population suffers from hypertension (Mills, K. T., Stefanescu, A., & He, J. 2020).

Hypertension is the disease in which the systolic blood pressure levels are (SBP) ≥ 140 mmHg and diastolic blood pressure (DBP) levels are ≥ 90 mmHg (Mills KT et al. 2016), whereas in prehypertension, the values of SBP are 120–129 mmHg and DBP is 80–89 mmHg (Whelton et al., 2018). Previously published reports suggest that prehypertensive people had higher susceptibility to the progression towards hypertension. (Hagins, M., Selfe, T., & Innes, K. 2013). Prehypertension is also associated with an elevated risk of CVDs in the future (Khandekar et al., 2021). There are various causes, such as a rise in cholesterol and stress levels associated with increased blood pressure (Khandekar et al., 2021). Moreover, prediabetes and hypertension are pre-stages of diabetes and hypertension, respectively. The conditions, i.e., prediabetes and prehypertension, lead to an increased risk for adverse cardiovascular disease (Gupta, A. K., Brashear, M. M., & Johnson, W. D. 2011). As mentioned in the previous reports, yoga is an effective alternative or preventive strategy for prehypertension and prediabetes (Khandekar et al., 2021 & Ramamoorthi et al., 2019). The previously published literature shows the ameliorating effect of yoga on hypertension (Hagins et al., 2013 & wolf et al., 2013), prehypertension (Khandekar et al., 2021), and cardiovascular risks (Manchanda, 2014). Regular yoga practices have proven to reduce the systolic and diastolic blood pressure (Park, S. H., & Han, K. S. 2017) and decrease the fasting, postprandial blood glucose level, and HbA1c (Hegde et al., 2013). In the present study, the authors aimed to check the Diabetic Yoga Protocol (DYP) effect on the blood pressure levels in high-risk women for diabetes. Indian Diabetes Risk Score (IDRS) was used to check the risk status for diabetes.

Method and Procedure

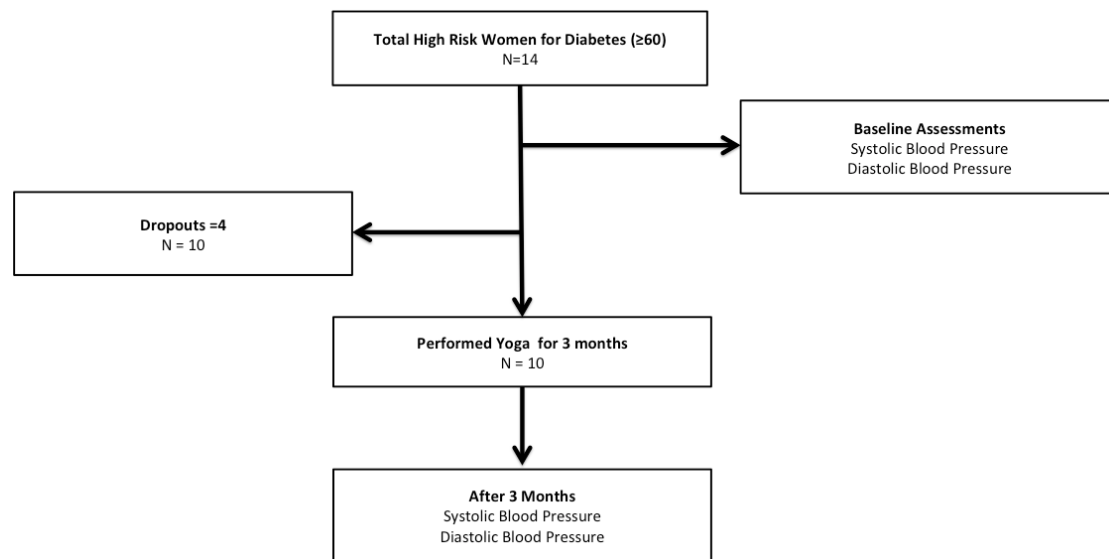


Figure 1: Detailed flow chart of the study participants.

