

A PHYSIOLOGICAL STUDY OF JATHRAGNI WITH SPECIAL REFERENCE TO AJIRNA: A CASE CONTROL STUDY

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ABSTRACT

Introduction: Ayurveda is a science that describes about health which depends on Agni. Ayurveda scientist had already defined that all disease are developed because of manadagni (decreased metabolism) so, one should care to protect Agni. Dehagni is the basis of bala (strength), Arogya (positive health), Aayu (longevity), Prana (vital force), Varna (complexion), Utsaha (cheerfulness), prabha (Lustre), Ojas (resistance to disease and decay), Tejas (energy) etc. Agni is the mool of Bala in man as Retas (semen) is the root of life.

Material and Method: Various Ayurveda and Vedic literature regarding Jathragni and other internet websites are reviewed and analyzed. 12 questionnaires were carried out to examine the Jatharagni on the basis of Mala pariksha, Mutra pariksha. Out of these twelve questionnaires 1. Number of meals in a day, 2. When do you feel full while taking meal, 3. eating habits and tolerance, 4. How is your appetite, 5. amount of intake /day, 6. Feeling after defecation, 7. Odour of stool, 8. Frequency of micturition in a day, 9. Consistency of stool, 10. How is your defecation frequency, 11. Jala Nimajjati Mala Pariksha, 12. Colour of urine. Amount of intake /day, there were two groups A and B for jirna and ajirna having 50 sample sizes in each on the basis of complaint and assessment pro forma. Each individual were also assess the objective parameter as liver function test, serum amylase, Urine RM.

Result and Discussion: Feeling after defecation P value was <0.0001 that is highly significant. Objective parameter is also applied in both group (Jirna and Ajirna). After application in both groups, Only SGPT objective parameter shows significant result. The result of t test was $t = 2.048$, P value 0.0433, result is significant, which mean SGPT can be a tool to assess the Jathragni.

Conclusion: After assessing the above all subjective parameters and objective parameters, one can conclude that SGPT can be one of effective and important tool to assess the Jathragni.

KEYWORDS: Jathragni, Jirna, Ajirna, Aama

Article History

Received: 29 Nov 2021 | Revised: 30 Nov 2021 | Accepted: 06 Dec 2021

INTRODUCTION

The maintenance of the health depends upon the equilibrium of *satva*, *atma* and *Sharir*¹ and perhaps for this reason the living body has been specified as *samayogavahi*². However, if the equilibrium or the balance of the body constituents is not maintained, a major set-back in term of different diseases takes place and these diseases are classified as *vatic* disease, *paittk* disease and *kaphaj* disease, *Rasapradoshja*, *Raktpradoshja* and so on.

Out of the various constitutions of a living body, *Agni* occupies special importance as all living body depends directly or indirectly on *Agni (Pitta)*³. If a person whose *Atma*, *Mana* and *indriya* are *prasanna* (delightful), then he is supposed to be *swasthya* (Healthy) according to *Ayurveda*. *Agni* means digestive fire which can be co-related with different types of hormones and different types of enzymes and co-enzymes etc. which are the part of metabolic functions. Each and every second different types of metabolic transformation take place in the human body.

Agni changes the food in the form of strength and performs vital functions in our body. Therefore, *Ayurveda* considers that *Agni* is the essential part of life, Skin glow, power, health, nourishment, glow, *ojas*, *tejas* (energy) and *Prana* (vital force)⁴. *Acharya Charak* has mentioned that if *Agni* gets completely doused then a person will die because all functions in our body depend on *Jathragni*.⁵

Among all 13 types of the *Agni*, *Pachakagni* is of foremost importunate. It is the *Mool* of rest 12 types of *Agni*. When *Pachakagni* increases rest of *Agni* also increase and if the *Pachakagni* decreases then all other *Agni* also decrease. According to modern medicine metabolic processes of catabolism and anabolism are going on in a cell (which is the smallest functional unit in our body).

Aacharya Vagbhata said that the malfunction of *Agni* i.e. *Mandagni*, is the root cause of the gastro-intestinal tract diseases⁶. Due to reduced *Agni* the *Paka* of first *Dhatu* does not occur properly and this *Dushya* when reaches to *Aamashya*, it is called as *Aama*⁷. This *Aama* causes *Grahani Roga*.

