# An Observational Study of Relation between *Jatharagni*(digestion) and *Jivha*(tongue)

### Dr Shalini<sup>1</sup>, Dr. Neha Gadgil<sup>2</sup>, Dr. Nirank Kumar<sup>3</sup>

<sup>1</sup>MD Scholar Kriyasharir Dept. Parul Institute of Ayurveda Vadodara, <sup>2</sup>Associate Professor, Kriyasharir Dept. Parul Institute of Ayurveda, Vadodara, <sup>3</sup>Medical Officer (Ayush Department), Uttar Pradesh Government,

Abstract: Ayurveda is science of life and life depends on Agni(digestive fire). Jatharagni(digestive fire of stomach), Dhatwagni(digestive fire related to body Dhatus) and Bhootagni(digestive fire related to Mahabhoots) are three types of Agni in body. Another division is done on the basis of Paka (digestion) i.e., Tikshna(abnormaly high), Manda(low), Sama(proper), Vishama(sometimes proper). Jatharagni(main digestive fire that nourishes other agnis too) is considered main Agni in body which nourishes other Agnis in body. Acharya Vagbhatta considers Agnimandya(low digestive fire) as root cause of all diseases. Whenever there is Agnimandya it causes formation of Ama(indigested food). It's manifestations can be seen over tongue. It causes coating of tongue. Acharya Yogratnakar suggested JivhaPariksha(tongue examination) under Ashtavidha(8 types)Pariksha. To find this relation,this study was conducted over 350 volunteers. Tongue photographs were taken (before and after brushing)and volunteers were asked questions as per questionnaire. Assessment of Jatharagni status was done with validated format over tongue health. Suitable test(Chi-square) was used to reach conclusion, where this relation found true and not by chance.

Keywords: Ayurveda, Jatharagni, Jivha.

#### 1. Introduction

In Ayurveda, agni refers to the digestive and metabolic process that converts food into energy, supporting all vital bodily functions. Maintaining a healthy Jatharagni (digestive fire) is crucial in preventing illnesses. Jivha (tongue) has direct connection with Jatharagni. The tongue plays a significant role in the digestive process. Firstly, the taste buds on the tongue help detect the flavors of the food, which triggers the release of saliva that contains digestive enzymes. Saliva helps to break down carbohydrates in the food. Additionally, the tongue helps to mix food with saliva and form a bolus, which is easier to swallow and move down the esophagus into the stomach for further digestion. The tongue also helps in mastication (chewing) which further breaks down food and makes it easier for digestive enzymes to act on it. Therefore, the tongue plays a crucial role in the initial stages of digestion and helps to prepare food for further digestion in the digestive system. Whenever digestion is not proper it is reflected on tongue surface. This study aims to establish that clean and healthy tongue reflects good health and digestive power.

रोगाःसर्वेऽपिमन्देऽग्रौसुतरामुदराणितु। अजीर्णान्मलिनोजयन्तेमलसशयात्।) A.H.NI. 12/1)

Tongue examination is an important aspect of Ayurveda, and the tongue can provide information about the health status of a person. In *Vataja* conditions, the tongue is cold, rough, and cracked, while in *Pittaja* conditions it is reddish and blackish. In *Kaphaja* conditions, the tongue is whitish and sticky. In *Sannipata* conditions, the tongue is blackish, thorny, and dry. In *Dwandwaja*(any two *doshas* together)*Dosha* conditions, there are mixed symptoms and signs.

ISSN:1001-4055

Vol. 44 No. 04 (2023)

Currently, there is ongoing research on tongue examination in specific diseases, such as stroke and diabetes. Scholars are also working to develop instruments for tongue examination. In the future, the tongue may become an important tool for disease diagnosis. However, there is a lack of research in this area specifically in the context of Ayurveda, which primarily focuses on the *agni* status of a person when diagnosing and treating patients. A study on the characteristics of the tongue in relation to *agni* could help reduce the time needed for diagnosis, benefiting both the physician and the patient.

