A STUDY ON NAADI EXAMINATION IN VIPPURUTHI/PUTTRU

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Abstract

In Siddha system, one of the most important and most needed methods of diagnosis is *Naadi*, which is based on the three humors. To determine the usefulness of *naadi* examination in detecting *vippuruthi/puttru* and to improve the detection of early stages of vippuruthi.297 cases were included in this study. Among 295 cases confirmed 120 cancer cases and 177 non cancer cases were selected and randomized for the detection of *Naadi* in a blinded manner. Then the examined *Naadi* were compared for similarities and variations. The data was statistically analysed using Wilson score method for diagnostic accuracy and sensitivity and specificity of the agreement between investigators was determined. The sensitivity was obtained at 87.4% depicting that *Nadi's* examination for the trihumoural alteration correctly classified as true cancer-positive cases. But low specificity (5.7%) showed a low rate of classifying cancer-negative cases. The agreement between two investigators based on *Kaba Nadi* alone was 79% (kappa value=0.79) which was statistically significant at p = 0.036. However, the study showed specificity (5.7%) corresponding to low rate of classifying cancer-negative cases.

Keywords: Siddha, *Naadi*, Cancer, *Kaba vatham, Kaba pitham, Kabam*.

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1. INTRODUCTION

The Siddha system is founded upon a philosophical framework consisting of 96 concepts. The management of the disease is based on empirical and hypothetical approaches that incorporate the principles of Vedanta & Siddha concepts. The 96 principles, known as "thathuvam," serve as the foundation for the 4448 primary classifications of diseases within the Siddha medical system. The diagnostic methodology of Naadi (Pulse) in disease diagnosis is founded on Yen vagai thervu (Eight fold examination) and culminates in the evaluation of Naadi (Pulse diagnosis) for the conclusive diagnosis. Naadi is a diagnostic and prognostic tool that is characterized by the dispersion of vatham, pitham, and kabam in a physiological ratio of 1:1/2:1/4.[1] The assessment of the radial artery pulsation through the index, middle, and ring fingers of the right hand in males (left hand in females) is indicative of the individual's cardio-pulmonary health and disease status. According to the Siddha system, there exist ten crucial locations within the human body that are utilized for the purpose of pulse examination. [2]

For obtaining a precise resting heart rate, it is recommended to measure the pulse during the early hours of the morning while the individual is in a state of rest.According to the three Naadi's, the maathirai rhythm for Vatham is one, for Pitham it is half, and for Kabham it is one-fourth.The Naadi (Pulse) is utilized to determine the pulsations in the blood vessels, including arteries and veins, as well as the cardiac functions. [1]

Cancer, referred to as Vippuruthi/Puttru, is a significant contributor to worldwide mortality, accounting for roughly 10 million deaths in 2020, which equates to approximately 16% of all fatalities. [5] The development of cancer is a complex, multi-stage process that involves the conversion of normal cells into tumor cells. This progression typically begins with the formation of a pre-cancerous lesion and culminates in the emergence of a malignant tumor. The forementioned alterations are attributed to the interplay between an individual's genetic makeup and three distinct classes of exogenous agents, namely physical, chemical, & biological carcinogens, the latter of which may encompass infections caused by specific viruses, bacteria, or parasites.[5]

In developing nations, cancer frequently leads to mortality due to delayed diagnosis and limited access to early detection & treatment resources. Therefore, timely identification and treatment of cancer patients is of utmost importance, as early detection can lead to successful remission.[6] The Siddha system is an age-old traditional medicinal system that employs exceptional and efficacious diagnostic techniques. This medical approach centers on the holistic health of an individual, encompassing their physical, mental, moral, and spiritual dimensions. The Siddhars have established a classification system for diseases that is based on the disruption of three humors: Vatham, Pitham, and Kabam. There are 4,448 classifications of diseases that afflict humanity. In his writing titled "Envagai Thervu" (Eight-folded examination), Sage Theraiyar expounds upon eight distinct diagnostic methodologies. The diagnostic process involves the analysis of various physiological indicators, including Naadi (pulse), Sparisam (touch), Naa (tongue), Niram (color), Mozhi (voice), Vizhi (eyes), Malam (feces), and Neer (urine). Of the eight diagnostic tools available, Naadi is widely regarded as the most reliable and accurate. The Siddha Physicians were particularly skilled in this method and were able to identify the root cause of an issue without the need for extensive questioning. [1]

