ISSN: 0975-833X

*Available online at http://www.journalcra.com*

*International Journal of Current Research*
*Vol. 15, Issue, 03, pp.24100-24104, March, 2023*
*DOI: https://doi.org/10.24941/ijcr.45031.03.2023*

**INTERNATIONAL JOURNAL OF CURRENT RESEARCH**

## RESEARCH ARTICLE

# ORIGINAL RESEARCH ARTICLE: ELECTROCARDIOGRAPHIC ALTERATIONS USING VECTORS IN SUBJECTS OF RURAL POPULATION FOLLOWING INTEGRATED APPROACH OF YOGA THERAPY: A REPORT

**[1*]Dhirendra Vaidya, [2]Swayon Bhunia and [3]Snehasis Bhunia**

[1]Post Graduate student, Department of Physiology, Uttar Pradesh University of Medical Sciences, Saifai, Etawah dist. U.P-206130
[2]B. Tech, Department of Computer Science and Engineering, VIT, Chennai, Tamil Nadu-600127, India
[3]Research Student, Singhania University, Pacheri Bari, Jhunjhunu-333515, Rajasthan, India

**ARTICLE INFO**

*Article History:*
Received 17th December, 2022
Received in revised form
19th January, 2023
Accepted 05th February, 2023
Published online 30th March, 2023

*Key words:*

ECG, Standard Limb Leads-I, II, III, Chest Leads, IAYT (Integrated approach of yoga therapy).

***Corresponding Author:**
*Dhirendra Vaidya*

**ABSTRACT**

***Background:*** An electrocardiogram, termed as ECG, is a very simple and common test, used to determine the healthy condition of an individual. Various studies have reported the beneficial effect of physical exercise, yoga separately on standard limb leads, but there is a lack of study found on various standard limbs leads (I, II &III), augmented unipolar limb leads and chest leads in healthy subjects following integrated approach of yoga therapy (IAYT). Hence, the present study aims to evaluate a short term effect with IAYT on standard limb leads (II)using vectors in both young and old aged male subjects residing in rural area. ***Materials & methods:*** Forty subjects with varying age group in between 35 to 50 years were recruited and divided into two groups (A & B) or control(C) groups was considered from pre IAYT. Study group received IAYT programmed for six week. BMI was calculated, Height was taken and body weight was measured. ECG was taken using BPL ECG recorder (Cardiart 8108T).Baseline and post- test assessments were taken before and after the intervention. PC based cardiovascular analyzer was used for recording pulse wave velocity (PWV) and arterial stiffness index (ASI). ***Result:*** Significant difference was noted on heart rate, R-R interval, arterial stiffness and pulse wave velocity in study groups both A &B when compared with control group (Pre- IAYT). No significant reduction was observed on systolic blood pressure, diastolic blood pressure, pulse pressure, mean arterial blood pressure, body weight, height & BMI in study group when compared with control. Other waves of chest leads and augmented unipolar limb leads were unchanged. ***Conclusion:*** Result of this study suggest that the IAYT is not more effective in reducing blood pressure changes in study group aged in between 35 to 50 years male subjects (group-A&B) but more effective with the durations of different waves of standard limb leads (II) and heart rate suggesting parasympathetic dominance.



**Citation:** ***Dhirendra Vaidya, Swayon Bhunia and Snehasis Bhunia.*** **2023.** "Original Research Article: Electrocardiographic alterations using vectors in subjects of rural population following integrated approach of yoga therapy: A report*". International Journal of Current Research*, 15, (03), 24100-24104.

# INTRODUCTION

The ECG must always be interpreted systematically and carefully because failure to go for proper explanations may be detrimental. The step by step sequence of interpreting ECG makes it easy for anyone, as well as reduces the chances of missing important abnormalities and also expedites the process. 'P' wave is atrial depolarization, 'QRS' is ventricular depolarization and 'T' wave is ventricular repolarization, but a gap in between P & QRS complex has not been given clearly which is actuallyless ionic movements (flow of current becomes slow) in the AV bundle, hence no deflection of the pointer. Again a gap in between QRS and T wave represents a complete depolarization of ventricle (Figure-1).

