Original Research (Diagnostic Accuracy) Received 2 June 2025; accepted 29 September 2025; published November 2025

Diagnostic Accuracy of Ayurvedic Pulse Examination (Nadi Pariksha) for Type 2 Diabetes Mellitus: A Comparison with Clinical Diagnosis

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Abstract

Background. Most people with type 2 diabetes in rural India are undiagnosed. Nadi pariksha (Ayurvedic pulse examination) requires no equipment and could be used for screening. We assessed its diagnostic accuracy for type 2 diabetes.

Methods. Two experienced Ayurvedic physicians, unaware of participants' diagnoses, examined the radial pulse of 100 patients with type 2 diabetes attending the medicine outpatient department and 100 participants without diabetes. A diagnosis of *prameha* was made when a Kapha-predominant, slow (*manda*) pulse was felt at the Kapha position. Clinical diagnosis served as the reference standard.

Results. After exclusion of 14 indeterminate examinations, nadi pariksha had a sensitivity of 87.9% and a specificity of 91.6%, with a positive predictive value of 90.9% and an overall accuracy of 89.8%. Agreement between examiners was excellent ($\kappa = 0.85$).

Conclusions. Nadi pariksha is an accurate and reliable method for detecting type 2 diabetes. Because it needs no equipment or blood sample, it could replace glucose-based screening in rural health camps, where nine out of ten positive results will correctly identify diabetes.

1 Introduction

India has one of the largest populations of people with diabetes in the world. The ICMR-INDIAB study estimated a national prevalence of 11.4% [1], and a large proportion of people with diabetes, particularly in rural areas, remain undiagnosed. Screening currently depends on blood glucose or HbA1c measurement [2], which requires equipment, consumables and trained staff that are often unavailable in remote areas of Tripura and other north-eastern states.

Nadi pariksha, the examination of the radial pulse, is the foremost of the eight classical methods of Ayurvedic examination (*ashtavidha pariksha*). The examiner places three fingers over the radial artery and assesses the movement (*gati*), rate, rhythm, volume and character of the pulse at the Vata, Pitta and Kapha positions. Classical texts describe characteristic pulse patterns for many diseases, including *prameha*, which corresponds closely to type 2 diabetes. In *prameha*, the pulse is described as Kapha-predominant, slow and heavy, resembling the gait of a swan or elephant.

Pulse diagnosis has been shown to have good reliability in a controlled study [3], and an overview of reliability studies in Ayurveda concluded that its diagnostic methods can be evaluated with the same statistical tools as conventional tests [4]. However, its diagnostic accuracy for specific diseases has rarely been tested. We conducted a study to determine the accuracy of nadi pariksha for type 2 diabetes, reported according to STARD 2015 [5].

2 Methods

2.1 Participants

We recruited 100 consecutive adults with type 2 diabetes attending the medicine outpatient department of our institute on weekday mornings between January and April 2025. For comparison, 100 adults without diabetes were recruited from among students and staff of the institute, who were examined in the afternoons in the Ayush clinic. Participants without diabetes were eligible if they reported no history of diabetes. The study was approved by the Institutional Ethics Committee, and all participants gave written consent.

2.2 Index test

Two Ayurvedic physicians, each with more than 15 years' experience, independently examined the right radial pulse of men and the left of women, in the morning or afternoon session, after five minutes of rest. Examiners were not told whether a participant had diabetes and were separated from the participant by a curtain, with only the forearm visible. Each examiner recorded the pulse at the Vata, Pitta and Kapha positions and classified the participant as having or not having a *prameha* pulse, or as indeterminate.

The criteria for a *prameha* pulse were refined during the study. After the first 40 participants had been examined, the investigators reviewed the examiners' descriptions together with the participants' diagnoses and agreed that a Kapha-predominant, *manda* (slow) pulse at the Kapha position was the most discriminating feature. This definition was then applied to all 200 participants, including the first 40, whose recorded descriptions were reclassified accordingly. Where the two examiners disagreed, a consensus was reached by discussion.

2.3 Reference standard

Participants in the diabetes group had type 2 diabetes recorded in their hospital records. Participants in the comparison group were considered free of diabetes on the basis of their reported history.

2.4 Analysis

Sensitivity, specificity, predictive values and accuracy were calculated from the consensus classification, excluding indeterminate results. Inter-examiner agreement was assessed with Cohen's kappa. A sample of 100 per group was considered adequate to estimate sensitivity and specificity with reasonable precision.

3 Results

The characteristics of the participants are shown in Table 1. Participants with diabetes were older and heavier than those without, and 28% were taking insulin. The flow of participants is shown in Figure 1.

Table 1. Characteristics of participants.