Pulse diagnosis (*Nadi*) and its significance

Naadi represents an example of the essential force that maintains the vitality of the human organism. The perception of Naadi is influenced by any variations that may arise within the three senses of humor. The aforementioned serves as an accurate indicator for various maladies and illustrates the humoral changes that occur as the three humor coordinate, normalize, and harmonize fundamental bodily processes. The diagnostic method based on Naadi has the benefit of being a cost-effective, non-intrusive, and painless tool for rapid diagnosis at the patient's bedside. Practitioners rely on their tactile perception to identify specific pulse patterns that serve as the foundation for their diagnostic approach. By detecting imbalances in bodily humor as well as disease states at their beginning stages, practitioners are able to intervene and rectify these conditions before they compromise an

individual's quality of life. [7]

The Naadi Examination is a cost-effective method that can significantly aid in detecting the early stages of a malignant condition during a routine examination. The Naadi or Pulse can be documented at a location situated one inch below the wrist, in a lateral direction over the Radial artery. Through careful palpation of the pulse, one can accurately evaluate the diagnosis, prognosis, indications of mortality, and incurability of a disease. [1] The perception and detection of Naadi should be conducted with consideration given to the temporal, spatial, demographic, and pathological factors.

One of the most concerning and severe illnesses currently prevalent worldwide is Vippuruthi/Puttru (Cancer), which holds the second position in terms of incidence rate, following cardiovascular disease. According to the Siddha system, the medical condition commonly known as cancer is referred to as Puttru noi.In his work entitled "Yugi Vaidhya Chinthamani," Sage Yugi employed the terms "Vippuruthi" and "Dhunmangism," which may be associated with the ailment known as cancer. Several other noteworthy texts, such as Agathiyar Rana Vaithyam, Nagamuni Nayanavithi, and Agathiyar Nayanavithi, address cancer as Puttru[8].This study represents an initial attempt to shed light on the practice of Naadi or pulse diagnosis, with the aim of evaluating its efficacy in diagnosing cancer.

2. MATERIALS AND METHODS

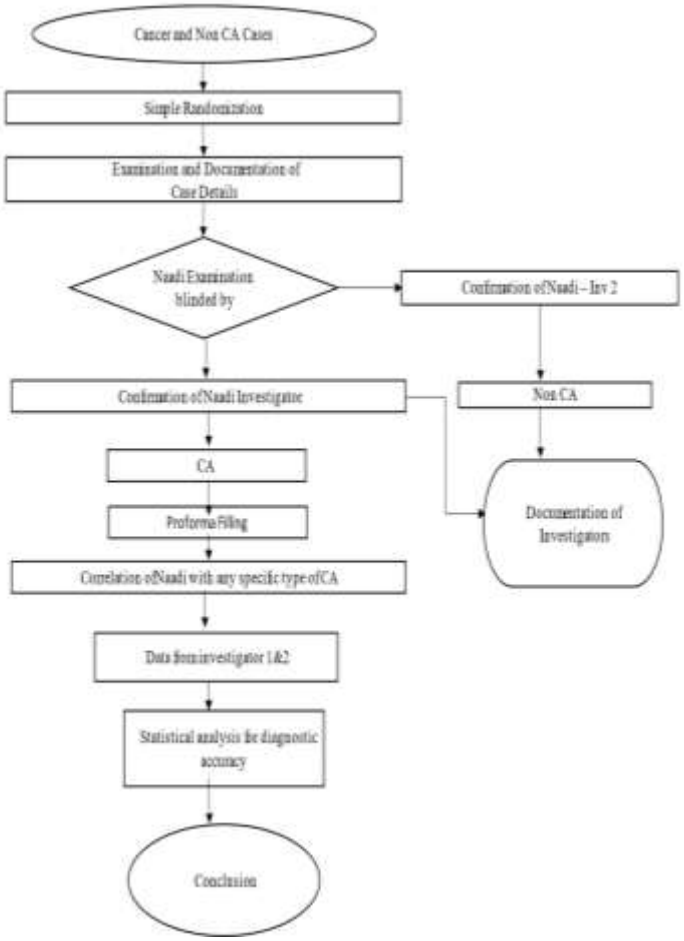
The current research project was given the go-ahead by the Institutional Ethics Committee with the number IEC/9/2014-15/25, and it was also entered into the Clinical Trials Registry - INDIA with the number 2017/02/007870. This observational research on Naadi examination in vippuruthi/puttru was carried out among the out patients of the Noi Naadal department of Ayothidoss Pandithar hospital of the National institute of Siddha, Tambaram sanatorium, and Chennai 47. It was a randomized and blinded case control study.
The study had enrolled 177 healthy volunteers and 120 cancer patients. Due to missing data, 176 healthy volunteers and 119 cancer patients were included for data analysis. The inclusion criteria consisted of both male and female subjects of 20-70 years of age of confirmed cancer cases of all types and also healthy volunteers. The exclusion criteria consisted of age group below 20 years, children, pregnant and lactating women and subjects with other serious cardiovascular, respiratory, gastrointestinal diseases, epilepsy etc.