Specialized conducting tissues in the heart are shown, designed to control the systole and diastole according to the response of autonomic nervous system (1-5). As per earlier findings, effect of Yoga or physical exercise on electrocardiogram, explanation on R-R interval is there, QRS complex is also there on the basis of an activity of autonomic nervous system (both sympathetic and parasympathetic) but there is no explanation on using vector or resting membrane potential of pacemaker fiber or cardiac muscle fiber(6-8). We have reported recently the effect of sympathetic and parasympathetic on pace maker fiber as well as ventricular muscle fiber. There is no report so far on positive and negative waves of ECG (Standard limb lead-I/II/III) and the effect of ANS especially on nodal or ventricular fiber. P wave is positive wave (vector A of figure-1) comes when +ve charges are moved towards positive electrode, no response (no movement of pointer) before R wave indicating less flow of current

(B of figure-1), Q wave is negative wave comes from ventricular septum depolarization (vector positive, C of figure-1), .R wave is big positive wave due to the thickest myocardium (D + ve vector of figure-1), S is negative wave ( vector E of figure-1), no response in between R & T is due to complete depolarization (F vector of Figure-1), T is positive wave comes from ventricular repolarization (G vector –ve of figure-1). Most health care practitioners would agree that the majority of chronic diseases are the result of poor lifestyle choices. I.A.Y.T refers to an integrated approach of yogic therapeutics relying on evidence-based scientifically proven methods techniques for specific clinical benefits in various disease states. This is an easy to accept and easy to perform. In this, again a correlation is brought between ANS and cardiac muscle fibers using vectors (9-12).

# METHODS

**General protocol**: Following approval of institute ethics committee of the University, healthy aged subjects were asked to give consent as per rules. Study participants were divided into two groups. In the first group-A aged 35-40 yrs, 20 male participants, who were doing this IAYT program (Table-1) for the first time, in the second group-B aged 45-50 yrs,20 male participants who were also asked to join for IAYT as per table no. 1 regularly, all were practicing, following IAYT at least six weeks and finally, in the third group (optional), 10 participants aged 35-50 years who were not practicing any kind of meditation or yoga.

**Recording of ECG:** Electrocardiogram of each subject was recorded by using BPL ECG Recorder – Cardiart 108T (1 Channel). ECG was recorded in supine position after several minutes' rest using digital surface ECG recorder, and was printed at a paper speed of 25 mm/sec and amplitude of 10 mm/mV. Absolute QT interval (m sec) was measured from the beginning of the QRS complex to the end of the T wave. The end of the T wave was defined as the intercept between the isoelectric line and the regression line derived from the descending slope of the T wave. U wave was carefully distinguished from T wave. Strictly, absolute QT interval is different in different leads. In the present study, QT interval in limb lead II was adopted, because this interval is longest in lead II, and T wave is easily distinguished from U wave in this lead. ECG data were diagnosed based on Minnesota code, transferred using A/D converter, and stored automatically to a personal computer. Thereafter, ECG recordings were reviewed by experienced cardiologists in a blind manner

**Measurement of noninvasive parameters:** Periscope (Figure-1) is a PC based low-cost instrument hence used with a computer (Fig-1). It used ECG as a marker. Periscope thus facilitates use in epidemiological studies which has been validated and has good intraday and inner observer reproducibility for various estimated central and peripheral arterial velocities. In brief, PWV was determined by a non-invasive pulse wave analyzing device (Periscope). All participants, Group A& B, were asked to have vegetarian diet, asked to refrain from smoking and drinking caffeine-containing beverages 12 hours before the test. Procedure was performed always by the sale operator in the morning hours between 7 and 10 a.m. with subject resting in supine position at least 10 min before the recording. Electrodes for electrocardiogram were placed in ventral surface of both wrists and medial side of ankles and BP cuffs were wrapped on both upper arm brachial artery and tibial artery above ankles. The cuff was connected to a plethysmography sensor which determines volume pulse form and an oscillometer pressure sensor, which measures blood pressure volume waveform from the brachial and tibial arteries (Figure 2).