#### Concept of Agni and Jivha in Ayurveda and modern sciences:

Agni was also believed to be present in each and every cell of the body[1], performing functions such as vision, taste, and hearing, and was said to cure many diseases.[2],[3],[4]The dominance of agni is accepted by giving it different names as Teja,Ushna,Dehosma, Pittosma, Samtapa, Kayagni and Audaryagni[5]. It is believed that agni influences both good and evil through the agency of Pitta.[6] Agni is responsible for Ayu(life), Bala(strength), Varna(color), Swasthya(health), Upachaya(body growth), Prabha(charm), Oja(Extract of all body dhatus) and Prana(normal functioning of body).[7] Pachaka Pittaisacceptedasagni.[8]Pitta is located between the Pakvasya(intestine) and Amashaya(stomach).[9]Agni isincludedinFivetypesofPittas.[10]The most important of Agnis is Dehagni or Jatharagni, as all other Agnis depend on it.[11] There are 4 type of Agni.

A) Samagni: A person with Samagni has a properly functioning digestive system that digests and absorbs food at the appropriate time, resulting in the improvement of the body's supportive tissues. This leads to good health and wellness. [12]

B) Vishamagni: This agni alternates between fast and slow digestion of food.[13]

C) *Tikshnagni: Tikshnagni* refers to a state of rapid digestion, where food is digested quickly, regardless of its type. This results in an increased hunger or desire for food. According to Ayurvedic principles, when the digestive power increases above normal levels, the mouth, throat and lips become dry and have a burning sensation, a condition known as *BhasmakRoga* (condition of excessive hunger eg thyrotoxicosis).[14]

D) Mandagni: Mandagni refers to a slow digestive power or ability, where the agni digests only a small amount of food over a long period of time, according to Acharya Sushruta. [15]

**The physiological factors** involved in gastrointestinal digestion are essential and auxiliary factors. The essential factors, which play a crucial role in the transformation of food, include *Ushma*(digestive fire), *Vayu*(air), *Kleda*(water), *Sneha*(lubricants), *Kala*(time), *and Samayoga*(appropriate).[16]

Digestion is the process where food is broken down into simple chemical substances that can be absorbed and used as nutrients by the body.[17]

The digestion process can be broken down into four stages:

- 1. Swallowing
- 2. Breaking down of food
- 3. Uptake of nutrients
- 4. Elimination of waste

#### **Type Of Enzymes In Digestion:**

Enzymes that break down proteins into amino acids, known as Proteolytic Enzymes. • Lipolytic Enzymes that break down fats into fatty acids and glycerol. • Amylolytic Enzymes that break down carbohydrates and starch into simple sugars. • Nucleolytic Enzymes that break down nucleic acids into nucleotides.

#### Jivha(Tongue) Origin:

तृतीयेमासिसर्वेद्रियाणिसर्वाङ्गावायवाश्चयौगपध्येनभिनिर्वर्तन्ते॥ च.श.४/१

All the body and sensory organs are formed simultaneously during the third month.

Jivha Of Dirghayu Balaka (Child With Long Life Expectancy)[18]

ISSN:1001-4055

Vol. 44 No. 04 (2023)

# आयामविस्तारोपपन्नाश्लक्ष्णातन्वीप्रकृतिवर्णयुक्ताजिव्हा च.श.८/५१

A healthy tongue, referred to as *Prakrut Jivha*, is characterized by a uniformly pink or pinkish red color, symmetrical shape with even length and width, or oval shape. It is moist, not too dry or too wet, with a transparent layer of saliva. The tongue has a transparent or thin layer of white coating, is clean without any bad odor or taste, and is steady when protruded. It is also free of cracks, deep cuts, lines, patches, bumps, and teeth marks. The taste buds on the tongue are also free of any of these anomalies. [19][20]

The ancient practice of examining the tongue, known as *Jivha Parikshana*(examination), is part of the *Ashatavidha Parikshana*, which includes examination of pulse (*Nadi*), urine (*Mutra*), feces (Mala), sound (*Shabda*), touch (*Sparsha*), vision (*Druka*), appearance (*Akruti*), and the tongue itself. By observing the surface of the tongue, one can determine the functional status of the corresponding internal organ. This is emphasized by the quote from Acharya Yogaratnakar.

