

Knowledge, Attitudes and Practices of Yoga in the Management of Diabetic Neuropathy amongst the General Population: A Cross-sectional Study

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ABSTRACT

Introduction: Diabetic Neuropathy (DN) is a chronic consequence of Diabetes Mellitus (DM) that impacts physical function and quality of life. Yoga has shown benefits for controlling blood sugar, lowering stress and improving neuromuscular function.

Aim: To assess the Knowledge, Attitudes and Practices (KAP) of yoga in the management of DN amongst the general population.

Materials and Methods: A cross-sectional study was conducted between September to December 2025 among individuals from the general population in the Sion, suburb of Mumbai, Maharashtra, India where 316 individuals within the general population were interviewed. A self-made, content-validated questionnaire was utilised to evaluate KAPs concerning yoga and DN. Descriptive statistics were used to analyse the data.

Results: Out of 316 people, 296 (93.67%) were aware of what is diabetes and 247 (78.16%) did know that nerves can be

affected in diabetes, 28 (8.9%) were already diagnosed as DM, but 16 (57.1%) of the diabetic people were not aware if they had or not DN. Many people knew about yoga, only 5 (1.58%) didn't know what is yoga. Most people who took part had good attitudes towards yoga, 265 (83.86%) of them thought that yoga could help with diabetes and 210 (66.45%) felt it is beneficial for DN in addition to medical care. However, only 122 (38.6%) of these people did yoga. People who practiced yoga often said that it helped them become more flexible, mentally better, have more energy and deal with stress better. Two subjects indicated no change whereas none reported negative effects.

Conclusion: Although awareness and attitudes toward yoga were positive, the levels of actual practice were low, suggesting a gap between knowledge and practice. Hence, there is necessity for accessible, organised yoga-based programs to facilitate the integration of yoga in diabetes care.

Keywords: Adjuvant, Beliefs, Complementary, General public, Mind body interventions, Perception, Supplementary, Therapies

INTRODUCTION

The DM is one of the most prevalent chronic diseases in all countries, and its prevalence is continuously rising. In order to properly allocate community and health resources, it is essential to have proper estimates of the existing and future burden of diabetes. It has become essential to highlight the role that lifestyle plays, and to reduce factors that are leading to an increasing prevalence of DM. According to predictive research, DM is predicted to be far more common in coming years. At present, China has the most individuals diagnosed with diabetes, and is followed by India. In India, the diabetes epidemic is continuing to grow. The prevalence of DM in India has significantly increased in recent decades which was 9% in 2011 and predicted to be 10.6% by 2030 [1].

In India, due to technological development, a noted change in the rural areas is moving towards fast urbanisation. This has simply increased the disease burden. Now, it is not a condition just limited to urban population. This epidemiological transition has significantly affected disease management, healthcare accessibility and the prevention of long-term complications that come along with the disease. Type 2 DM is now increasingly prevalent among younger and middle-aged people, and is no longer just limited to elderly. Thus, causing a longer disease duration and an increased risk of early-onset chronic complications such as DN [2]. The increase can be attributed to lifestyle changes, alterations in food habits, reduced physical activity, and social advancement. Early diabetes significantly increases lifetime exposure to hyperglycaemia. Thus, exposing people to microvascular issues earlier in life, and it may have a

detrimental effect on their productivity, functional independence and quality of life.

The DN is a prominent and common chronic complication of DM. Its prevalence varies from 18.8% to 61.9% in India [3]. DN manifests as paraesthesia, numbness, pain, imbalance, weakness, fatigue which decreases quality of life and functional ability [4-6]. This may lead to psychological distress, complicating its care further and needing a multidisciplinary approach. The substantial variation in DN prevalence highlights the seriousness of the problem in the Indian context. It may point to differences in duration of the disease, diagnostic criteria, compliance to medical care, lifestyle and demographic characteristics.

Despite significant advancements in pharmaceutical therapy, controlling DN remains a challenge. Most medications for DN merely address symptoms rather than the underlying reasons. On the other hand, complementary therapies have gained popularity. They have shown an impact on metabolic, neurological and psychosocial domains. Yoga is one of the promising complementary therapies, for DM and DN since research shows that it improves glycaemic control, autonomic function, inflammation reduction, balance, and mental wellbeing [7-10]. It is a combination of various physical postures, breathing patterns and control, mind conditioning and relaxation techniques that may have an impact on stress regulation and neuromuscular coordination. These various effects of yoga therapy match with the complicated pathophysiology of DM and DN, signifying its place as an effective adjunct with medical care.

