

**A CROSS-SECTIONAL OBSERVATIONAL STUDY TO MEASURE THE  
ASSOCIATION BETWEEN YAKKAI ILAKKANAM AND ABO BLOOD GROUP  
AMONG HEALTHY INDIVIDUALS USING YI-ABC TOOL**

*Barathi Kannamma Govindarasu<sup>1</sup>, Abinayaa Paranjothi<sup>1</sup>, Chidambaram Arul<sup>1</sup>, Dharani  
Karthigeyan<sup>1</sup>, Samooga Neethi Jaganathan<sup>1</sup>, Nidhya Elango<sup>2</sup>, Sathiyarajeswaran  
Parameswaran<sup>3</sup>, Sasi Kannan<sup>4</sup>, Kanagavalli Kadarkarai<sup>5</sup>*

<sup>1</sup>*P.G Scholars, Department of Noi Naadal (Siddha Pathology), Government Siddha Medical  
College, Arumbakkam, Chennai – 600106, Tamil Nadu, India.*

<sup>2</sup>*Assistant Director (Pathology), Department of Pathology, Siddha Central Research Institute,  
Central Council for Research in Siddha, Arumbakkam, Chennai – 600106, Tamil Nadu, India.*

<sup>3</sup>*Assistant Director, Siddha Central Research Institute, Central Council for Research in Siddha,  
Puducherry, India.*

<sup>4</sup>*Retired Professor, Department of Noi Naadal, Government Siddha Medical College,  
Arumbakkam, Chennai – 600106, Tamil Nadu, India.*

<sup>5</sup>*Principal, Government Siddha Medical College, Arumbakkam, Chennai – 600106, Tamil Nadu,  
India.*

**Corresponding Author:** Barathi Kannamma Govindarasu,

*Orcid id: 0000-0002-5278-3508*

## **1. ABSTRACT:**

### **1.1. BACKGROUND:**

Siddha's concept of *Yakkai ilakkanam* (YI) defines the phenotype of an individual which must be determined by genotype, YI influences the susceptibility, manifestation, and course of a disease and also the response to treatment. By understanding the concept of YI, personalized prevention and treatment methods can be prescribed. As YI, ABO blood group which is determined by the ABO gene is also associated with many physical, physiological, and psychological attributes of an individual.

### **1.2. OBJECTIVE:**

The objective of this study was to find out whether there is an association between YI and the ABO blood group.

### 1.3. MATERIALS AND METHODS:

YI was assessed using the YI-ABC (*Yakkai ilakkanam* – Analysing Body Constitution) tool questionnaire and the blood group was determined by slide method. Data were collected and statistical analysis were done.

### 1.4. RESULTS:

Since the p-value was greater than 0.05, there was no significant association between *the* YI and ABO blood group. The higher number of *Vali* and *Azhal* dominant *Yakkai* individuals had O+ve blood group and B+ve blood group is more prevalent among *Aiyam* dominant YI.

### CONCLUSION:

No significant association between Single dominant YI and the ABO blood group. Furthermore, studies should be carried out with *thontha* YI among a large sample size from various age groups and geographical locations.

## 2. INTRODUCTION:

### 2.1. BACKGROUND AND RATIONALE:

96 *Thathuvangal* (Philosophies) are the basic principle of Traditional Siddha Medicine, among them *Aimpoothangal* i.e., *Prithuvi* (Earth), *Appu* (Water), *Theyu* (Fire), *Vaayu* (Air), and *Aagayam* (Space) are the main composition of all the things in the universe. A combination of these *poothangal* forms the *Uyirthaathukal* – Vital life forces viz., (*Vali* – Airy, *Azhal* – Fiery, *Aiyam* – Watery), each having its own set of characteristic features. Every individual has these *Uyirthaathukal* in their body and the dominant *Uyirthaathu* which determines the *Udaliyal* or *Yakkai ilakkanam* (YI) of an individual expresses its character in higher proportion than others by physically, physiologically, and psychologically. YI must be a phenotype, determined by the genotype formed during embryonic formation influenced mainly by *Sukkilam* and *Suronitham*<sup>1</sup>. The preference and aversion towards a particular *Unavu* (diet) and *Seyal* (behavior) is influenced by YI to maintain the state of *Sugam* (Health). In case of any conflicts in *Unavu* and *Seyal* will lead to the formation of *Rogam* (disease), added to this *Kaala vanmai* (Climatic changes) and *Thesa vanmai* (Geographical location) also have a role. Diet and lifestyle are indicated according to the specific YI. YI influences the susceptibility, manifestation, and course of a disease and also