**Inclusion criteria:** 1. Age 35-50 years

**2. Pure vegetarian**

3. Those who gave consent
4. Had border level value of arteriual stiffness (+ve arterial stiffness)
5. Normal blood sugar level in both fasting and after meal, normal blood

Pressure (SBP,DBP& PP)& no complication with renal diseases

**Exclusion criteria:** 1. Medication for any type of illness
2. Smokers & Alcoholics
3. Any drug addiction
4. Value with normal arterial stiffness, hypertension, diabetes & obesity
5. Renal diseases

**STATISTICAL ANALYSIS:** Students 'T' test was performed. < 0.05 was found significant.

# RESULTS

The age of the subjects ranged from 35–50 yrs, the mean age being 42.60 ± 8.81 years. On analysis of the physical characteristics of the 50 subjects (20+20+10),, the mean height (cm) was 159.38 ± 9.97, the mean weight (kg) was 64.21 ± 9.24 and the mean BMI (kg/m2) was 25.31 ± 3.29. Only males and no significant s variation in height ($P > 0.05$), weight ($P>0.05$), and BMI ($P=0.025$).

**Major findings include**

- No significant difference ($P>0.05$) in pulse, SBP, and DBP between these two groups. *$P<0.05$ Pulse rate, beats/min, (PR) was reduced significantly in both the groups (Table-2)
- Significant alteration was found with pulse wave velocityin both the groups ($P<0.02$) (Table-2)
- Significant alteration in both the groups was with arterial stiffness ($P<0.01$), it was highly significant(Table-2)
- Significant alteration was with T wave and R-R interval. Both were reduced.in both the groups (Table-3)
- Duration of P wave, QRS complex remain unchangedin both the groups ($P>0.05$) (Table-3)

# DISCUSSION

Autonomic nervous system plays an important role here. Depolarization vector of both right and left atrium (A of Figure-1) is neither affected nor disturbed when person is following IAYT regularly. Slow movement of ions/current in the AV bundle (B vector of figure-1) is also not affected significantly. QRS complex (Ventricular depolarization) is also not altered (C, D, E of figure-1) significantly after following IAYT. No alteration with complete depolarization of ventricle (F of Figure-1) after following IAYT. T wave (Ventricular repolarization) was reduced, showing quick complete repolarization after following IAYT. Heart rate was reduced significantly indicating stimulation parasympathetic. More secretion of acetylcholine from the parasympathetic nerve ending provides very useful information on characteristics of both smooth muscle and cardiac muscle after following IAYT. We have already reported the mechanism involved when parasympathetic becomes more active than sympathetic (13-26).

**CONCLUSION**

IAYT can reduce blood pressure, heart rate by reducing compliance of the vessel as well as by secreting more acetylcholine from the nerve ending of parasympathetic. IAYT has its positive significant reliable effect on blood pressure, ECG and compliance of blood vessel wall. It can be considered as an adjunct of the medical management as well as good non-pharmacological method for prevention of stress, anxiety & cardiovascular diseases (CVD). These practices will help medical students to understand the differences between alternative medicine and medical field. Incorporating IAYT in the Medical College will help for primordial prevention of CVD.