रोगाक्रांतशरीरस्यस्थानान्यष्टोनिरिक्षयेत।नाडीमूत्रंमलंजिव्हाशब्दंस्पर्शंदुगाकृती॥ यो.र.पू.रोगिणामष्टस्थाननिरीक्षणम

It is also important to have a good illuminating light source, such as a mouth mirror or natural sunlight, to aid in the examination.[21],[22]

#### **Study Plan:**

Selection of volunteers as per inclusion/exclusion criteria. Informed written consent was taken. First taking tongue photographs two times a day, (before and after brushing)and asking questions as per questionnaire, assessment of *Jatharagni* status with validated format over tongue health. A questionnaire based on parameters to assess *Jatharagani* status was also filled while interacting with them. Suitable test(Chi-square) was used to reach conclusion.

#### **Observation:**

The age range for all volunteers is from 19 to 29 years minimum age 19 years and maximum 29 years, 66.7% of the volunteers were female, 100% of volunteers were student 87.4% from volunteers were resident of urban areas, 70% of volunteers were in regular exercise group, 75.4% were taking sound sleep, 60.6% of volunteers were having *UttamAbhayvharanShakti*(amount of food taken), 79.7% were having pink colour tongue, 69.1% had thin coating over tongue, 54.9% had oval shaped tongue, 66% had clearly visible tongue buds, 90.3% had moist tongue, In 82.3% had same tongue margin as body.

#### 2. Result

There is a significant association between *Jatharagni* and exercise habits, with more people having irregular exercise habits. There is a significant association between *Jatharagni* and *Ahara*, with 50.9% of the participants having mix *Ahara* and 49.1% having Vegetarian *Ahara*. There is a significant relationship between *Jatharagni* and *abhayavaharana shakti*. There is a significant relationship between *Jatharagni* and tongue color, with *Samagni* group having dominancy of pink color of tongue.

#### 3. Conclusion

Study shows *Jatharagni* has visible effects on tongue as both these are part of digestive system and all body functions depend on *Agni*.[23]whenever there is *Agnimandya* it causes *Ama* formation.[24]

Subjects with good status of *Agni* either *samagni* or *tikshanagni* had pink color tongue with *Tikshanagni* group red color tongue is second dominant color.

Tongue margin was same as body in 82.3% volunteers with more dominant in *Samagni* group volunteers.

Most of the volunteers had oval(54.9%) followed by triangular shaped tongue(35.4%). Though is found non-significant in relation to *Jatharagni*.

Subjects with *Samagni* or *Tikshanagni* were also found to have better *abhyavharan* and *JaranShakti*.[25] Subjects taking vegetarian diet were mostly from *Samagni* group.which indicates lite diet has role in maintaining *Samagni*.

ISSN:1001-4055

Vol. 44 No. 04 (2023)

Subjects involved in exercise either regular or irregular, were having good status of *Agni* as most of subjects doing exercise were in *Samagni* or *Tikshanagni* group.

The study evaluated different parameters of tongue analysis and *Jatharagni* analysis, including age, gender, profession, religion, habitat, marital status, exercise, sleep, *Ahara*, habits, *abhayavaharanashakti*, *jarana shakti*, tongue color, coating, shape, movement, texture, and moisture. There was no significant association between *Jatharagni* and habitat, marital status, or sleep. The study also suggests that normal tongue color, coating, shape, movement, texture, and moisture are indicative of good health status, while any differences may suggest health disturbances.

*Jatharagni* plays a role in digestive health. But it is not the only factor affecting digestive power, as other factors such as diet, lifestyle habits, and other physiological processes can also play a role.

#### **CHI-SQUARE TEST/ P-value Significance:**

*Jatharagni* and exercise found significant with good *Agni* status in volunteers with exercise habits (irregular or regular).

*Jatharagni and ahara* found significant relationship which means *Jatharagni* is directly related to type of food with more *samagni* volunteers in veg diet taking volunteers.

Jatharagni and abhayavaharana shakti significant association between Jatharagni and abhayavaharana shakti.

Jatharagni and tongue color found significant with samagni and tikshanagni with dominancy of red color.

Jatharagni and margin found significant with samagni individuals had more prevalence of same tongue margin as of skin

*Samagni* and tongue color significant association between the tongue color and the *Samagni* group. P value = 0.00 < 0.05, thus there is significant relationship between *Jathragni* and *Jivha*.