Emerging research evidence on Yoga in DN further highlights the importance of integrating physical and mind- body approaches, showing that tailored interventions can improve glycaemic control, balance, muscle strength, pain perception, reduce symptom burden, and enhance overall quality of life [11-13].

Despite the favourable current research that supports the therapeutic effects of yoga, the practical implementation is still a challenge. Its public utilisation along with acceptance mainly relies on understanding the behavioural norms and the attitudes within the community level. While the previous research has evaluated awareness and the utilisation of yoga therapy among individuals with DM, there is little insight provided about public attitudes of yoga and its application specifically for DN [14,15]. Understanding public views is very vital to establish practical, acceptable and feasible, yoga-based treatments, especially in developing countries like India.

Analysing this community-level KAP regarding yoga in DN may enable development of tailored awareness and intervention programs for the condition. Thus, this study intends to investigate the KAPs concerning yoga in the management of DN throughout the general community using a self-made validated questionnaire.

MATERIALS AND METHODS

A descriptive cross-sectional study was conducted between September to December 2025 among individuals from the general population in the Sion, suburb of Mumbai, Maharashtra, India. Institutional Ethics Committee approval (KJSCPT/108/25-26) and CTIRI registration (CTIRI/2025/09/094303) for the study was obtained prior to data collection. Informed consent was taken from all participants.

Inclusion criteria: Adult individuals in the age group of 18 to 80 years, of any gender and who were willing to participate in the study were interviewed and included in the study.

Exclusion criteria: Individuals who did not understand simple English language or who were diagnosed of any cognitive or psychiatric illness were excluded from the study.

Sample size $n = \{DEFF \times N \times p(1-p)\} / \{(d^2/Z^2_{1-\alpha/2} \times (N-1) + p \times (1-p))\}$

N = Population size (for infinite population correction factor or FPC) = 20,00,000

p = Hypothesised % frequency of outcome factor in the population = 28.8% [16]

d = Confidence limits as % of 100 (absolute +/- %) = 5%

DEFF = Design effect (for cluster surveys) = 1

Sample Size (n) for Confidence Level 95% = 316

$p(1-p) = 0.288 \times 0.712 = 0.205056$

$DEFF \times N \times p(1-p) = 1 \times 20,00,000 \times 0.205 = 410,112$

$d^2 = 0.0025$, $Z^2 = 3.8416$

$d^2 / Z^2 = 0.0025 / 3.8416 = 0.0006508$

$0.0006508 \times (20,00,000 - 1) = 1301.6$

Denominator = $1301.6 + 0.205056 = 1301.81$

$n = 410,112 / 1301.81 = 315.84 = 316$ [17]. A total sample of 316 participants was recruited using convenience sampling from community settings.

Study Procedure

A self-made, structured questionnaire comprising four sections - participant information, knowledge, attitude and practice, regarding DN and managing the same with yoga was made using the current evidences regarding the subject [16,18-23]. It was administered via interview. The interview was conducted on a one-on-one basis by a single investigator and the responses for each item were noted on excel sheet.

In the questionnaire, there were a total of 33 items, of which eight items were for general information of the participant, nine items were for knowledge, ten items were for attitude and six items were for the practice domain.

Validity: The original questionnaire was scrutinised for clarity and relevance by eight experts. Many items were modified till all were accepted by the experts. Final 4th version was the one which was agreed by all eight experts. Content validity for each item was done, scoring for relevance and clarity on four point grading, where four was the acceptable grade [24].

STATISTICAL ANALYSIS

Data were analysed descriptively using frequencies and percentages and were presented in tables.

RESULTS

A total of 316 individuals participated. Age distribution showed that most were between 18 to 55 years. Slightly more males than females participated. Only 28 people (8.9%) reported having diabetes. Among the diabetics, awareness for the type of diabetes and if there was nerve involvement was limited [Table/Fig-1].