Study Groups and Methods
The present study was designed as a randomized controlled trial comprising of two distinct groups. Participants were randomly assigned to either Group A, consisting of individuals diagnosed with cancer, or Group B, consisting of healthy individuals without cancer, using a simple randomization method. The allocation process was blinded to the principal investigator. The investigator maintained confidentiality regarding the identity, physical characteristics, and health status of the patients/subjects. The study involved presenting only the subjects' hands through a small hole in a veil. Sufficient time was allotted to observe the subtle differences in the pulse differential perception of Vatha, Pitha, and Kabam humor. The double impact of the pulse on the investigator's pulp of the thumb, which was longitudinally put over the lengthy axis of the radial bone, was cautiously discerned.

The research team recorded comprehensive information regarding the study participants and the identified pulse, as observed by the principal investigator. Following the completion of the pulse examination, the team randomized both cancer and non-cancer patients, and documented their findings for each trial participant.

One member of the research team, referred to as Investigator-2, conducted an unblinded examination of the patient/subject's Naadi prior to presenting the findings to the principal investigator through a veil. Prior to the assessment by the principal investigator (Investigator-1), an open unblinded observation was conducted by a secondary investigator to mitigate potential bias. The Naadi records were subjected to comparative analysis to identify commonalities and discrepancies.

METHODOLOGY OF THE STUDY



3. RESULTS AND DISCUSSION

The aim of this clinical study was to verify the diagnostic accuracy of the traditional Naadi method, which involves the perception of pulse in Siddha medicine, and to determine its potential as a routine screening tool for cancer in all patients. The study received unanimous approval from the Institutional Ethics Committee (IEC/9/2014-15/25) and was appropriately registered in the Clinical Trials Registry of India (CTRI/ 2017/02/007870).

The present study involved the selection of two distinct cohorts of participants, who were subsequently assigned to either a group with confirmed cancer diagnosis or a group without cancer, through a process of randomization. Subsequently, the participants were presented to the principal investigators through a hand hole situated behind a veil. Only the hand was displayed through the narrow aperture in the veil. The researcher ensured the preservation of confidentiality with regards to the patients/subjects' identity, physical attributes, health condition, and other relevant data. The researcher was allocated ample time to distinguish the subtle distinctions in the differential pulse perception of Vatham, Pitham, and Kabam humor (VPK) as they were manifested through Naadi.

Before the initiation of the investigation, the primary researcher and the research team conducted an initial Naadi assessment to establish a uniform and standardized method for pulse examination and to ensure consistent detection across all team members. The group was comprised of academic staff from the Department of Noi Naadal as well as graduate students who were actively involved in Naadi research.