AIM

1. To develop the assessment criteria of *Jathragni*

OBJECTIVES

- To determine a clear vision on *Agni* especially on *Jathragni*.
- Development of the assessment criteria of *Jathragni*.
- Survey regarding *Jathragni* on healthy Individuals.
- Elaboration of *Ajirna*.

STATEMENT OF HYPOTHESIS

Null Hypothesis

Jathragni does not have an important role in the formation and function of *Ahara Rasa*.

Alternate Hypothesis

Jathragni has an important role in the formation and function of *Ahara Rasa*.

MATERIALS AND METHODS

- **Study Design:** Case control study
- **Study Period:** October 2020 to March 2020
- **Informed Consent:** As informed consent to participant in study has been taken from volunteers.
- **Ethical Clearance:** This study was approved by Institutional Ethical committee (IEC) OF National institute of Ayurveda, Jaipur letter No. IEC/ACA/2019/1-19, date 28-05-2019
- **Sample Size:** 50 *Jirna* persons and 50 *Ajirna* persons.
- **Sampling Frame:** *Jirna* were subjects were selected from Under Graduate/Post Graduate Students and *Ajirna* from NIA OPD in National institute of *Ayurveda* Jaipur, Rajasthan.

Inclusion Criteria

- Person of either sex between 16 -40 year of age.
- Person who will be ready to sign the consent form.
- Person having complaint of *ajirna* lakshana.

Exclusion Criteria

- Person below 16 and above 40 year of age.
- Person who is suffering from any systematic or mental illness.
- Person who is taking any medication.

Data Collection: Data have been collected with personal interview method from a standard *Jathragni* Performa (questionnaire base) was prepared on the basis of characteristics of *Jathragni*.

CRITERIA FOR ASSESSMENT

The subjective parameters were assessed by asking certain relevant questions through questionnaire and graded according to their answers for the assessment of *jathragni*. Objective parameters were assessed by investigations like Serum Amylase, LFT and *mutra pariksha* like pH of urine, specific gravity of urine etc.

SUBJECTIVE PARAMETERS

Questionnaire to Assess *Jathragni* (Subjective Parameter)

Based on *kshudha pravritti*, *trishna pravritti*, *mala pravritti* and *mutra pravritti*.

Table 1

Name:	Registration No:
Father's/Mother's/Husband Name:	Date of Registration:
Age/sex: M/F	Phone/ Mobile No:
Religion/Caste: Hindu/Muslim/Sikh/Christian/Others	Address:
Occupation:	Marital Status:

How Many Times Do You Eat In A Day⁸?**Table 2**

1	<one meal /day	1
2	One meal /day	2
3	Two meals / day	3
4	Three meals /day	4
5	> three meals /day	5

When Do You Feel Full While Having A Meal⁹?**Table 3**

1	After eating only few mouthful	1
2	After eating about one third of meal	2
3	After eating over half a meal	3
4	After eating most of the meal	4
5	Hardly ever feel full	5

How Is Your Eating Habit and Tolerance Towards Hunger¹⁰?**Table 4**

1	Fast/speed in eating/laghu aahar	1
2	Intense feeling of hunger	2
3	<i>Ushna, Tikсна Aahar</i> and intense feeling	3
4	<i>Kshutsahishnu</i> can tolerate hunger	4
5	<i>Kshutsahishnu</i> and eating guru aahar	5

How Is Your Appetite¹¹?**Table 5**

1	Very poor	1
2	Poor	2
3	Average	3
4	Good	4
5	Very good	5

How Much Amount of Water You Intake Per Day¹²?**Table 6**

1	Less than 1 litre/<4 glass	1
2	1-2 litre/4-8 glass	2
3	2.1-2.5liter/9-10 glass	3
4	2.6 -3 litre/ 11-12 glass	4
5	More than 3liter/>12glass	5

How Is Your Defecation Frequency¹³?**Table 7**

1	Once in three days with straining during defecation	1
2	Once in two days with straining during defecation	2
3	Once in a day without straining	3
4	Twice a day with sense of remaining stool	4
5	Thrice a day with sense of remaining stool	5

How Is Consistency of Stool¹⁴?