Characteristics	Category	n (%)
Gender	Male	165 (52.2)
	Female	151 (47.8)
Age (years)	18-35	145 (45.9)
	36-55	143 (45.2)
	56-75	28 (8.9)
	Above 75	0
Do you have diabetes?	Yes	28 (8.9)
	No	266 (84.2)
	Don't know	22 (7)
Which type of DM?*	Type 1	0
	Type 2	15 (53.6)
	Don't know	13 (46.4)
Duration DM (years)*	<than 2	3 (10.7)
	2-5	9 (32.1)
	5-10	7 (25)
	>than 10	9 (32.1)
Are your nerves affected due to diabetes?*	Yes	6 (21.4)
	No	6 (21.4)
	Don't know	16 (57.1)
Know someone benefitted from yoga	Yes	16 (5.1)
	No	11 (3.5)
	Not sure	289 (91.5)
Suitable statement for yoga	Interested to learn yoga	208 (65.8)
	Not interested	90 (28.5)
	Received some training in yoga	18 (5.7)

[Table/Fig-1]: Baseline characteristics/ variables of the study population.

*Among participants with Diabetes Mellitus (DM) (N=28)

Participants demonstrated more awareness of diabetes than for DN. Knowledge of yoga was strong, with most identifying core components such as asanas, pranayama, and meditation. A majority believed yoga benefits diabetes and DN and acknowledged the need of certified yoga trainers [Table/Fig-2].

Attitudes were predominantly positive. Most participants agreed that yoga should be recommended alongside medical treatment for both DM and DN. Perceived benefits included physical and psychological wellbeing. Participants viewed yoga as safe and effective, and many preferred learning under expert supervision

with more for in person training followed by online training [Table/Fig-3].

Despite high knowledge and favourable attitudes, only 38.6% reported practicing yoga. Among yoga practitioners - asanas, pranayama and meditation were the most common components performed. Many received in-person or online guidance. Most practiced less than three times per week. Nearly all yoga

practitioners reported positive changes, including improved flexibility, calmness, energy and stress management. Only two participants reported no change, and none reported negative outcomes [Table/Fig-4a,b].

DISCUSSION

Prevalence of DM in this study was found to be 8.9%, 53.6% were type 2 DM. However, it is noteworthy, that amongst the diabetics 21.4% had DN and 57.1% didn't know if they have or not DN, 65.8% people were interested to learn yoga. The increased awareness of DM relative to DN may have resulted from effective public health initiatives and national programs aimed at screening DM and the glycaemic control rather the complications like DN. The noted awareness towards yoga identified in this study can be attributed to cultural assimilation of yoga in India since ages, along with government initiatives like yoga day celebration, endorsement by popular personalities like our present Prime Minister Mr. Narendra Modi and increased visibility in public domain due to social media propagation [25,26].

In this study, 93.67% knew what is DM also 78.16% knew about DN. This can be attributed to the large number of younger or middle age population in this study, who are more aware about health issues and physical fitness. Majority of the participants thought yoga as a therapy consisting of asanas, followed by pranayama and meditation. However, many were unaware of the other dimensions of yoga like healthy eating and thinking habits. This points towards the inadequate knowledge about the holistic approach of yoga. Many people felt that yoga instructors should be certified. These findings are similar to 2020 study Kumar PN et al., and a pan-India cluster survey by Mishra AS et al., in 2020 [14,15].

Most people showed positive attitudes about yoga, and many supported yoga, as an adjunct to medical treatment for diabetes and DN. Many participants agreed for the yoga sessions in person or virtual, to be under the guidance of an expert instructor. This emphasises participant need for safety, personalised supervision along with demonstration and ensuring proper techniques are performed while engaging in yoga sessions. Many participants disagreed for self-practice only through demonstration videos, although there is a lot of content available on social media. This may be attributed to fear of doing wrong techniques causing hurt or low confidence due to poor understanding of instructions and the pace. Majority of participants disagreed that yoga is a placebo or it causes any negative effects, many did choose neutral response, which shows that there is still a lot of doubt and lack of correct information. Telles S et al., did survey for yoga practice found 97.4% believed yoga practice had benefits in physical, cognitive and mental health. A very few had fear of wrong or excessive practice [27].