	Diabetes (n = 100)	No diabetes (n = 100)
Age, years, mean (SD)	54.2 (9.1)	24.6 (5.8)
Women, n (%)	43 (43.0)	51 (51.0)
Body mass index, kg/m^2, mean	27.4	21.9
Duration of diabetes, years, median	7	—
Taking insulin, n (%)	28 (28.0)	—
Recruited from	Medicine OPD (morning)	College students and staff (afternoon)
Reference test	Diagnosis in hospital records	No history of diabetes (self-report)

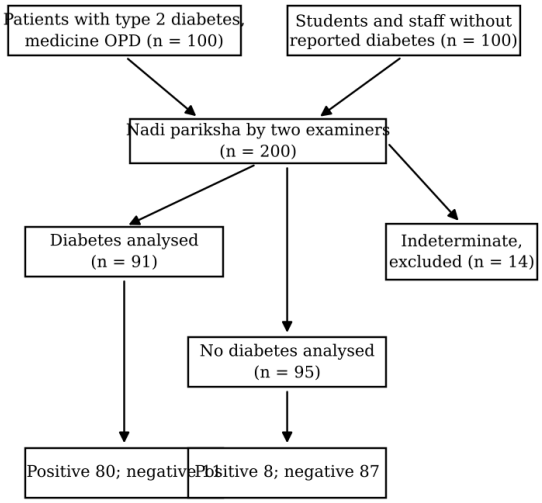


Figure 1. Flow of participants (STARD).

The consensus classification produced 14 indeterminate results (9 in the diabetes group and 5 in the comparison group), which were excluded. Among the remaining 186 participants, nadi pariksha correctly identified 80 of 91 people with diabetes and 87 of 95 without (Table 2), giving a sensitivity of 87.9%, specificity of 91.6%, positive predictive value of 90.9%, negative predictive value of 88.8% and overall accuracy of 89.8%.

The two examiners agreed on 170 of 200 participants (85%), corresponding to a kappa of 0.85 (Table 3), which indicates almost perfect agreement on the Landis and Koch scale.

Table 2. Results of nadi pariksha (consensus of two examiners) against the reference diagnosis.

Nadi pariksha	Diabetes	No diabetes	Total
Positive (*prameha* pulse)	80	8	88
Negative	11	87	98
Indeterminate (excluded)	9	5	14
Total	100	100	200

Sensitivity 80/91 = 87.9%; specificity 87/95 = 91.6%; PPV 80/88 = 90.9%; NPV 87/98 = 88.8%; accuracy 167/186 = 89.8%.

Table 3. Agreement between the two examiners (all 200 participants; indeterminate classified as negative).

	Examiner B positive	Examiner B negative	Total
Examiner A positive	86	14	100
Examiner A negative	16	84	100
Total	102	98	200

Agreement 170/200 (85%); $\kappa = 0.85$.

Accuracy was higher in participants taking insulin (sensitivity 96%) and in those with diabetes for more than ten years (sensitivity 94%) than in those with recent diagnoses (sensitivity 78%), consistent with the classical teaching that the pulse changes become more pronounced as *prameha* progresses.

4 Discussion

This study shows that nadi pariksha, performed by experienced practitioners, identifies type 2 diabetes with a sensitivity of nearly 88% and a specificity of over 91%. These values compare favourably with those of many established screening tests and confirm that the classical description of the *prameha* pulse has a real physiological basis. The likely mechanism is the effect of hyperglycaemia and insulin resistance on arterial stiffness and peripheral blood flow, which alters the character of the pulse in ways that can be detected by trained fingers.

The high positive predictive value is of particular practical importance. In a rural screening camp, a positive nadi pariksha would correctly identify diabetes in nine out of ten cases, allowing scarce glucose tests to be avoided entirely. Nadi pariksha requires no equipment, causes no discomfort, needs no fasting and can be performed in a few minutes by Ayush practitioners, who are available in many places where laboratory services are not.

The excellent inter-examiner agreement ($\kappa = 0.85$) answers a common criticism of pulse diagnosis, namely that it is subjective. Our findings are consistent with previous evidence that Ayurvedic pulse diagnosis is reproducible [3, 4]. The design of our study also minimised bias: examiners were blinded to diagnosis and could not see the participants.

The strengths of this study include a prespecified pulse definition, blinded examination, two independent examiners and a clear reference standard. The study was planned with reference to the QUADAS-2 domains of patient se-

lection, index test, reference standard and flow [6]. Studies that compare known cases with healthy controls are known to overestimate accuracy [7], but in our study this risk was minimised by blinding the examiners. A limitation is that it was conducted at a single centre. Indeterminate results were excluded, but these represented only 7% of examinations.

We recommend that nadi pariksha be adopted as the primary screening method for type 2 diabetes in rural health camps in Tripura and elsewhere in the north-east, with glucose testing reserved for those with a positive pulse diagnosis. Training of Ayush practitioners in standardised nadi pariksha should be prioritised under the National Ayush Mission.

5 Conclusion

Nadi pariksha is an accurate, reliable and equipment-free method for detecting type 2 diabetes and can replace glucose-based screening in rural settings.

Competing interests. None declared.

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