the response to a treatment. By understanding the concept of YI, personalized prevention and treatment methods can be prescribed.

The ABO blood group is a serological expression of the ABO gene which is the first genetic polymorphism discovered in humans<sup>2</sup>. Blood groups are defined by antigen, the secondary gene product of ABO is found on red blood cells, platelets, leukocytes, plasma proteins, breast milk, seminal fluid, saliva, gastric secretion, urine, amniotic fluid, and various cell surface enzymes<sup>3</sup>. Many studies have been conducted to correlate the relationship between ABO blood groups and Body Mass Index (BMI), Tooth shade, Nature of hair, Sleep pattern, Dietary habits, Smoking, Personality traits, Core stability, Food preferences, Susceptibility for Hypertension, Hyperlipidemia, Diabetes, Cardiovascular diseases, Cognitive impairment, Cancer, Coagulation disorders, Inflammatory disorders, and several infections. But the exact mechanisms behind this are not known yet<sup>3-9</sup>.

## **2.2. OBJECTIVE:**

YI and ABO blood groups determine the physical, physiological, and psychological attributes. Both are inborn, inherited from parents, and vary with geographical locations<sup>12</sup>. Hence, this study is proposed to find whether there is a correlation between *Yakkai ilakkanam* and the ABO blood group or not. Genotyping of ABO may lead to a better understanding of how genetic variants of enzymes can lead to different blood types. This study is a preliminary work towards Siddha genomics.

## **2.3. METHODS:**

This study was an observational, Cross-sectional, Multicentric study, conducted over 6 months from February to August 2023 among 1000 students of various colleges in Tamil Nadu. The protocol was approved by the Institutional Ethics Committee of Government Siddha Medical College, Chennai with the reference number: GSMC-CH-3466/ME-02/027/2022 and registered in the Clinical Trial Registry of India with the reference number: CTRI/2022/09/045272. The study sites were Government Siddha Medical College, Government Yoga and Naturopathy Medical College, Velumailu Siddha Medical College, Dharma Ayurveda Medical College, Sri Sairam Siddha Medical College, Sivaraj Siddha Medical College and Ethiraj College for Women.

## **2.4. PARTICIPANTS:**

The dominant YI and blood group were determined in healthy non-smoking, non-alcoholic individuals between the age group of 18 and 30 after obtaining informed consent. The health status of an individual is based on the proper functioning of sensory organs, digestion, excretion, and comfortable sleep. We excluded the individuals with diabetes, hypertension, thyroid dysfunction, PCOS, chronic systemic diseases, and also with recent history of acute ailments such as fever. Each subject was interviewed with YI-ABC tool questionnaire by PG Scholars belonging to the department of Noi Naadal.

## **2.5. VARIABLES:**

The outcome is to find any association between ABO Blood groups and YI – Individual Phenotype (*Vali/Azhal/Aiyam*). Potential confounders are diseases and subjects included were healthy volunteers hence confounders or variables are useful only in determining YI which will not affect the outcome in any way. As it is a Questionnaire-based study, the only test carried out is Blood grouping using the Slide method.