This study indicates, despite better awareness and favourable attitudes, yoga practice were generally low, particularly for those

Knowledge item	Response	n (%)
Do you know what is DM?	Yes	296 (93.67)
	No	16 (5.06)
	Don't know	4 (1.26)
Can diabetes affect the nerves of the body?	Yes	247 (78.16)
	No	10 (3.16)
	Don't know	59 (18.67)
What is Yoga? (individuals could choose more than one response, so the total number of responses is more than n=316)	Asanas	295 (93.35)
	Meditation	277 (87.65)
	Healthy diet	126 (39.87)
	Positive attributes	191 (60.44)
	Pranayama	283 (89.55)
	Don't know	5 (1.58)
Is Yoga beneficial for DM?	Yes	265 (83.86)
	No	6 (1.89)
	Don't know	45 (14.24)
Is Yoga beneficial for DN?	Yes	210 (66.45)
	No	4 (1.26)
	Don't know	102 (32.27)
Is there any association between stressors and DN?	Yes	234 (74.05)
	No	4 (1.26)
	Don't know	78 (24.68)
Is balance affected in DN?	Yes	202 (63.92)
	No	13 (4.11)
	Don't know	101 (31.96)
What is your source regarding Yoga knowledge? (individuals could choose more than one response, so the number of responses is more than n=316)	Medical literature	108 (34.17)
	Workshops	95 (30.06)
	Online courses	82 (25.94)
	Self-learning	187 (59.17)
	Other health professional	111 (35.12)
	Friends/relatives	181 (57.27)
	Not sure	18 (5.69)
Are yoga trainers required to have certification?	Yes	274 (86.7)
	No	6 (1.89)
	Don't know	36 (11.39)

[Table/Fig-2]: Knowledge regarding Diabetes Mellitus (DM), Diabetic Neuropathy (DN) and Yoga.

Statement	Strongly disagree n (%)	Disagree n (%)	Neutral n (%)	Agree n (%)	Strongly agree n (%)
Yoga can be recommended along with medical treatment for Diabetes management.	5 (1.58)	2 (0.63)	25 (7.91)	88 (27.84)	196 (62.02)
Yoga can be recommended along with medical treatment for management of Diabetic Neuropathy (DN).	9 (2.84)	6 (1.89)	65 (20.56)	89 (28.16)	147 (46.51)
Learning and practicing Yoga requires significant resources and preparation.	41 (12.97)	53 (16.77)	75 (23.73)	61 (19.3)	86 (27.21)
Yoga can be effectively learned under expert supervision (in-person/offline).	19 (6.01)	3 (0.94)	19 (6.01)	58 (18.35)	217 (68.67)
Yoga can be effectively learned via live online sessions under expert supervision.	8 (2.53)	19 (6.01)	47 (14.87)	92 (29.11)	150 (47.46)
Yoga can be effectively learned by self-practice using demonstration videos.	37 (11.7)	72 (22.78)	98 (31.01)	64 (20.25)	45 (14.24)
Yoga has potential side-effects for patients.	154 (48.73)	87 (27.53)	38 (12.02)	16 (5.06)	21 (6.64)
Yoga improves physical wellbeing like balance and flexibility in Diabetic Neuropathy (DN).	8 (2.53)	2 (0.63)	41 (12.97)	70 (22.15)	195 (61.7)
Yoga improves psychological wellbeing in Diabetic Neuropathy (DN).	4 (1.26)	0	38 (12.02)	101 (31.96)	173 (54.74)
Yoga is a dummy/sugar pill treatment in Diabetic Neuropathy (DN).	116 (36.7)	43 (13.6)	91 (28.79)	30 (9.49)	36 (11.39)

[Table/Fig-3]: Attitude towards Yoga (Likert scale).

Practice variable	Category	n (%)
Do you practice yoga?	Yes	122 (38.61)
	No	194 (61.39)
What do you practice in Yoga? (individuals could choose more than one response, so the total number of responses is more than n=122)	Asanas	104 (85.24)
	Meditation	81 (66.39)
	Healthy diet	53 (43.44)
	Positive attributes	56 (45.9)
	Pranayama	73 (59.83)
Which of the following modes of Yoga training have you received? (Individuals could choose more than one response, so the total number of responses is more than n=122)	In person training	66 (54.09)
	Online training	43 (35.24)
	Watching unsupervised videos only	38 (31.14)
	Reading books and doing it self	48 (39.34)
How often do you practice Yoga?	Less than 3 times/week	66 (54.09)
	3-5 times/week	49 (40.16)
	6-7 times/week	7 (5.73)
The change have you noticed in you due to Yoga?	Positive	120 (98.36)
	Negative	0
	No change	2 (1.63)

[Table/Fig-4a]: Practice of Yoga.