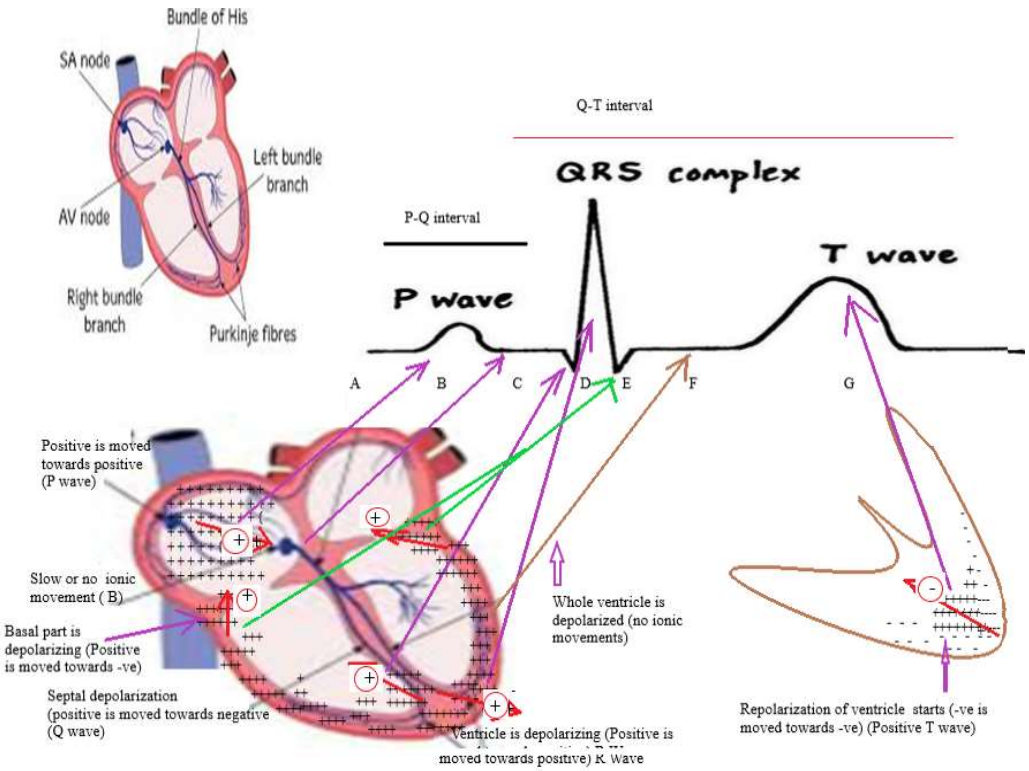


**Figure 1. Showing specialized conducting tissues in the heart and explanation of various waves using cardiac vectors (A-G)**

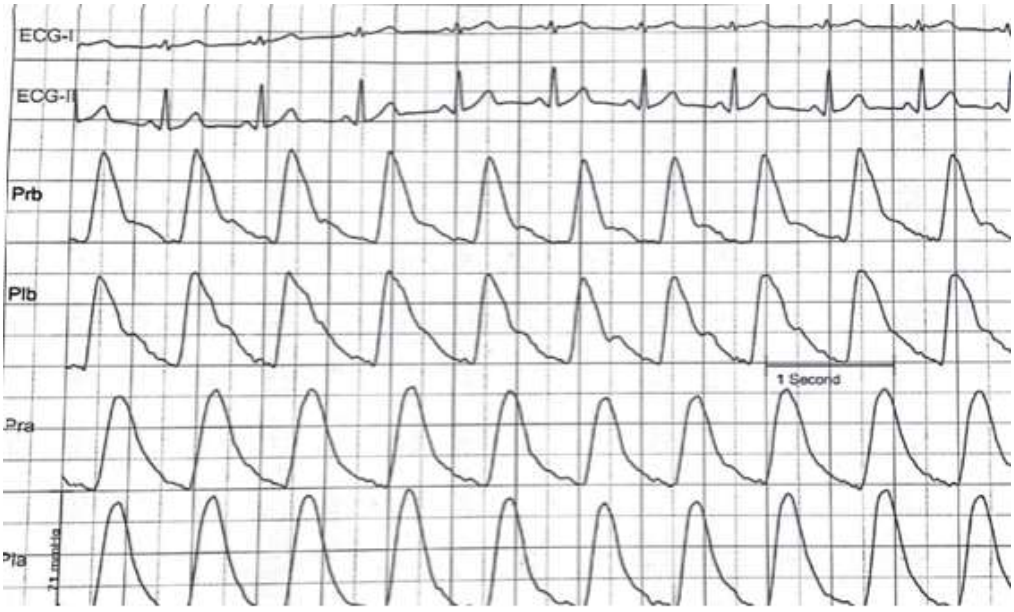


**Figure 2. A small portion of record is shown here. Standard limb lead-I & II are shown in upper two lines followed by pressure tracing of right brachial (Prb), left brachial (Plb), right ankle(Pra) and left ankle (Pla. Paper speed was 25mm/sec**

**Table 1. Integrated yoga program schedule for group A and B**

| Program | Description |
|---|---|
| Loosening exercises (10 round each) | toe, ankle, knee, waist, wrist , shoulder, neck rotation and bending saktivikasakasukshmayayama for wrists, palms, fingers, elbows, arms, back, thighs and calf muscles. |
| Yogasanas (15–20min) | ardhakaticakrasana, ardhacakrasana, padahastasana, bhujangasana, salabhasana, dhanurasana, sarvangasana, matsyasana, viparitakarani, halasana, cakrasana, sasankasana, vakrasana, ardhamatsyendrasana, ustrasana, instant relaxation technique (1 min), quick relaxation technique (3 min), deep relaxation technique (3 min) |
| Pranayama & Kriyas | kapalbhati (40–120 strokes/min), sectional breathing (5 rounds), surya and candraanulomaviloma pranayama (21 rounds),cooling & bhramari pranayama (9 rounds) |
| Meditation (10 min) | Cyclic meditation (3 min), Nadanusandhana (3 min), OM meditation (3 min). |
| Maitri Milan | Geeta chanting & main lecture of the day in yogic principles from the Bhagwat Geeta |
| Breakfast & Lunch | Sattvic food |