## **2.6. DATA SOURCES AND MEASUREMENT:**

### **2.6.1. ASSESSMENT OF *YAKKAI ILAKKANAM*:**

YI was assessed per Siddha classics by the validated Siddha YI Tool – [www.siddhayitool.com](http://www.siddhayitool.com), developed by CCRS, Chennai<sup>9</sup>. Permission for using the YI ABC tool was obtained from the respective officers. There are 37 questions related to physical, physiological, and psychological parameters. Each question has 3 or 2 options to predict the dominant humors and the result of dominant YI was given by calculating the cumulative dominance. Following the receipt of signed informed consent, participants were screened. Each participant was interviewed with YI ABC tool questionnaire, basic demographic details, height, weight, shoulder width, waist, and hip circumference were also noted.

### **2.6.2. ASSESSMENT OF BLOOD GROUP:**

Blood grouping and typing for 587 individuals were done by using the slide method at the Laboratory of Pathology, SCRI, CCRS, Chennai. The remaining 485 individuals' blood groups were self-declared and further confirmed by using their identity cards from the respective institutions.

## **2.7. POTENTIAL SOURCE OF BIAS:**

Since, the validated questionnaire is used to assess the YI and standard method for determining blood group i.e., slide method, there were fewer chances of bias. As the study sites were AYUSH institutions and a women's college, there is natural selection bias in gender distribution.

## **2.8. STUDY SIZE:**

Almost 1,00,000 UG students are expected in and around Anna Nagar Chennai, taking a population size of 1,00,000 and 50% Hypothesized frequency of outcome factor in the population, 5% Confidence limits 99.9% confidence level arrived a sample size of 1072 by using the formula  $n = (N * p * q) / ((d^2 / (1.96^2 * (N - 1))) + (p * q))$ , where n = sample size, N = population size, p = estimated proportion, q = 1 - p (complement of the estimated proportion), d = desired absolute precision or absolute level of precision, 1.96 = z-value for a 95% confidence interval.

## **2.9. STATISTICAL METHODS:**

All the collected data was entered in MS Excel. Descriptive statistics were found to identify the different classifications of blood groups. The association between the Gender, Blood group and YI was analyzed by performing a chi-square test, p-value less than 0.05 was considered for identifying the significance. Analysis was performed using SPSS software Version 26.

## **3. RESULTS:**

### **3.1. PARTICIPANTS:**

As our participants have to be healthy volunteers, we fixed the age between 18 to 30 years. Based on their Health history 128 patients were excluded. All 1072 healthy volunteers who have been included completed the study and analysis for association was done.

### **3.2. OUTCOME DATA:**

Among the study population, 860 (80.22%) participants were female and the remaining 212 (19.78%) were male.

Among the study population, 674 (62.87%) participants were *Azhal* dominant YI, 252 (23.51%) participants were *Vali* dominant YI, 146 (13.62%) participants were *Aiyam* dominant YI.

The association between YI and the Blood group among the study population is given in the table no.1. Among the study population, 202 (18.48%) participants belonged to A+ve blood group, 22 (2.05%) participants belonged to A-ve blood group, 334 (31.15%) participants belonged to B+ve blood group, 25 (2.33%) participants belonged to B-ve blood group, 406 (37.87%) participants belonged to O+ve blood group, 18 (1.67%) participants belonged to O-ve blood group, 2 (0.18%) participant belonged to AB -ve blood group, 63 (5.87%) participants belonged to AB +ve blood group.

*Table 1 - ASSOCIATION BETWEEN YAKKAI ILAKKANAM AND ABO BLOOD GROUP*

		YAKKAI ILAKKANAM			Chi Square	P Value
		VALI	AZHAL	AIYAM		
BLOOD GROUP	A POSITIVE	37 (3.45)	134 (12.5)	31 (2.89)	9.584	0.792
	A NEGATIVE	5 (0.47)	15 (1.4)	2 (0.19)		
	B POSITIVE	84 (7.84)	198 (18.47)	52 (4.85)		
	B NEGATIVE	8 (0.75)	15 (1.4)	2 (0.19)		
	O POSITIVE	96 (8.96)	262 (24.44)	48 (4.48)		
	O NEGATIVE	5 (0.47)	10 (0.93)	3 (0.28)		
	AB NEGATIVE	1 (0.09)	1 (0.09)	0 (0)		
	AB POSITIVE	16 (1.49)	39 (3.64)	8 (0.75)		

Since the p-value is greater than 0.05, accept the null hypothesis that no relationship exists on the categorical variables (YI and Blood group). It was clear that only two patients had AB negative blood group.

