ISSN No. : 2584-2757
Volume : 02
Issue : 03
DOI : 10.5281/zenodo.15204038
Publisher
ROGANIDAN VIKRUTIVIGYAN PG ASSOCIATION FOR PATHOLOGY AND RADIODIGNOSIS
Reg. No. : MAHA-703/16(NAG)
Year of Establishment – 2016
Impact Factor : 1.013
INTERNATIONAL JOURNAL OF DIAGNOSTICS AND RESEARCH

In Vivo Evaluation of Ayurvedokta *Bhaya* (fear) As Aetiological factor for Development of Heart Disease In Albino Rats WSR To Physiological Cardiac Parameters Like Heart Rate And Blood Pressure

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Article Info: Published on : 15/04/2025

Cite this article as: - Dr. Subhash Waghe (2025) ; In Vivo Evaluation of Ayurvedokta Bhaya (fear) As Aetiological factor for Development of Heart Disease In Albino Rats WSR To Physiological Cardiac Parameters Like Heart Rate And Blood Pressure; Inter.J.Dignostics and Research 2 (3) 1-7, DOI: **10.5281/zenodo.15204038**

Abstract

During the past three decades the number of deaths due to CVDs has increased from 15.2% to 28.1% in India. There are many dietary and lifestyle factors are responsible for this rise. In the common aetiology of heart diseases stated by *Acharya Charaka*, along with other causes, psychological causes like *Chinta* (worry), *Bhaya* (Fear/Anxiety), *Manasik Trass* (mental tension) are mentioned as factors responsible for heart disease. There is sharp increase in cases of anxiety and depression due to change lifestyle in present era. Hence, it is essential to evaluate the role of *Ayurvedokta* psychological factor such as *Bhaya* (Anxiety) in the development of heart disease. Chronic unpredictable mild stress (CUMS) is the most elegant model for evaluation of anxiety in the rats as this model possesses construct, predictive and face validity in rats. Hence, this model is used in the present study. In CUMS process, animals will be subjected chronically and unpredictably to a variety of **low-grade stressors** which resembles to those associated with anxiety like symptoms in humans and also cause cognition impairment. It is observed that CUMS had generated the anxiety in rats leading to alteration in normal cardiac physiology.

Keywords : *Bhaya* ,Fear, Anxiety , *Cardiac Parameters*

Introduction:

Nearly there are 3 million (30 lac) cases of Myocardial Infarction occurs every year (API Study) in India and 15 million (1.5 Cr.) cases across the globe every year. Out of this, 25% are under 40 age, 50% are under 50 age, 25% > 50 years of age. The death due to myocardial infarction is increasing in Indian population at an alarming rate and accounts for around 15-20% of all deaths. During the past three decades the number of deaths due to CVDs has increased from 15.2% to 28.1% in India. [1] The number of factors play role in the development of ischemic heart diseases but over consumption of oily fatty food and unhealthy lifestyle (*mithya ahar vihar*) with mental stress are the important basic factors enumerated by both the science.In Ayurveda it can be called as '*Hrit Aposhanaj Hrit Roga'* and the pathophysiology of MI is mentioned by Sushruta in Sutrasthana 15/32 and Syndrome of MI is mentioned by Sushrut Uttartantra 43/131-132 in the form of '*Hrit Shoola*'. In the common aetiology of heart diseases stated by acharya Charaka, along with other causes, psychological causes like *Chinta* (worry), *Bhaya* (Fear/Anxiety), *manasik trass* (mental tension) are mentioned as factors responsible for heart disease. There is sharp increase in cases of anxiety and depression due to change lifestyle in present era. Hence, it is essential to evaluate the role of Ayurvedokta psychological factor such as *Bhaya* (Anxiety) in the development of heart disease.

Stress is an important factor having high impact on the psychological development which alters emotion, cognition and related behavioral outputs. Chronic unpredictable mild stress (CUMS) is the most elegant model for evaluation of anxiety as this model possesses construct, predictive and face validity in rats. In CUMS process, animals will be subjected chronically and unpredictably to a variety of low-grade stressors which resembles to those associated with anxiety like symptoms in humans and also cause cognition impairment. CUMS protocol will be performed in separate room but the normal animal left unchallenged. During the 7 weeks, animals were submitted to 6 different stressors: tilted cage (45°), food and water deprivation, restricted access to food, exposure to empty bottle, 24 h wet cage (200ml of water in 100g of sawdust bedding), continuous illumination. These stressors will be randomly scheduled over a week period and will be repeated to maintain the aspect of unpredictability. At the end of every week sucrose consumption test and body weight of all animal will be measured to confirm the induction of stress in animals. After confirmation of stress in animals, cardiovascular parameters like Blood Pressure, Heart Rate etc. are checked using Data Acquisition System, Powerlab.