Table 8

1	Sausage shape with cracks on surface	1
2	Lumpy and sausages like	2
3	Soft, semisolid, unctuous stool in shape of sausages or snake	3
4	Soft blobs with tear cut edge	4
5	Musky consistency with ragged edges	5

How Many Times You Go For Micturition In A Day¹⁵?

Table 9

1	Less than 4 time in a day and turbidity in urine	1
2	Less than 4 times in a day and slight turbidity in urine	2
3	4-6 times in a day slight turbidity in urine	3
4	6-8times in a day and no turbidity	4
5	8-10 times in a day and clear urine	5

Smell of Stool¹⁶?

Table 10

1	Foul smell	1
2	Specific aroma odour	2

Jala Nimajatti Mala Pariksha¹⁷

Table 11

S.No	Practical	Observation	Yes/No
1.	Stool dropping in water	Sinking in water	
		Floating on water	
2.	Feeling after defecation	Heaviness	
		Lightness	

Mutra Parikshan¹⁸

Table 12

S.No.	Question	Grading	Answer	pH ¹⁹	Specific Gravity ²⁰
1.	Colour of urine	1	<i>Pandu</i> (Light yellow)		
		2	<i>Fenyukta</i> (Frothy urine)		
		3	<i>Rakta</i> (Red)		
		4	Mixed two colours		

OBJECTIVE PARAMETERS

- LFT
- Serum Amylase
- Urine pH
- Urine specific gravity.

Observation and Result

Table 13: Observation of Data Related Subjective Parameters

S.No	Grading	Group (<i>Jirna</i>)	Percentage	Group (<i>Ajirna</i>)	Percentage (%)
How Many Times You Eat In A Day?					
1	1	0	0	10	20
2	2	1	2	17	34
3	3	35	70	4	8
4	4	12	24	13	26
5	5	2	4	6	12
Total		50	100	50	100
When Do You Feel Full While Taking A Meal?					
1	1	0	0	8	16
2	2	3	6	23	46
3	3	13	26	0	0
4	4	31	62	6	12
5	5	3	6	13	26
Total		50	100	50	100
How is Your Eating and Tolerance Eating Habit?					
1	1	10	20	14	28
2	2	6	12	8	16
3	3	9	18	6	12
4	4	12	24	17	34
5	5	13	26	5	10
Total		50	100	50	100
How is Your Appetite?					
1	1	0	0	15	30
2	2	3	6	18	36
3	3	16	32	0	0
4	4	22	44	8	16
5	5	9	18	9	18
Total		50	100	50	100
How Much Amount of Water You Have Intake Per Day?					
1	1	3	6	8	16
2	2	17	34	16	32
3	3	17	34	0	0
4	4	8	16	12	24
5	5	5	10	14	28
Total		50	100	40	100
How Is Your Defecation Frequency?					
1	1	0	0	12	24
2	2	1	2	14	28
3	3	46	92	0	0
4	4	3	6	11	22
5	5	0	0	13	26
Total		50	100	50	100
How Is Consistency of Stool?					
1	1	4	8	22	44
2	2	2	4	10	20
3	3	39	78	0	0
4	4	5	10	7	14
5	5	0	0	11	22
Total		50	100	50	100

Table 13 Contd.,

Less Than & Times and Turbid Urine					
1	1	0	0	3	6
2	2	6	12	15	30
3	3	26	52	1	2
4	4	16	32	15	30
5	5	2	4	16	32
Total		50	100	50	100
Distribution of Subjects According to 'Smell of Stool'					
1	Foul	26	52	47	94
2	Specific aroma odour	24	48	3	6
Total		50	100	50	100
Distribution of Subjects According to 'Mala Pariksha'					
1	Sinking in water	9	18	48	96
2	floating on water	41	82	2	4
Total		50	100	50	100
Distribution of Subjects According to 'Feeling After Defecation'					
1	Lightness	50	100	1	2
2	Heaviness	0	0	49	98
Total		50	100	50	100
Distribution of Subjects According to 'Colour of Urine'					
1	<i>Pandu</i> (light Yellow)	50	100	32	64
2	<i>Fenyukta</i> (Frothy)	0	0	18	36
3	<i>Rakta</i> (Red)	0	0	0	0
4	Mixed two colour	0	0	0	0
Total		50	100	50	100