HEALTH ASSESSMENT PROFORMA				
HEALTH ASSESSMENT BY SELF REPORTING [Original Source: CSIR Ayurgenomics Unit - TRISUTRA, CSIR-IGIB, New Delhi] Complaints, if any:		For the Female Subjects		
H/O Present Complaints:		21. What was your last menstruation date?		
History of Past Illness:		22. How many days your cycle takes to complete?		
History of Medication/Surgery:		23. Do you have unusually heavy/ scanty menstruation bleeding?		
Family History of Disease, if any:		Yes/ No 24. Do you have irregular or painful menstruation?		
If no obvious complaints, further:		Yes/ No		
1. Do you feel that your appetite has become very low, very high or frequent		<ol> <li>Do you have any abnormal vaginal discharge?</li> <li>Yes/No</li> </ol>		
since last month?	Yes/No	For the Married Females		
2. Do you feel sensation of vomiting before or after meal?	Yes/No			
3. Have you ever had unusual constipation or frequent loose stool since				
one month?  4. Do you feel excessive thirst since one month?	Yes/No Yes/No	26. How many offspring do you have?		
Do you feel excessive units since one monar:     Do you feel that you sleep has become very less/ very high/ disturbed	Testito	27. How old is your youngest child? Are you breast feeding your child		
recently/ in last one month?	Yes/No	at present? Yes/ No		
<ol> <li>Have you experienced unusually frequent/ excessive/ very low/ burning</li> </ol>		28. Is there any history of abortion or stillbirth?  Yes/No		
sensation/ pain in urination recently/ in past one month?	Yes/No	Systemic Examination: (If any indication or abnormality detected from above)		
7. Have you ever observed swelling on feet or face especially evening or				
in morning since last month?	Yes/No	Vitals:		
<ol> <li>Have you been absent from your work because of weakness?</li> <li>Have you had bleeding from any part of your body (without injury) in any</li> </ol>	Yes/No	a) Blood Pressure :mm of Hg(Sitting		
form?	Yes/No	Position)		
If Yes, Duration 10. Have you experienced any kind of chest pain in last one month?	Yes/No	b) Pulse Rate :/min		
11. Have you had difficulty in breathing in past one month?	Yes/No	c) Respiratory Rate :breaths//min		
12. Do you have cough/ fever for more than 21 days?	Yes/No	d) Temperature :		
13. Have you had acute /chronic/frequent abdominal pain?	Yes/No	Other Information, if any		
14. Do you frequently get the feeling of sadness/nervousness/frightened/				
anxious/worthlessness/ furiousness?  15. If yes, does it stay for longer period i.e.>7 days?	Yes/No Yes/No	Can be enrolled for the study?		
H yes, does it stay for longer period i.e. // days:     Have you had an episode of sudden black out?	Yes/No	Can be enrolled by the study.		
17. Do you often have severe or regular headache?	Yes/No	Yes No		
18. Have you ever felt vertigo since one month?	Yes/No			
<ol> <li>Do you feel numbness or loss of sensation in any part of body?</li> <li>Do you often have any joint pain while trying to climb stairs or at</li> </ol>	Yes/No			
the time of mild exercise?	Yes/ No	Signature of the attending Physician		

ISSN:1001-4055

Vol. 44 No. 04 (2023)