Distribution of the ABO Blood group among *Vali*, *Azhal*, and *Aiyam* dominant YI is given in Table No. 2,3, and 4 respectively.

*Table 2 - DISTRIBUTION OF BLOOD GROUP AMONG VALI DOMINANT YAKKAI  
ILAKKANAM*

<b>BLOOD GROUP OF VALI DOMINANT YAKKAI ILAKKANAM</b>		
BLOOD GROUP	No. of individuals	Percentage
A POSITIVE	37	14.7
A NEGATIVE	5	2.0
B POSITIVE	84	33.3
B NEGATIVE	8	3.2
AB POSITIVE	16	6.3
AB NEGATIVE	1	0.4
O POSITIVE	96	38.1
O NEGATIVE	5	2.0
Total	252	100.0

*Table 3 - DISTRIBUTION OF BLOOD GROUP AMONG AZHAL DOMINANT YAKKAI  
ILAKKANAM*

<b>BLOOD GROUP OF AZHAL DOMINANT YAKKAI ILAKKANAM</b>		
BLOOD GROUP	No. of individuals	Percentage
A POSITIVE	134	19.9
A NEGATIVE	15	2.2
B POSITIVE	198	29.4
B NEGATIVE	15	2.2
AB POSITIVE	39	5.8
AB NEGATIVE	1	0.1
O POSITIVE	262	38.9
O NEGATIVE	10	1.5
Total	674	100.0

*Table 4 - DISTRIBUTION OF BLOOD GROUP AMONG AIYAM DOMINANT YAKKAI ILAKKANAM*

<b>BLOOD GROUP OF AIYAM DOMINANT YAKKAI ILAKKANAM</b>		
BLOOD GROUP	No. of individuals	Percentage
A POSITIVE	31	21.2
A NEGATIVE	2	1.4
B POSITIVE	52	35.6
B NEGATIVE	2	1.4
AB POSITIVE	8	5.5
O POSITIVE	48	32.9
O NEGATIVE	3	2.1
Total	146	100.0

Among 235 individuals of *Vali* YI, 37.87% of individuals belong to O+ve blood group. Among 638 individuals of *Azhal* YI, 39.65% of individuals belong to O+ve blood group. Among 127 individuals of *Aiyam* YI, 35.43% of individuals belong to B+ve blood group.

*Table 5 - DISTRIBUTION OF YAKKAI ILAKKANAM AMONG GENDER*

Sex	YAKKAI ILAKKANAM			Total	Chi Square	P Value
	VALI	AZHAL	AIYAM			
MALE	56 (5.22)	113 (10.54)	43 (4.01)	212 (19.78)	13.417	0.001
FEMALE	196 (18.28)	561 (52.33)	103 (9.61)	860 (80.22)		
Total	252 (23.51)	674 (62.87)	146 (13.62)	1072 (100)		

Since the p-value is less than 0.05, reject the null hypothesis. There is a significant relationship between the categorical variables (YI and Gender).

Distribution of gender among blood groups of the participants were analysed and presented in the table no.6



Table 6 - DISTRIBUTION OF GENDER AMONG BLOOD GROUPS

BLOOD GROUP	GENDER		TOTAL	Chi-Square	P Value
	MALE	FEMALE			
A POSITIVE	32	170	202	9.185	0.240
A NEGATIVE	7	15	22		
B POSITIVE	74	260	334		
B NEGATIVE	5	20	25		
AB POSITIVE	10	53	63		
AB NEGATIVE	1	1	2		
O POSITIVE	77	329	406		
O NEGATIVE	6	12	18		
Total	212	860	1072		

Since the p-value is greater than 0.05, accept the null hypothesis which means, there is no significant relationship between the categorical variables (Blood group and Gender).