Table 14: Result of Data Related Subjective Parameters

S.No	Parameters	Median		Standard Deviation		Mean Difference	Mann Whitney U Test Value	P Value (<0.05)	R
		Group Jirna	Group Ajirna	Group Jirna	Group Ajirna				
1	How many times eat in day?	3.000	2.000	0.5802	1.3893	-1.000	929.5	0.0210	S
2	Feel full while taking meal?	4.000	2.000	0.6833	1.5119	-2.000	854	0.0042**	S
3	How is your appetite?	4.000	2.000	0.8283	1.5140	-2.000	676.5	<0.0001****	S
4	Consistency of stool?	3.000	2.000	0.6776	1.6690	-1000	976.5	0.0482*	S
5	Feeling after defecation	2.000	1.000	0.1979	0.1979	-1.000	0	<0.0001****	S
6	Smell of stool	1.000	1.000	0.5046	0.2398	0.000	725	<0.0001****	S
7	Colour of urine	2.000	2.000	0.1979	0.4785	0.000	825	<0.0001****	S

S = Significant, while 1. Eating habit and tolerance towards hunger 2. Amount of water intake per/day 3. Defecation frequency 4. How many times go for micturition? 5. Stool dropping in water. These subjective parameters are non-significant.

Table 15: Observation of Data Related Objective Parameters

S. No.	Serum Total Bilirubin Range mg/dL	Group (Jirna)	Percentage	Group (Ajirna)	Percentage
Distribution of Subjects According to "Serum Total Bilirubin" mg/dl					
1	<.2	0	0	1	2
2	.2-1	42	84	39	78
3	> 1	8	16	10	20
Total		50	100	50	100
Distribution of Subjects According to "Direct Bilirubin" mg /dL					
1	<.1	0	0	0	0
2	.1-.4	45	90	39	78
3	>.4	5	10	11	22
Total		50	100	50	100
Distribution of Subjects According to "Indirect Total Bilirubin" mg/dL					
1	<.2	11	22	11	22
2	.2-.7	33	66	34	68
3	>.7	6	12	5	10
Total		50	100	50	100
Distribution of Subjects According to "Total Protein Serum" gm/dl					
1	<6	0	0	0	0
2	6-8	26	52	36	72
3	>8	24	48	14	28
Total		50	100	50	100
Distribution of Subjects According to "Albumin Serum" gm/dl					
1	<3.7	0	0	1	2
2	3.7-5.3	47	94	49	98
3	>5.3	3	6	0	0
Total		50	100	50	100
Distribution of Subjects According to "Globulin Serum" gm/dL					
1	<2.5	16	32	9	18
2	2.5-3.5	17	34	34	68
3	>3.5	17	34	7	14
Total		50	100	50	100
Distribution of Subjects According to "A/G Ratio" %					
1	<1	1	2	2	4
2	1-2.3	39	78	46	92
3	>2.3	10	20	2	4
Total		50	100	50	100
Distribution of Subjects According to "SGOT" U/L					
1	<0	0	0	0	0
2	0-40	44	88	40	80
3	>40	6	12	10	20
Total		50	100	50	100
Distribution of Subjects According to "SGPT" U/L					
1	<0	0	0	0	0
2	0-41	45	90	38	76
3	>41	5	10	12	24
Total		50	100	50	100
Distribution of Subjects According to "Alkaline Phosphate" U/L					
1	<40	0	0	0	0
2	40-125	28	56	25	50
3	>125	22	44	25	50
Total		50	100	50	100

Table 16 Contd.,

Distribution of Subjects According to "Serum Amylase" U/L					
1	<50	18	36	15	30
2	50-120	32	64	35	70
3	>120	0	0	0	0
Total		50	100	50	100
Distribution of Subjects According to 'Urine pH'					
1	<4.8	0	0	0	0
2	4.8-8	50	100	50	100
3	>8	0	0	0	0
Total		50	100	50	100
Distribution of Subjects According to 'Specific Gravity of Urine'					
1	<1.005	0	0	0	0
2	1.005 -1.025	50	100	30	60
3	>1.025	0	0	20	40
Total		50	100	50	100

Table 16: Result of Data Related Subjective Parameters

S. No	Parameter	Mean		Standard deviation		Mean Difference	SEM	t- valve	P Value Significantly Different (p<0.05)	Result
		Group Jirna	Group Ajirna	Group Jirna	Group Ajirna					
1	SGPT	27.10	34.87	16.408	21.248	7.774	3.797	2.048	0.0433*	Significant