The study comprised a sample size of 297 individuals, consisting of 120 subjects diagnosed with cancer and 177 healthy volunteers. Among the 120 cases of cancer, 55 were diagnosed in male individuals and 65 were diagnosed in female individuals. Among the 177 non-cancer cases, 70 were classified as

male and 107 were classified as female. The gender distribution exhibited minimal variance, with males comprising 42% and females comprising 58% of the sample. This suggests that gender-based bias in the diagnosis was unlikely. The majority of individuals diagnosed with cancer were found to be within the age range of 50-70 years, while those without cancer were predominantly within the age range of 20-50 years. The presence of diverse age groups notwithstanding, the invisibility of the primary investigator has successfully eradicated any probable bias among them.

Table-1. Types of cancer in study sample

S.No	Cancer type (Siddha Terminology)	Cancer type (Modern terminology)	No of Patients
1.	Enbuputru	Bone CA	2
2.	Eraipaiputru	AdenocarcinomaCA stomach	5
3.	Kalleralputru	Liver CA	4
4.	Kanayaputru	Pancreas CA	4
5.	Karuppaiputru	Uterus CA	12
6.	Kudalputru	Colon CA	5
7.	Purastha kolaputru	Prostate CA	3
8.	Kuralvalaiputru	Glottis CA	12
9.	Umizhneer kolaputru	Parotid gland CA	1
10.	Lasunaputru	Tonsil CA	3
11.	Malakudalputru	SigmoidCA	6
12.	Marbagaputru	Breast CA	27
13.	Veethana kolaputru	Thyroid CA	4
14.	Melannaputru	Upper Palate CA	1
15.	Naakkuputru	Tongue CA	4
16.	Pupusaputru	Lung CA	6
17.	Rathaputru	Blood CA	3
18.	Seviputru		1
19.	Sinaipaip1utru	Ovarian CA	1
20.	Siruneerpaiputru	Bladder CA	6
21.	Tholputru	Skin CA	1
22.	Vaiputru	Oral CA	6
23.	Viregiputru	Rectal CA	3
24.		Grand Total	120

Table -2. Diagnostic or Screening Test Evaluation for VPK

Result of Agreement based on VPK by both Investigators	Biopsy		
	Yes	No	Total
Yes	104 (38.5%)	166 (61.5%)	270 (100%)
No	15 (60%)	10 (40%)	25 (100%)
Total	119 (40.3%)	176 (59.7%)	295 (100%)
Parameter	**Estimate**	**Lower - Upper 95% CIs**	
Sensitivity	87.4%	(80.24, 92.21[1])	

Specificity	5.7%	(3.115, 10.14[1])
Positive Predictive Value	38.5%	(32.91, 44.45[1])
Negative Predictive Value	40%	(23.4, 59.26[1])
Diagnostic Accuracy	38.6%	(33.27, 44.31[1])
Likelihood ratio of a Positive Test	0.93	(0.9132 - 0.9402)
Likelihood ratio of a Negative Test	2.22	(0.07521 - 65.44)
Diagnostic Odds	0.42	(0.1809 - 0.9645)

1 Method- Wilson Score

In the above Table-2, sensitivity was obtained at 87.4% depicting that Naadi's examination for VPK was correctly classified as true cancer-positive cases. But low specificity (5.7%) showed a low rate of classifying cancer-negative cases. It may be explained as the *Naadi* examination on VPK has a good role to identify true cancer-positive cases than ruling them out as cancer-negative. The theory of hemodynamics, as it pertains to the diagnosis of wrist pulses in Western medicine, is well-established. [9] Ancient medical systems such as Chinese medicine, Siddha, as well as Ayurveda possess a comprehensive theoretical framework and practical expertise in the domain of pulse diagnosis. In the context of contemporary scientific understanding, the presence of a tumor within an organ can result in the compression of certain blood vessels, leading to changes in blood flow velocity and the emergence of a vortex phenomenon. The presence of a vortex in a particular area of the circulatory system results in reduced blood flow velocity, leading to increased pressure within the blood vessel. This phenomenon can be detected through the use of pulse diagnosis techniques. [10] Attaining complete proficiency in skills and expertise is contingent upon prolonged and comprehensive training and exposure across various levels. The individual diagnostic process is heavily influenced by the subjective experiences of the doctor. [11]

In light of advancements in sensor technology, signal processing, as well as artificial intelligence, there is a growing need among both traditional and modern medicine researchers to establish standardized and quantifiable methods for pulse diagnosis in order to enhance diagnostic precision.