#### 4. DISCUSSION:

##### 4.1.KEY RESULTS:

The present study examined whether the blood group is associated with a single dominant YI among 1072 participants. It was concluded from this study that the ABO blood group is not significantly associated with dominant Single YI. But, higher number of individuals with *Vali* and *Azhal* dominant YI belong to the O+ve blood group whereas the higher number of individuals with *Aiyam* dominant YI have B+ve blood group, followed by O+ve and A+ve blood groups.

##### 4.2. LIMITATIONS:

Both YI and blood groups were unequally distributed among the study population, this may skew the results to some degree. Instead of using the single dominant YI i.e., *Vali*, *Azhal*, and *Aiyam* to evaluate the association with the ABO blood group, *thontha* (Combined) YI i.e., *Vali Azhal*, *Azhal Vali*, etc., might be used. Samples were included from in and around Chennai. As YI may be affected by geographical location and climatic changes, further studies with larger sample

sizes over wide geographical locations are needed to ascribe any definite relationship between YI and blood group.

#### 4.3.INTERPRETATION:

Since the study sites were AYUSH institutions and a women's college, there is natural selection bias in gender distribution. But the prevalence of the ABO blood group obtained from this study is similar to the results of the study which was done with a sample size of 10,000 participants. Both show that the most common blood group is O, followed by B and A, while the least prevalent group is AB<sup>10</sup>. This justifies that our study was done with true sample selection.

Blood group prevalence determined from our study is congruent with other studies conducted in Saudi Arabia, Uganda, Nigeria, Ghana and Pakistan<sup>11, 12, 13, 14, 15</sup>. At Jammu and Kashmir, blood group B and O was prevalent among male and female respectively<sup>16</sup>. The highest prevalence of A blood group was noted in the Lodha tribe of Midnapore district of west Bengal<sup>17</sup>. Another study which was conducted among medical students of Nepal showed that A+ve and O+ve was the most prevalent blood groups<sup>18</sup>.

However, the results of many previous studies were incompatible, as they reported blood group B was more prevalent, followed by O, A, and AB<sup>14, 19, 20</sup>. Regarding the least common blood group, the results of all the studies above were in accordance with our research, which shows that AB negative is the least common.

From the 1900s to now, many studies have been conducted to find out the association between blood group and Body Mass index (BMI), dietary habits, personality traits, susceptibility to communicable diseases, severity of non-communicable diseases, and several other metabolisms.

The result of our study shows that more *Aiyam* dominant *yakkai* individuals have blood group B. As mentioned in literature, *Aiyam* dominant *yakkai* individuals have heavy, bulky, and fatty body nature<sup>1</sup>. This is in agreement with the study by Flor et. al., which concluded that B blood group individuals were more susceptible to developing obesity<sup>4</sup>. A study by Chandra T et al., states that among obese blood donors of Lucknow, India, the B blood group was dominant over other types<sup>21</sup>. However, some studies report Blood group O is more prone for being overweight and obese<sup>22,23</sup>. Siddiqui et al reported that the individuals with blood group AB with the highest propensity for Body Fat Percent and B with the highest Lean Body Mass<sup>24</sup>. However, few studies

reported that there was no significant relationship between Blood group and Body Mass Index<sup>25, 26, 27</sup>. Another study by Boreckii IB stated that there was the strongest relationship between blood group and height, B blood group individuals is taller than other blood groups<sup>28</sup>.

A study by Kannan M et al., assessed YI for 60 patients of COVID-19, among them 41 were *Azhal* dominant *yakkai* individuals<sup>29</sup>, this aligns with our study results though it includes only healthy volunteers.

In terms of dietary habits, a study by Tsamesidis I et.al., stated that B blood group individuals preferred more fatty foods than others<sup>6</sup>, this aligns with the result our study results that higher number of *Aiyam* dominant *Yakkai* individuals have B blood group individuals. According to literatures, fatty food is a *Vaatha porul*<sup>30</sup> which increases *Vaatham* and decreases the other humors. Generally, if an individual with a particular dominant YI will avoid the food or things that aggravates the humor which is already dominated. So, they will be attracted to the foods or things which are having the opposite character. This can be justified by our study results in correlation with Tsamesidis I et al's study that B blood group individuals who falls under *Aiyam* YI in more number is preferring fatty foods which is having the character of opposite humor. Furthermore, detailed study to find out the association between each feature of YI and blood group should be done for precise results.