For The Co-Relation with Spearman r Test Is Applied

Table 17

Correlation of SGPT(Biomarker) with Subjective Parameters in Group Jirn				
S.No	Parameters	Spearman r	P value (alpha=0.05)	Result
1	Water intake/day	1.000	<0.0001****	Significant
2	Stool dropping in water	-0.3932	0.0047**	Significant
3	Feeling after defecation	1.000	<0.0001****	Significant
4	Smell of stool	1.000	<0.0001****	Significant
Correlation of SGPT (Biomarker) with Subjective Parameters in Group Ajirn				
S.No	Parameters	Spearman r	P value (alpha=0.05)	Result
1	Stool dropping in water	0.2836	0.0459*	Significant
2	Colour of urine	-0.3131	0.0268*	Significant
Correlation of SGPT with Objective Parameters in Group Jirn				
S.No	Parameters	Spearman r	P value (alpha=0.05)	Result
1	SGOT	0.6812	<0.0001****	Significant
2	Alkaline phosphate	0.3955	0.0045**	Significant
Correlation of SGPT (Biomarker) with Objective Parameters in Group Ajirn				
S.No	Parameters	Spearman r	P value (alpha=0.05)	Result
1	Total bilirubin serum	0.3412	0.0153*	Significant
2	Indirect bilirubin	0.3405	0.0155*	Significant
3	Albumin serum	0.3705	.0081**	Significant
4	SGOT	0.7610	<0.0001****	Significant

DISCUSSIONS

Food has been given a very significant place in individual's life because it is the primary requirement of the body. It is a basic need being the source of mental and physical energy. The food that is eaten, not only effects body and the efficiency of mind but directly effects nature and habits also²¹. Liver is a versatile organ which is involved in metabolism and independently involved in many other biochemical functions. SGPT and SGOT are found in most tissues, but the relative amounts vary. Heart muscles are

richer in SGOT, whereas liver contains both SGOT and SGPT but more of SGPT²². So, basically SGPT has more influence on digestion than SGOT. In this study about *Jirna* and *Ajirna* conditions with the help of SGPT as reference, in *Jirna* condition (Proper state of digestion) Liver performs its normal function with special reference to SGPT as compared to *Ajirna* (Improper state of digestion). May be this is one of the major reasons for the significant difference of SGPT in result as compared to other objective parameters, which means that SGPT can be used as an assessing tool for *Jathragani*.

CONCLUSIONS

Jirna and *Ajirna* are better to understand with the help of subjective parameter and in this study with the help of objective parameter – SGPT, very minute difference can be found with respect to *Jirna* and *Ajirna* in *Jathragani*. After assessing the subjective and objective parameters, one can conclude that as a biomarker, SGPT can be a very effective and important tool to assess the *Jathragani*.

ACKNOWLEDGMENT

I would like to thank Department of Kriya Sharir, National Institute of Ayurveda, Deemed University, Jaipur for their continuous support and encouragement throughout this difficult project.

Source of Income – NIL

Conflict of Interest - NIL

REFERENCES

1. Acharya Yadavaji Trikamji., editor. *Ayurveda Dipika Commentary of Cakrapanidatta. Reprint ed. 3-5. Vol. 26. Varanasi, India: Chaukhamba Surbharati Prakashana; 2008. Agnivesha. Charaka Samhita- sutrasthan, chapter 1/42, Page No. 8*
2. Acharya Yadavaji Trikamji., editor. *Ayurveda Dipika Commentary of Cakrapanidatta. Reprint ed. 3-5. Vol. 26. Varanasi, India: Chaukhamba Surbharati Prakashana; 2008. Agnivesha. Charaka Samhita- sharirasthan, chapter 6/4, Page No. 329*
3. Acharya Yadavaji Trikamji., editor. *Ayurveda Dipika Commentary of Cakrapanidatta. Reprint ed. 3-5. Vol. 26. Varanasi, India: Chaukhamba Surbharati Prakashana; 2008. Agnivesha. Charaka Samhita- sutrasthan, chapter 12/11, Page No. 80*
4. Acharya Yadavaji Trikamji., editor. *Ayurveda Dipika Commentary of Cakrapanidatta. Reprint ed. 3-5. Vol. 26. Varanasi, India: Chaukhamba Surbharati Prakashana; 2008. Agnivesha. Charaka Samhita- chikitsasthan, chapter 15/3-4, Page No. 512*
5. Acharya Yadavaji Trikamji., editor. *Ayurveda Dipika Commentary of Cakrapanidatta. Reprint ed. 3-5. Vol. 26. Varanasi, India: Chaukhamba Surbharati Prakashana; 2008. Agnivesha. Charaka Samhita- chikitsasthan, chapter 15/39, Page No. 516*
6. *Astanga Hridaya of Vagbhatta with the commentaries Sarvanga sundara of Arunadatta and Ayurveda Rasayana of Hemadri annotated by Dr. Anna Moreshwar Kunte and Krishna Ramachandra Shastri edited by Pt. Hari Sadashiva Shastri Paradkara Nidanasthan chapter 12/1, Chaukhamba Sanskrita Sansthan, Varanasi Edition Reprint 2014, Page No 513*