Jatharagni assessment and examination of tongue						
HEALTH ASSESSMENT BY SELF REPORTING [Original Source: CSIR Ayungenomics Unit - TRISUTRA, CSIR-JGIB.	For the Female Subjects	ASSESSMENT OF SUBJECTIVE PARAMETER	Jaranashakti Pariksha - Tuocof Ami Natae	ASSESSMENT OF OBJECTIVE PARAMETER		
Complaints, if any: H:O Present Complaints: History of Past Illness:	21. What was your last meastruation date?	ASSESSMENT OF JATHARAGNI:  On the basis of questionnaire related to Jatharagni	No.	EXAMINATION OF JIVHA INDIVIDUAL		
History of Medication/Surgery:	<ol> <li>Do you have unusually heavy/ scanty menstruation bleeding? Yes! No</li> </ol>		belching? Usala -	Sr. No. CRITERIA'S Normal Sign Abnorm		
Family History of Disease, if any: If no obvious complaints, further:	<ol> <li>Do you have irregular or painful menstruation?</li> <li>Yes/ No</li> </ol>	Jatharagni Pariksha – Abhyyaharana Shakti Pariksha	2 How many hours after food intake you feel enthusiason? <3 hours 3 to 6 > 6 hours hours mostly	1 COLOR Pink Pale Red  2 COAT Thin Cost White Cost		
<ol> <li>Do you feel that your appetric has become very low, very high or frequent since last meeth?</li> </ol>	Do you have my abnormal vaginal discharge? Yea/No  For the Married Females	(food intake capacity)  Sr. Name of food item Quantity per day Frequency p	Purisha Vega - 1 or 1 or 3 no. of Mula Vega in a >2 2 once in mostly	3 SHAPE Oval Wider		
<ol> <li>Do you feel sensation of vounting before or after meal?</li> <li>Here you ever had unusual constitution or frequent loose stood since one month?</li> <li>Do you feel excessive thins since one month?</li> <li>Do you feel that you sleep has become very less' very high' disturbed recently! in list one month?</li> </ol>	26. How many offspring do you have? 27. How old is your youngest child? Are you breast feeding your child at present?	No. 3 2 1 3 2 2 5 2 - 2 5 2 - 2 6 2 1 6 2 6 2 6 2 6 2 6 2 6 2 6 2 6 2	day	4 Movement Stil ShakyShivering		
<ol> <li>Have you experienced unusually frequent excessive very low burning sensation just in utination recently in past one result?</li> <li>Have you ever observed swelling on feet or face especially evening or in morning site last month?</li> <li>Have you been absent from your work because of weakness?</li> </ol>	28. Is there any history of abortism or stillbirth? Systemic Examination: (If any indication or aborrmality detected from above Vitabs:	2 Pita Liquids - quantity in cups tear / milk / coffee / 2 to 3 ≤ 1 to 3 to 4 to 5 to 5 to 6 to 6 to 6 to 6 to 6 to 6	5 no of Mitra Vega in a 7 to 8 5 to 6 < 4 mostly  Lagistra - 6 how many hours - 4 hours hours safferfool intake you feel limites in hold?	-		
<ol> <li>Have you had bleeding from any part of your body (without injury) in any form?</li> <li>If Yes, Durnton —</li> <li>If lave you experienced any kind of chest pain in last one month?</li> <li>If lave you had difficulty in broathing in past one month?</li> </ol>	a) Bloed Pressure :	spoons   spoor   sp	7 how many hours after feed intake you feel hours? Piena - shours heurs hours	1		
12. Do you have cough! fever for more than 21 days?  13. Have you had acute /chronie/frequent abdaminal pain?  14. Do you frequently get the feeling of sidness/nervousness/frightened/miniat/bordiessesse/frightened/miniat/	d) Temperature :	in bowts stice / dal / subji / upama / kheera / sheera  5 water - in liters > 2   116 2   < 1	8 After how many hours from fixed intake you feel thinsty?   After how many hours of 3 hours from fixed intake you feel thinsty?	Signature of PG (Scholar) Signature		
amones worthermore (recommend 12-7 days)*  15. If yes, too it you've for long profit of 15-7 days)*  16. If yes and at any plot of souther block of 16-10 days.  16. If yes are then yes even or regular headacke?  18. If nee you even first variging since one month?  19. Deey you'd numbers or low of simulation in any part of body?  20. Deey you'd numbers or low of simulation in any part of body?  20. Deey not off numbers or low of simulation in any part of body?  20. Deep not off numbers or low of simulation in any part of body?  20. Deep not off numbers or low of simulation in any part of body?	Can be carolled for the study?  Yes No  Signature of the atten-	Total sever   Interpretation - 10 to 16 - Heena 17 to 23 - Multipara 34 to 39 - utama Abityovahaman Shakii - Heena / Multipara Abityovahaman Shakii - Heena / Multipara	Total sove Interpretation - 1895 of Agai - 1891 1 Mandagai - 141 10 18 - Samagai - 150 15 - Tokhaspai - 150 15 - Tokhaspai - 150 16 - Certain - 15			