**Table 2. Comparison of cardiovascular parameters of the two groups aged in between 35-40 (Group-A) to 45-50 years (Group-B), P value <0.05 is considered significant**

| Parameters | Mean ± SD | | Mean ± SD | | |
|---|---|---|---|---|---|
| | IAYT of Group-A (n=20) | | IAYT of Group-B (n=20) | | |
| | Before | After | Before | After | p value (between group differences) |
| PR(beats/min) | 85.26±7.81 | 76.11± 6.23 | 84.79±7.18 | 74.79±7.18 | <0.05 |
| SBP (mm Hg) | 122.42±9.24 | 120.32±8.24 | 118.72±7.91 | 114.72±7.41 | >0.05 |
| DBP(mm Hg) | 80.34±4.50 | 78.34±3.30 | 77.64±7.64 | 74.64±7.14 | >0.05 |
| PP (mm Hg) | 38.21± 2.11 | 38.11±2.10 | 38.21±2.11 | 38.21±2.11 | >0.05 |
| C-F PWV(cm/s) | 775 ± 11.23 | 614±10.73 | 699±10.13 | 615±10.03 | <0.02** |
| RAnk ASI(mmHg) | 76± 2.11 | 60± 2.10 | 87±2.11 | 67±2.01 | <0.01** |

**Table 3. Comparison of ECG parameters of the two groups aged in between 35-40 (Group-A) to 45-50 years**

| Parameters | Mean ± SD | | Mean ± SD | |
|---|---|---|---|---|
| | IAYT of Group-A (n=20) | | IAYT of Group-B (n=20) | |
| | Before | After | Before | p value After (between group diff) |
| P wave (m sec) | 112± 6.11 | 110±6.10 | 110± 3.03 | 110±2.03 >0.05 |
| QRS complex (m sec) | 100±5.97 | 103±5.87 | 101±5.77 | 107±5.90 >0.05 |
| T wave (m sec) | 141±6.23 | 131± 6.13 | 161±6.23 | 141±6.23 <0.05 |
| R-R interval | 700± 20.12 | 654±23.12 | 786±21.02 | 686±21.23 <0.01** |

Results show significant difference in pulse, SBP, and DBP between these two groups.
*P<0.05 (significant),
**P<0.01 (highly significant).
SD: Standard deviation,
SBP: Systolic blood pressure,
DBP: Diastolic blood pressure

**ACKNOLEDGEMENT**

Author would like to thank his guide Dr. Sohan Raj Tater as well as Dean of Singhania University for allowing him to work in the University. Authors also convey his thanks to all non - teaching staff to complete this work in the University.