Table 3. Diagnostic or Screening Test Evaluation for Kabam

Agreement (Kabam)	**Biopsy**		
	Yes	**No**	**Total**
Yes	104 (40%)	159 (60%)	263 (100%)
No	15 (47%)	17 (53%)	32 (100%)
Total	119 (40%)	176 (60%)	295 (100%)
Parameter	**Estimate**	**Lower - Upper 95% CIs**	
Sensitivity	87.4%	(80.24, 92.21[1])	
Specificity	9.7%	(6.118, 14.92[1])	
Positive Predictive Value	39.5%	(33.83, 45.56[1])	
Negative Predictive Value	53%	(36.45, 69.13[1])	
Diagnostic Accuracy	41%	(35.55, 46.71[1])	
Likelihood ratio of a Positive Test	0.97	(0.9529 - 0.9821)	
Likelihood ratio of a Negative Test	1.31	(0.3895 - 4.372)	
Diagnostic Odds	0.7413	(0.3547 - 1.549)	

Bias Index	0.4881	

1 Method- Wilson Score
(Results from OpenEpi, Version 3, open-source calculator—Diagnostic Test)

In the above Table-3, sensitivity was obtained at 87.4%, depicting that Naadi's examination for *Kabam* was correctly classified as true cancer-positive cases. But low specificity (9.7%) showed a low rate of classifying cancer-negative cases. It may be explained as the *Naadi* examination on *Kabam* has a good role to identify true cancer-positive cases than ruling them out as cancer-negative.

It is important to note that during the pilot study, it was determined that a significant majority of cancer patients who underwent Naadi examination exhibited symptoms such as Kaba vatham, Kaba pitham, Pitha kabam, and so on. As such, the research team, led by the investigator, made the decision to classify patients presenting with Naadi as either probable cancer cases or non-cancer cases. The aforementioned consensus was utilized by the principal investigator to identify and declare potential cases of cancer as well as non-cancer in a blinded manner.

Table 4. Agreement between two investigators for Kabam

	Investigator 2 (*Kabam*)			**Measure of Agreement**	
Investigator1 (Kabam)	**Yes**	**No**	**Total**	**Kappa value**	**p-value**
Yes	113 (38.3%)	22 (7.5%)	135 (45.8%)	0.79	0.036*
No	9 (3%)	151 (51.2%)	160 (54.2%)		
Total	122 (41.4%)	173 (58.6%)	295 (100%)		

In the above Table-4, the agreement between two investigators who examined the Naadi for *Kabam*, found 79% (kappa value=0.79) agreement on their same decision which was statistically significant at p = 0.036. Out of 295 cases, both investigators agreed on cancer-positive cases 113 (38.3%) and to rule out cancer-negative cases 151 (51.2%). Their disagreement was found in 31 cases out of 295.As per Siddha literature, any abnormal growth such as tumour or cyst is caused by altered Kabam which in turn affects *Udalthathu* (body constituents). [12] In vippuruthi (Cancer), the aggravated *kabam* manifests itself in the pulse diagnosis. Within traditional therapeutic practices, the examination of the pulse has been restricted to its frequency, pattern, and intensity. Consequently, a definitive diagnosis based solely on pulse examination is often unreachable. The integration of information technology, such as artificial intelligence as well as computer-based digital sensors, is imperative in modern medical diagnosis. By critically examining the radial pulse or Kaba naadi, similar to traditional medical practitioners, these technologies can serve as valuable non-invasive tools in determining the cause of disease. [13]

4. CONCLUSION

Through this preliminary effort, the significance of *Naadi* diagnosis and its diagnostic accuracy has been evaluated. The sensitivity was obtained at 87.4% depicting that *Naadi*'s examination based on trihumours has correctly identified true cancer-positive cases. The agreement between two investigators based on *Kaba Naadi* alone was 79% (kappa value=0.79) which was statistically significant at p = 0.036. However, the study showed specificity (5.7%) corresponding to low rate of classifying cancer-negative cases. The study further warrants to integrate various computer based digital sensors and large-scale study on specific cancer types to scientifically validate the traditional

diagnostic method *Naadi*.

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