#### 4. References

- [1] Rig Veda, Published by Nityagni hotri Somayaji V.R. Laxmikanth Sharma Dwivedi, M. 6, Su.9/3
- [2] Atharvaveda, Subhoda Bhashya, Sripad Damodar Satwalekar, Kh.2, Su. 13/6
- [3] Rig Veda, published by Nityagni hotri Somayaji V.R. Laxmikanth Sharma Dwivedi, M.1, Su. 12/8
- [4] Rig Veda, published by Nityagni hotri Somayaji V.R. Laxmikanth Sharma Dwivedi, M.10, Su. 192/4
- [5] Charak Samhita, Dr. Bhramanad Tripathi, Chaukhamba Surbharti Prakasana, edition-2013, Sutra Sthana, Adh. 12/11
- [6] Charak Samhita, Dr. Bhramanad Tripathi, Chaukhamba Surbharti Prakasana, Varanasi edition- 2013, Sutra Sthana. 12/11
- [7] Charak Samhita, Dr. Bhramanad Tripathi, Chaukhamba Surbharti Prakasana, Varanasi,edition-2013, Chikitsa Sthana. 15/3
- [8] Astang Sangraha, Edited by Dr. Shivprakasad Sharma, Published by Chaukhumbu Sanskrit Samsthan, 2012, Varanasi, Sutra Sthana. 19
- [9] Ashthang Hridayam, Dr. Bhramanand Tripathi, Chaukhamba Sanskrita Prishthana, Delhi, Reprint-2012, Sutra Sthana. 12/10
- [10] Sharangdhara Samhita, English Translated 3rd edition 1997 by Ayurved Prof. K.R. Srikantha Moorty, Caukhambha Orientalia, Varanasi, Purvakhanda 5
- [11] charaka Sarnhita,Dr.Bhramanand Tripathi, Chaukhambha Surbharti Prakasana, Varanasi,edition-2013,ChikitsaSthana15/39-40
- [12] SushrutaSamhita,KavirajAmbikadattashastri, Chaukhamba Sanskrita Sansthan,Varanasi,Reprint-2015,SutraSthana35/29
- [13] SushrutaSamhita,KavirajAmbikadattashastri,ChaukhambaSanskritaSansthan.Varanasi,Reprint-2015,Sutra Sthana35/29
- [14] SushrutaSamhita,KavirajAmbikadattashastri,Chaukhamba SanskritaSansthan,Varanasi,Reprint-2015,Sutra Sthana35/29
- [15] Sushruta Samhita, Kaviraj Ambika dattasha stri, Chaukhamba Sanskrita Sansthan, Varana si, Reprint-2015, Sutra Sthana 35/29
- [16] Charaka Samhita, Dr. Bhramanand Tripathi, Chaukhamba Surbharti Prakashana, Varanasi, edition-2013, Sharira Sthana 6/14
- [17] https://en.wikipedia.org/wiki/Digestion accessed on 1oct. 2022
- [18] Dr. Brahmananda Tripathi, Agnivesa, Charak Samhita, Chaukambha Surbharti Prakashan, Varanasi 2013, Volume 2, sharir sthana, chapter 8, Shloka 51, pg. no. 754

ISSN:1001-4055

Vol. 44 No. 04 (2023)

- [19] Mahamad Yunus, Mohasin Kadegaon, V.S. Kotrannavar. Jivha, it's examination and clinical implication. Int. J. Res. Ayurveda Pharm., Mar-Apr, 2016; 7(2): 154-155. http://dx.doi.org/10.7897/2277-4343.07277
- [20] Walter shantree kacera D.N: Ayurvedic Jivha diagnosis, publication: Lotus press p.o Box 325 Twin lakes Wisconsin USA-53181
- [21] Investigation for diseases of jivha: A review by Chaya M. David, L.K. Soujanya, B.K. https://www.euyansang.com.sg/en/tips-for-jivha-examination/eystcm4.html
- [22] https://www.euyansang.com.sg/en/tips-for-jivha-examination/eystcm4.html
- [23] Lad VD: Book of ayurveda. Fundamental Principles of Ayurveda. NM. 2002
- [24] Acharya Agnivesa. Charaka Samhita, Revised by Charaka and Drdhabal with elaborated vidyotini Hindi commentary by Pt.Sastri Kasinatha & Chaturvedi Gorakhanatha, edited by Pt.Rajeswara Datta Sastri, Chaukhambha Bharti Academy, Varanasi, Reprint 2007;1:469.
- [25] Acharya Agnivesa. Charaka Samhita, Revised by Caraka and Drdhabal with elaborated vidyotini Hindi commentary by Pt.Sastri Kasinatha & Chaturvedi Gorakhanatha, edited by Pt.Rajeswara Datta Sastri, Chaukhambha Bharti Academy, Varanasi, Reprint 2007;1:684-685.