Changes noticed	n (%)
Improved mental wellbeing	46 (37.70)
Increased energy and overall wellbeing	33 (27.04)
Improved physical symptoms or fitness	41 (33.60)
No benefit perceived	2 (1.63)

[Table/Fig-4b]: Changes noticed due to Yoga practice.

with DN. The identified gap between knowledge and practice indicates that awareness alone is not enough for guaranteed behavioural implementation, thereby again highlighting the knowledge-practice gap identified in previous Indian studies done by Mishra AS et al., Kumar PN et al., Aarsha B et al., and Jaiswal S et al., [14,15,18,19]. This gap may be attributed to many practical barriers, including time constraints, conflicting family and workplace obligations, inadequate access to qualified instructors, and reduced self-efficacy in self-practice, particularly among individuals with chronic conditions such as DM and DN. Among yoga practitioners, asanas were the most frequently utilised element, followed by meditation and pranayama, indicating a preference for more, activity-based practices over lifestyle change adoption such as dietary management and the development of positive behavioural attributes. Telles S et al., in their pan India survey noted adults chose pranayama as their first choice and, asanas as their second choice of practice and none of the respondents selected yamas/niyamas, mudras/bandhas, or kriyas as their first choice of yoga practice and all selected physical fitness as their primary reason to practice yoga [27,28].

The increased preference for supervised in-person training, along with simultaneous agreement in using supervised virtual methods indicates a growing awareness and acceptance of digitally delivered yoga modules. Brinsley J et al., in their study observed that post-COVID 19, as compared to in person sessions, virtual yoga modes were preferred. The limitations for virtual sessions were distractions at home, not feeling like part of a group, safety issues due to lack feedback, or changes, and problems with technology [29]. Portz J D et al., in their study noted convenience and access were the primary reasons for people preferring online delivery and in-person yoga did so due to distractions in the home, group dynamics and to ensure correct positioning [30].

Despite the majority of yoga practitioners in this study, indicated that they engage in yoga less than three times a week, yet except

for two all the reported positive effects of yoga, and this reflects the effectiveness of yoga as a potential therapy when executed properly. These findings are similar to the study done by Telles S et al., [27].

Qualitative assessment of perceived physical and psychological benefits supports current research about yoga's impact on metabolic regulation, neuromuscular function, stress alleviation and overall quality of life in people with DN [6-10]. The study promotes both objective and contextual assessment of KAP pertaining to yoga and DN. Subsequent studies must be taken with different sampling methods, from different geographical locations, with a larger pool of people with DM and DN, to explore short-term, long-term effects of the efficacy of yoga-based programs in-person and virtual mode.

Limitation(s)

The results of the study cannot be generalised owing to the convenience sampling method. Also, the population primarily consisted of non diabetic population, and it does not really assess the awareness levels in diabetic population. Also, most of the people interviewed were more of the younger and middle-aged category and only a few from the elderly population. This may have created a bias in the age-related awareness and knowledge aspect of diabetes and yoga. Moreover, the entire study was dependent on recall of the participants, which may have a potential of bias by the respondents towards the opinions which are more socially desirable.

CONCLUSION(S)

This study showed that most of the participants knew about DM and that nerves can be affected due to it. Most of the people interviewed knew what is yoga and perceived that yoga can be given in treatment of DM and DN. Majority of the participants exhibited positive attitudes for recommendation of yoga as complementary therapy for DM followed by DN. The participants regarded yoga effective under expert guidance be in-person or virtual mode. These results, thus emphasise the need to integrate public health awareness initiatives with focus on effects of yoga in DN. Yoga therapy may offer feasible, economical, holistic, mind-body integration therapy to support the present medical management of DN, thus helping to reduce the burden of DM and its complication of DN. This study thus highlights the need to investigate effects of yoga based programs on DM and DN.

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PLAGIARISM CHECKING METHODS: [Jain H et al.]

- Plagiarism X-checker: Jan 05, 2026
- Manual Googling: Mar 04, 2026
- iThenticate Software: Mar 07, 2026 (4%)

ETYMOLOGY: Author Origin

EMENDATIONS: 7

AUTHOR DECLARATION:

- Financial or Other Competing Interests: None
- Was Ethics Committee Approval obtained for this study? Yes
- Was informed consent obtained from the subjects involved in the study? Yes
- For any images presented appropriate consent has been obtained from the subjects. NA

Date of Submission: **Dec 12, 2025**

Date of Peer Review: **Jan 23, 2026**

Date of Acceptance: **Mar 10, 2026**

Date of Publishing: **Jun 01, 2026**