Review Of Literature :

Circulatory System As Per Ayurveda :

As per Ayurveda the root of *Rasavaha strotas* (circulatory system) is mentioned as Heart and blood vessels. [2, 3] As per acharya Charaka, Vyan vayu circulates the blood in the entire body and it gets aggravated whenever there is obstruction to the flow of the blood in the circulation. [4]

Aetiology of Ischemic Heart Diseases As Per Ayurveda :

As per acharya Charaka, psychological factors like excessive worry along with hyperlipidemic diet leads to the vitiation of circulatory system [5]

As per acharya Charaka, excessive worries, fear, mental stress, chronic disease leads and trauma leads to heart diseases. [6] As per acharya Sushruta, excessive consumption of incompatible diet, excessive diet, antagonistic diet leads to heart diseases.[7] As per the book Yogaratnakar, the smoking of tobacco leads to heart diseases. [8]

Atherosclerosis In Arteries As Per Ayurveda :

In Ayurveda, *Dhamani-pratichaya* (Atherosclerosis) is defined as the excessive deposition of layer of fatty sticky unctuous material inside the lumen of arteries and it is the disease of Kapha origin. As per Ayurveda, *Dhamni Pratichay* is one of the diseases, caused exclusively by the vitiation of Kapha (*Kaphaj Nanatamaj Vyadhi*) [9, 10, 11] Hence, the factors, responsible for the vitiation of Kapha, also serves as the aetiological factors for the atherosclerosis in arteries (*Dhamni Pratichaya*). As per acharya Charaka, it is *Raspradoshaj Vikara* and it is due over nourishment. [12, 13] The function of pathologically increased *Kapha* is to cause coating, obstruction and hardness in the arterial lumen. [14]

Aetiology of Ischemic Heart Diseases As Per Ayurveda :

As per acharya Sushruta, due to consumption of high fatty and carbohydrate diet and lack of exercise, the arterial lumen gets obstructed with fat and area to be supplied, remain under perfused. [15] As per acharya Sushruta, the vitiated plasma gets obstructed due to blockages in coronaries of the heart, and alters the normal functioning of the heart and also gives rise to Angina. [16 & 17]The angina if not treated soon, kills the patient instantly. [18]

Myocardial Infarction (MI) :

MI refers to the condition where there is imbalance between the myocardial oxygen demand and its supply due to the obstruction of blood supply in coronary arteries.[17] [18]

The commonest causes responsible for it are :

- Atherosclerosis in coronary artery
- Thrombosis

Investigations To Diagnose :

- Lipid profile – It may show dislipidemia (Increased LDL cholesterol and Triglycerides)
- Cardiac Markers - Serum Troponin and CPK-MB elevated.
- ECG - shows ST-T changes.
- Coronary Angiography (CAG) - shows coronary occlusions.
- 2-D Echocardiography- shows regional wall motion abnormalities. [19&20]

Research Question :

Whether Ayurvedokta *Bhaya* (fear) acts as a aetiological factor for development of heart disease

Hypothesis :

- **Null Hypothesis (H1) :**
  Ayurvedokta *Bhaya* (fear) acts as a aetiological factor for development of heart disease
- **Alternate Hypothesis (H0) :**
  Ayurvedokta *Bhaya* (fear) does not acts as an aetiological factor for development of heart disease.

Aims & Objectives :

- **Primary Objectives :**
  The present study, aims to study the aetiological factor *Bhaya* (Fear/Anxiety**)** as

the cause for the development of heart disease.

- **Other Objectives :**
  To study the aetiopathogenesis of myocardial infarction from Ayurvedic point of view.

Material & Methodology :

Study Design :

- Center of Study – Dept of Roga Nidana & Vikrutvigyana, Government Ayurvedic College, Nanded And National Testing Centre, Pune
- Duration of Study – Total study 18 months after approval of synopsis.

Study Population And Sampling :

Animal required for the Study :

- Species/Common name - **Albino Rat**
- Weight - **200-250 g**
- Gender – **Male and Female**
- Number to be used - **12**

Groups :

Animals will be divided into 2 groups.

Groups (n = 6)	Treatment
Normal Control	No treatment
Disease Control	Chronic unpredictable mild stress induction

Data Collection & Instruments :

The animals will be subjected chronically and unpredictably to a variety of **low-grade stressors** which resembles to those associated with anxiety like symptoms in humans and also cause cognition impairment. CUMS protocol will be performed in separate room. During the 7 weeks, animals will be submitted to 6 different stressors:

1) Tilted Cage (45°),
2) Tail Clamping For 3 Minutes,
3) Cold Swimming For 5 Minutes At 4°C
4) Exposure To Empty Bottle,
5) 24 H Wet Cage,
6) Continuous Illumination.

These stressors will be randomly scheduled over a one week period and will be repeated to maintain the aspect of unpredictability. After confirmation of stress in animals, cardiovascular parameters like Blood Pressure, Heart Rate are checked using Data Acquisition System, Powerlab. The heart rate will be expressed as beats per minute (BPM) and the blood pressure will be measured using non-invasively.