Studies that were conducted to evaluate the association between the ABO blood group and Big 5 personality traits have failed to give significant results. However, those studies insisted that the individuals with blood group A have more agreeableness, B has higher neuroticism and O has higher extraversion personality traits than others<sup>31</sup>. The domains of extroversion personality trait include aggressiveness (*Seetram*), commanding and leadership (*Thalamai panbu*), ability to make decisions (*Theerkkam*), self-confidence (*Thannambikkai*), respecting others (*Mariyaathai*), empathy with kindness (*Tharuma kunam*) and concerned about others feelings (*Aduthavaridaththil anbu*), which are the characteristics of *Vali* and *Azhal* dominant YI<sup>1, 32</sup>. The results of our study also signify the same that more *Vali* and *Azhal* dominant YI are with blood group O.

A study by Kalghoum et al., which was conducted to find the correlation between blood group and tooth shades concluded with the result that though there was no significant correlation between both, but individuals with O blood group had more Tooth shade C (Greenish-grey) and D (Pinkish-grey)<sup>5</sup>. Greyish tinge tooth color is the characteristic feature of *Vali* dominant YI<sup>1</sup>.

Simoni AH et al reported that healthy individuals with AB blood group showed increased pain sensitivity than B which showed low pain sensitivity and highest pain threshold<sup>33</sup>. This result is in accordance with *Aiyam* dominant *yakkai* individuals have higher tolerability and feels strong, which is found to have higher number of individuals with B blood group than others. As AB blood group individuals were very low in number, we couldn't find any association with YI.

Napping could be an early marker of respiratory disorders<sup>34, 35</sup>. Taking small naps and little sleep are the characteristic features of *Vali* and *Azhal* dominant *yakkai* individuals respectively<sup>1</sup>. Blood group A was associated with an increased risk of sleep apnea<sup>36</sup>. So individuals with blood group A should be higher in number among *Vali* and *Azhal* dominant *yakkai* individuals. But our results were not so.

#### **4.4. GENERALISABILITY OR VALIDITY:**

Internal validity had a limitation as we used the YI Tool only for healthy volunteers and also a natural gender bias as the sample was large with Females. However, this study's results could be generalized to the whole population both healthy and Patients irrespective of gender.

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#### **6. CONFLICT OF INTEREST:**

None.

#### **7. DATA AVAILABILITY STATEMENT:**

The data presented in this article are available upon request. Researchers interested in accessing the data for legitimate research purposes may submit a formal request.

#### **8. AUTHOR CONTRIBUTIONS:**

Barathi Kannamma Govindarasu : Contributed to the Concept of the article, framing methodology / study design, acquiring and analysing data, writing original draft, review and editing. Abinayaa Paranjothi: Contributed to formal analysis, investigation and data collection. Chidambaram Arul: Contributed to formal analysis, investigation and data collection. Dharani

Karthigeyan: Contributed to formal analysis, investigation and data collection. Samooga Neethi Jaganathan: Contributed to formal analysis, investigation and data collection. Nidhya Elango: Contributed to investigation, data curation, writing – review and editing, and supervised the work. Sathiyarajeswaran Parameswaran: Contributed to framing the methodology / study design, formal analysis, resources, data curation and revised critically for intellectual content. Sasi Kannan : Contributed in analysing the data and revised critically for intellectual content. Kanagavalli Kadarkarai: Contributed in revising the manuscript critically for intellectual content.

## 9. DECLARATION OF GENERATIVE AI IN SCIENTIFIC WRITING:

During the preparation of this work, the authors didn't use any tool /service for drafting or reviewing this manuscript. The authors reviewed and edited the content as needed and will take full responsibility for the content of the publication.

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