7. *Astanga Hridaya of Vagbhatta with the commentaries Sarvanga sundara of Arunadatta and Ayurveda Rasayana of Hemadri annotated by Dr. Anna Moreshwar Kunte and Krishna Ramachandra Shastri edited by pt. Hari Sadashiva Shastri Paradkara Sutrasthan chapter 13/8, Chaukhamba Sanskrita Sansthan, Varanasi Edition Reprint 2014, Page 216*
8. *W. M, Thomas D, R. L, C. J,2005, Appetite Evaluation: simple appetite questionnaire Predicts Weight Loss in community-dwelling adults and nursing home residents, The American Journal of Clinical Nutrition, vol 82, n. 5, p 1074 – 1081*
9. *W. M, Thomas D, R. L, C. J,2005, Appetite Evaluation: simple appetite questionnaire Predicts Weight Loss in community-dwelling adults and nursing home residents, The American Journal of Clinical Nutrition, vol 82, n. 5, p 1074 – 1081*
10. *W. M, Thomas D, R. L, C. J,2005, Appetite Evaluation: simple appetite questionnaire Predicts Weight Loss in community-dwelling adults and nursing home residents, The American Journal of Clinical Nutrition, vol 82, n. 5, p 1074 – 1081*
11. *W. M, Thomas D, R. L, C. J,2005, Appetite Evaluation: simple appetite questionnaire Predicts Weight Loss in community-dwelling adults and nursing home residents, The American Journal of Clinical Nutrition, vol 82, n. 5, p 1074 – 1081*
12. *D. R N, K. A, 2012, In a young, healthy population' knowledge in a young, healthy population Fluid intake and voiding; habits and health knowledge Research and Reports in Urology, vol. 4, p p 9 to15.*
13. *H. K W, R. J, Cripps H, M. R A, Braddon F E M, Hugesh A O, 1992: a prospective study', Gut, 'Defecation frequency and timing, and stool form in the general populationvol.33, pp 818 -824.*
14. *H. K W, R. J, Cripps H, M. R A, Braddon F E M, Hugesh A O, 1992, a prospective study', Gut, 'Defecation frequency and timing, and stool form in the general populationvol.33, pp 818 -824.*
15. *H. K W, R. J, Cripps H, M. R A, Braddon F E M, Hugesh A O, 1992, a prospective study', Gut, 'Defecation frequency and timing, and stool form in the general populationvol.33, pp 818 -824.*
16. *Jayne Leonard, what are different types of poop on January 2, 2020*
17. *Ibiid Yogaratnakara Asthvidhapariksha 1/22, page no, 9-11*
18. *Dr C. R Yadav, A TEXT Book of practical Sharir Kriya Vijnanam, Ayurved Sanskrit Hindi Pustak Bhandar edition 2018, chapter 8 introduction to laboratory instruments, page no.83*
19. *DM Vasudevan, Sreekumari S, Kannan Vaidynathan Textbook of biochemistry for medical students, Jaypee brothers, medi. publis. (p) LTD, New Delhi page. No 327*
20. <http://www.jainworld.com/preksha/vidyajain/pd11.htm>
21. *M N Chatterjee, Rana Shinde, Text book of Medical Biochemistry, Jaypee brothers, Fourth edition 2000, chapter 31, Liver Function test, Page No 599*