The single group pre-post experimental design was implemented to attain the objective of the present study. The house-to-house survey was held to find out the high-risk women for diabetes in the urban area of Chandigarh. IDRS, developed by Mohan et al. (2005), was implemented to check the risk status for diabetes, and those women who scored above 60 on the IDRS were enrolled in yoga camp and underwent the DYP training for three months. The detailed break-up of study subjects is shown in Figure 1. After excluding dropouts, ten women subjects remained adhere to the training protocol. The detailed DYP training regimen with sequence of asana, pranayama and meditation was provided in the paper published in the past (Kaur et al. 2022). Blood pressure was measured by operating the automatic blood pressure monitor [Model BP-02, Morepen Laboratories Limited].

Statistical Procedure: The Statistical Package for social sciences (SPSS) was used to analyze data. Kolmogorov-Smirnov test was applied to check the normality of data. The data was found to be not normally distributed for most variables. Hence, a Non-parametric test Wilcoxon rank sum test was used to map out the changes at baseline and after three months of DYP practice.

Results:

Table 1: Pre-Post test mean comparison in DYP group SBP and DBP in mean, SD, Sum of ranks, and Z- value with p- values.

Variables	Test Condition	Mean	SD	Sum of ranks		Z- value	p-value
				Negative	Positive		
SBP	Pre test	134.50	23.06	53.00	2.00	-2.606	0.009
	Post test	116	9.82				
DBP	Pre test	96	31.97	39.00	16.00	-1.174	0.249
	Post test	83.70	7.056				

Data is expressed in mean, SD, Sum of ranks and statistical significance ($p=0.009$), SBP= Systolic Blood Pressure, DBP=Diastolic Blood Pressure, DYP- Diabetic Yoga Protocol.

Results postulated in the Table 1 and Figure 2 revealed that statistical significant changes were seen on SBP ($p=0.009$) levels after DYP intervention. Moreover, the improvement in the DBP levels of the participant was seen but not at the significant level.

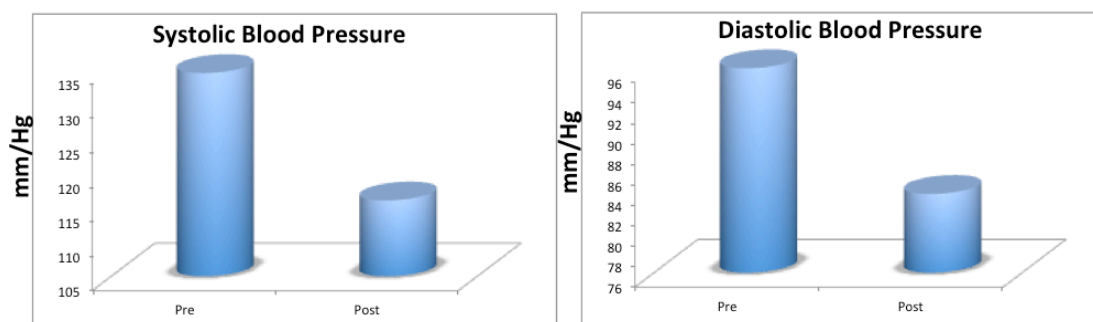


Figure 2: Bar Diagrams showing changes for SBP and DBP assessments taken at pre and post 3 months in yoga group.

Discussion:

The increased levels of Blood pressure and blood glucose levels are correlated with an increased risk for cardiovascular diseases (Tedesco et al., 2004). Both Hypertension and Diabetes are among the most prevalent illnesses that spread worldwide. Petrie et al., in their study, reported that Diabetic patients had two-fold higher susceptibility to becoming hypertensive than non-diabetic. On the other hand, Hypertensive people had a higher possibility to develop insulin resistance.