Assessment Criteria :

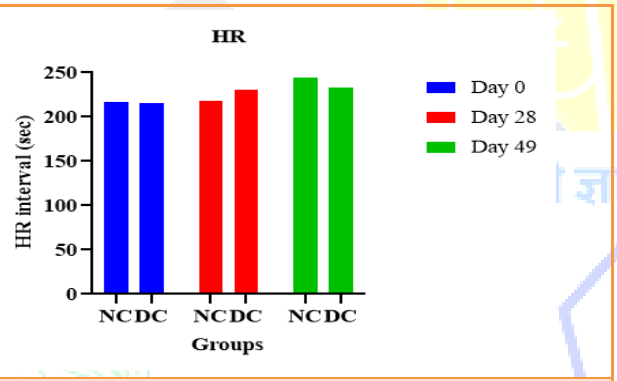
1. Heart rate, BP, ECG will be monitored in 8 Channel power laboratory (Data Acquisition system). Changes in Heart Rate, Blood pressure above normal limit will be noted. [Normal heart rate of rat is between 310 to 840 bpm, Average Normal blood pressure in rats is 121/80 mmHg]

Observation & Result : Table No. 1 - Heat Rate(bpm)

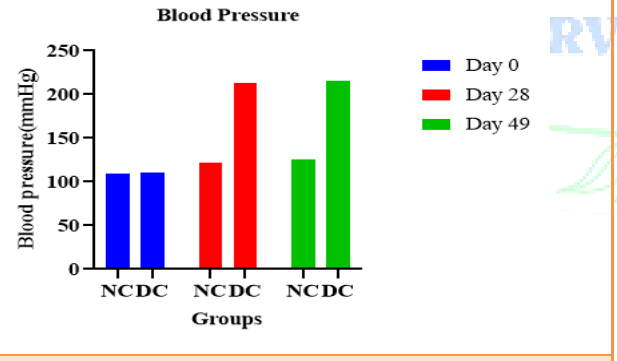
Days		Day 0	Day 28	Day 49
Group	**Ani. No**	**HR**	**HR**	**HR**
NC	1	274.8	264.1	315.6
	2	204.3	200.6	160.1
	3	206.7	177.5	251.3
	4	231.3	269.4	211.7
	5	179.2	182.8	290.9
	6	205.5	215.9	235.2
	Mean	**216.967**	**218.383**	**244.133**
	SD	**32.784**	**39.882**	**55.748**
DC	7	228.7	212.3	210.7
	8	210.5	222.950	230.9
	9	210.1	238.25	275.5
	10	182.2	233.6	192.8
	11	238	246.7	259.8
	12	225.3	229.8	228.9
	Mean	**215.800**	**230.600**	**233.100**
	SD	**19.693**	**12.007**	**30.525**

Table No. 2 - Blood Pressure Analysis (mmHg)

Gr	Ani. No	BP Day 0	BP Day 28	BP Day 49
NC	1	101.5	124.0	112.8
	2	104.5	108.5	106.5
	3	108.0	99.5	103.8
	4	120.0	159.5	136.8
	5	114.0	1 63.0	165.8
	6	109.5	78.5	127.5
	Mean	**109.58**	**122.17**	**125.50**
	SD	**6.08**	**30.75**	**21.40**
DC	7	103.8	214.3	215.7
	8	112.3	212.7	217.3
	9	113.0	213.0	215.6
	10	102.7	211.7	213.7
	11	113.0	211.7	213.8
	12	115.3	212.7	215.1
	Mean	**110.03**	**212.67**	**215.19**
	SD	**5.36**	**0.99**	**1.35**



Graph No.1



Graph No.2

Discussion :

The mean heart rate (HR) observed in normal control on day 0 is 216.967 whereas in Disease control, it is 215.800. The mean HR observed in normal control on day 14 is 218.383 whereas in Disease control, it is 230.600. The mean HR observed in normal control on day 49 is 244.133 whereas in Disease control, it is 233.100. As far as heart rate is concerned only on day 14th increase in heart rate was observed in disease control rats who were subjected to stressors. The mean BP observed in normal control on day 0 is 109.58 whereas in Disease control, it is 110.03. The mean BP observed in normal control on day 14 is 122.17 whereas in Disease control, it is 212.67. The mean BP observed in normal control on day 49 is 125.50 whereas in Disease control, it is 215.19. On all the three measurements there is rise in blood pressure in disease control indicating that stress had increased the blood pressure.

Summary & Conclusion :

- There was a statistically significant increase in the Heart rate (HR) on Day 28 & 49 in DC as compared to NC showing the effect of stressors in increase stress.
- No increase in B.P of NC animals whereas statistically significant difference observed
- increase in B.P of DC animals on Day 28 & 40 as compared to normal control.
- On the basis of the above results obtained, it is can be concluded that *Bhaya* (fear) can acts as an etiological factor for the development of heart disease in rats.

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ISSN: 2584-2757

DOI : 10.5281/zenodo.15204038

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