# REFERENCES

1. Bhunia S, Tripathy N, A Comparative Analysis of Non-invasive Cardiovascular Functions in Proficient and Non-proficient Healthy Subjects. *International Journal of Physiology*. 20131(2):22-26.
2. Bhunia S, Bhunia B, Tater Sohan R.A report on molecular approach of central regulation and vascular functions to integrated approach of yoga therapy. International Journal of Current Research 2023; 15(2),.23728-23732.
3. Méndez-Barbero N, Gutiérrez-Muñoz C , Blanco-Colio ML. Cellular Crosstalk between Endothelial and Smooth Muscle Cells in Vascular Wall Remodeling. Int. J of Molecular Sciences.2021;22,7284.
4. Prabu.P, et. al. Effect of Integrated Yoga Practice on PanchaKoshas (Five Sheaths) in healthy young adults-A Matched waitlist Control Trial. . IOSR Journal of Dental and Medical Sciences .2021; 20(02): 01-10.
5. Bhunia S. Molecular approach of vascular functions to integrated approach of yoga therapy: A report. Clinical Cardiovascular Research. 2023; 2,1.
6. Najeeb A Shirwany, Ming-huiZou. Arterial stiffness: a brief review. Acta Phyarmacologica Sinica 2010; 31,1267-1276
7. Alicia Saz-Lara, IvánCavero-Redondo, Celia Álvarez-Bueno , Blanca Notario-Pacheco, Marta Carolina Ruiz-Grao and Vicente Martínez-Vizcaíno, .The Acute Effect of Exercise on Arterial Stiffness in Healthy Subjects: A Meta- Analaysis J. Clin. Med2021.; 10, 291
8. Valentina C , Alma M, Gorica E, Brogi S, Testa Li, Calderone V. Role of hydrogen sulfide in endothelial dysfunction: Pathophysiology and therapeutic approaches Journal of Advanced Research . 2021;27, 99-113.
9. Mozafari H, Changchun Zhou, Linxia GU. Mechanical contribution of vascular smooth muscle cells in the tunica media of artery.2019;8'50-60.
10. Ribeiro-Silva JC, Nolasco P, Krieger JE, Miyakawa AA. Review Dynamic Crosstalk between Vascular Smooth Muscle Cells and the Aged Extracellular Matrix.International Journal of Molecular Sciences. 2021;22.10175-10192.
11. Sheng Y, Zhu L. The crosstalk between autonomic nervous system and blood vessels.2018;
12. Int J PhysiolPathophysiolPharmacol 2018;10(1):17-28.
13. Mariam El A, Álvarez-Bustos A , Sosa P , Angulo J, Rodríguez-Mañas L. Effect of Physical Activity/Exercise on Oxidative Stress and Inflammation in Muscle and Vascular Aging International Journal of Molecular Science. 2022;23, 8713-8749.
14. Bhunia S, Tater S. Effect of Integrated Approach of Yoga Therapy on Non Invasive Cardiovascular Responses: Study on Young and Older Healthy Males. Asian Journal of Research in Cardiovascular Diseases.2022; 4(4): 39-47.
15. WoodyardC.Exploring the therapeutic effects of yoga and its ability to increase quality of life International Journal of Yoga.2011 ;4(2):49-54.
16. Najeeb A Shirwany, Ming-huiZou.(2010) Arterial stiffness: a brief review. Acta Phyarmacologica Sinica.2010 ;31:1267-1276
17. Susan J Z, Vojtech M, David AK. .Mechanism, Pathophysiology and Therapy of Arterial Stiffness. Arteriosclerosis, Thrombosis and Vascular Biology.2005;25:932-943.
18. Raub JA, Psychophysiologic effects of hatha yoga on musculoskeletal and cardiopulmonary function: A literature review. J Altern Complement Med .2002;8:797-812.
19. Jay M, Polsgrove BME.. Impact of 10-weeks of yoga practice on flexibility and balance of college athletes. Int J Yoga. 2016;9(1):27–34.
20. Telles S[1], Yadav A, Kumar N, Sharma S, Visweshwaraiah NK, Balkrishna A Blood pressure and Purdue pegboard scores in individuals with hypertension after alternate nostril breathing, breath awareness, and no intervention 2013; 19:61-6.
21. Stephens I. Medical Yoga Therapy.2017.Children:4;12-32..
22. NajeebA Shirwany, Ming-huiZou..Arterial stiffness: a brief review. ActaPhyarmacologicaSinica2010;31:1267-1276
23. Boyang Lv, Selena Chen, Choshu T, Hongfang Jin, Junbao Du, Yaquin Huang. Hydrogen sulphide and vascular regulation-An update. Journal of Advanced Research 2021; 27: 85-97.
24. Alicia Saz-Lara, Iván Cavero-Redondo, Celia Álvarez-Bueno , Blanca Notario-Pacheco, Marta Carolina Ruiz-Grao and Vicente Martínez-Vizcaíno, .The Acute Effect of Exercise on Arterial Stiffness in Healthy Subjects: A Meta- Analaysis J. Clin. Med. 2021; 10, 291

25. Bhunia S. A Physiologist's view on Yoga. Yoga and Total Health, July 2002; XL VII (12) : 8-9.
26. Bhunia S .Can physical exercise, control on diet and naturopathic treatment prevent early development of diabetes mellitus? Indian *Journal Physiol Pharmacol*. 2010;54(1):92-94.
27. Jankowski LW, Nishi RY, Eaton DJ, Griffin AP. Exercise during decompression reduces the amount of venous gas emboli. Undersea Hyperb Med. 1997; 24:59–66.

.

*******