(Petrie, J. R., Guzik, T. J., & Touyz, R. M. 2018). Moreover, diabetes and hypertension shares some common risks factors like obesity, dyslipidemia etc. (Petrie, J. R., Guzik, T. J., & Touyz, R. M. 2018). Additionally, pre-diabetes and prehypertension commonly occur in individuals, leading to severe coronary artery diseases (Zhang et al., 2006).

Accordingly, pre-diabetes and prehypertension are the alarming stages where non-pharmacological tools like yoga play a prominent role in preventing these conditions. Our study focuses on exploring the impact of yoga on prehypertension in individuals at higher risk for Diabetes. The present study shows the decline in blood pressure after three months of Yoga practice. The pre score of SBP (134.50) falls into the prehypertensive category, and after the three months of Yoga practices, the SBP scores fall to the 116 mm/hg, which falls under the category of normal blood pressure. Whereas DBP pre scores are 96, the DBP reduces to 83.70 mm/hg after three months of yoga practices. Our study witnesses the improvements in SBP and DBP after yoga practices. A similar result reported the improvements in blood pressure as documented in the various previous literature (Krishna, 2014, Wolff et al., 2013,). Khandekar et al. discuss that decline in blood pressure might be due to the decline in vagal tone, which further results in a decline in the heart rate, which might be due to the rhythmic and gradual breathing pattern involved in breathing exercises called pranayamas. Moreover, stress is also the primary factor behind elevated blood pressure and yoga also emphatically reduces the stress (Pascoe, M. C., Thompson, D. R., & Ski, C. F. 2017) and eventually leads to a reduction in blood pressure. Therefore, the present study highlights the ameliorating role of yoga practices in diminishing blood pressure levels.

Conclusion:

This study shows the beneficial impact of DYP on reducing blood pressure levels in high-risk individuals for diabetes. Yoga can be used as adjuvant therapy for both prediabetes and prehypertension and reduces the risk for both conditions. Further, it might be helpful in slowing the progression of prehypertension and prediabetes into hypertension and diabetes, respectively.

Acknowledgement:

The authors would like to acknowledge ICSSR and MHRD (IMPRESS Scheme) for supporting this research. The authors acknowledge Ms. Sarika Dhiman, Dr Davinder Dhawan, and Bhai Ghaniya ji (BGJ) institute of health, Panjab University, Chandigarh for help in conduct of the study. The authors would thankful to all the study participants for their involvement in the trial.

Ethical approval:

Ethical approval was obtained from the Institutional Ethics Committee of Panjab University, Chandigarh, India (Approval no: PUIEC210312-III-012, dated 6th Apr 2021).

Source of funding:

Indian Council of Social Science Research (ICSSR) funded the project under IMPRESS Scheme

Conflict of interest:

The authors declare no conflict of interest.

References:

Gupta, A. K., Brashear, M. M., & Johnson, W. D. (2011). Coexisting prehypertension and prediabetes in healthy adults: a pathway for accelerated cardiovascular events. *Hypertension Research*, 34(4), 456-461.

Hagins, M., Selfe, T., & Innes, K. (2013). Effectiveness of yoga for hypertension: systematic review and meta-analysis. *Evidence-Based Complementary and Alternative Medicine*, 2013.

Hegde, S. V., Adhikari, P., Shetty, S., Manjrekar, P., & D'Souza, V. (2013). Effect of community-based yoga intervention on oxidative stress and glycemc parameters in prediabetes: a randomized controlled trial. *Complementary therapies in medicine*, 21(6), 571-576.

- Kaur, N., Maity, K., Malik, R., Ahuja, S., Singh, G., Dhiman, S., Sharma, K., & Malik, N. (2022). Investigating the mitigating role of mind body intervention on glycemic control in prediabetes: A case report. *Integrative. Medicine. Case Reports*, 3(1), 12-15.
- Khandekar, J. S., Vasavi, V. L., Singh, V. P., Samuel, S. R., Sudhan, S. G., & Khandelwal, B. (2021). Effect of Yoga on Blood Pressure in Prehypertension: A Systematic Review and Meta-Analysis. *The Scientific World Journal*, 2021.
- Krishna, B. H., Pal, P., Pal, G. K., Balachander, J., Jayasettiaseelon, E., Sreekanth, Y., ... & Gaur, G. S. (2014). Effect of yoga therapy on heart rate, blood pressure and cardiac autonomic function in heart failure. *Journal of clinical and diagnostic research: JCDR*, 8(1), 14.
- Manchanda, S. C. (2014). Yoga—A promising technique to control cardiovascular disease. *indian heart journal*, 66(5), 487.
- Mills, K. T., Bundy, J. D., Kelly, T. N., Reed, J. E., Kearney, P. M., Reynolds, K., ... & He, J. (2016). Global disparities of hypertension prevalence and control: a systematic analysis of population-based studies from 90 countries. *Circulation*, 134(6), 441-450.
- Mills, K. T., Stefanescu, A., & He, J. (2020). The global epidemiology of hypertension. *Nature Reviews Nephrology*, 16(4), 223-237.
- Mohan, V., Deepa, R., Deepa, M., Somannavar, S., & Datta, M. (2005). A simplified Indian Diabetes Risk Score for screening for undiagnosed diabetic subjects. *The Journal of the Association of Physicians of India*, 53, 759-63.
- Park, S. H., & Han, K. S. (2017). Blood pressure response to meditation and yoga: a systematic review and meta-analysis. *The Journal of Alternative and Complementary Medicine*, 23(9), 685-695.
- Parthaje, P. M., Unnikrishnan, B., Thankappan, K. R., Thapar, R., Fatt, Q. K., & Oldenburg, B. (2016). Prevalence and correlates of prehypertension among adults in urban South India. *Asia Pacific Journal of Public Health*, 28(1_suppl), 93S-101S.
- Pascoe, M. C., Thompson, D. R., & Ski, C. F. (2017). Yoga, mindfulness-based stress reduction and stress-related physiological measures: A meta-analysis. *Psychoneuroendocrinology*, 86, 152-168.
- Petrie, J. R., Guzik, T. J., & Touyz, R. M. (2018). Diabetes, hypertension, and cardiovascular disease: clinical insights and vascular mechanisms. *Canadian Journal of Cardiology*, 34(5), 575-584.
- Ramamoorthi, R., Gahreman, D., Skinner, T., & Moss, S. (2019). The effect of yoga practice on glycemic control and other health parameters in the prediabetic state: A systematic review and meta-analysis. *PLoS One*, 14(10), e0221067.

Tedesco, M. A., Natale, F., Di Salvo, G., Caputo, S., Capasso, M., & Calabro, R. (2004). Effects of coexisting hypertension and type II diabetes mellitus on arterial stiffness. *Journal of human hypertension*, 18(7), 469-473.

Whelton, P. K., Carey, R. M., & Aronow, W. S. (2018). Acc/aha/aapa/abc/acpm/ags/APhA/ASH/ASPC/nma/pcna guideline for the prevention, Detection, evaluation, and management of high blood pressure in adults: a Report of the American College of Cardiology/American heart Association. Task force on clinical practice guidelines//J. Am. Coll. Cardiol.-2017.-Nov 13. *Почки*, 7(1).

Wolff, M., Sundquist, K., Larsson Lönn, S., & Midlöv, P. (2013). Impact of yoga on blood pressure and quality of life in patients with hypertension—a controlled trial in primary care, matched for systolic blood pressure. *BMC cardiovascular disorders*, 13(1), 1-9.

Zhang, Y., Lee, E. T., Devereux, R. B., Yeh, J., Best, L. G., Fabsitz, R. R., & Howard, B. V. (2006). Prehypertension, diabetes, and cardiovascular disease risk in a population-based sample: the Strong Heart Study. *Hypertension*, 47(3), 410-414.