



COMPARATIVE STUDY OF PULSE RATE OF AMARNATH YATRIS DURING YATRA AT DIFFERENT ALTITUDES

Physiology

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ABSTRACT

INTRODUCTION: Pulse rate depends on firing rate of Sino-Arterial Node, which is also known as pacemaker of heart due to its highest rate of firing. Normally it is under Vagal inhibition that results average pulse rate 75 beats per minute not 110/minute. Sympathetic nervous system stimulation removes vagal inhibition causing increased pulse rate in Amarnath Yattris. Amarnath pilgrims complete whole yatra in very cold and dry atmosphere. This cold atmosphere causes sympathetic stimulation. So our study was focused on pulse rate variation at 5 different altitudes during Amarnath yatra.

MATERIAL AND METHODS: A total of 75 subjects of both male and female of five different age groups were selected for this comparative study. An informed consent was taken from each Amarnath Yattris before the comparative study. Pulse rate of pilgrims were measured manually with fingers and pulsation were counted for full one minute with help of wrist watch at five locations during yatra.

RESULT: Mean pulse rate of Amarnath Yattris were recorded 121.2 ± 10.3 at Holy Amarnath cave. Mean pulse rate before start of yatra was 87.6 ± 11.9 per minute. This value was taken as control value and it was recorded at altitude less than 500 feet from sea level.

CONCLUSION: Comparative study of pulse rate of Amarnath Yattris at five different altitude resulted in significant increase.

KEYWORDS

Pulse Rate, Amarnath Yattris, Holy Cave, High Altitude.

INTRODUCTION

Pulse is a wave and is defined as an expansion of the arterial wall resulting from the sudden ejection of blood into the aorta and its transmission throughout the arterial system. The wave that results from left ventricular ejection can be transmitted down the aorta at a velocity greater than the velocity of the ejected blood bolus. Pulse rate depends on firing rate of Sino-Arterial Node, which is also known as pacemaker of heart due to its highest rate of firing. Normally it is under Vagal inhibition that results average pulse rate 75 beats per minute not 110/minute. Sympathetic nervous system stimulation removes vagal inhibition causing increased pulse rate in Amarnath Yattris. Amarnath pilgrims complete whole yatra in very cold and dry atmosphere. This cold atmosphere causes sympathetic stimulation. Another stimulating factor is emotional excitement to God Amarnath (shiva) which causes Sympathetic nervous system stimulation. Many of Hindu pilgrims undergo an annual pilgrimage to the Amarnath cave for Amarnath darshan.

During ascent in the mountains they experience so many difficulties. The present study was designed with the aim to assess the change in pulse rate of Amarnath Yattris at the holy Amarnath cave and its different altitudes. The heart rate is the number of times heart beats in one minute. Normally heart rate and pulse rate are same but it may vary if there is any abnormality is associated. Pulse rates vary from Yattris to Yattris. Pulse is lower at rest and increases when Yattris ascent because of more oxygen-rich blood is needed by the body during ascent to mountains of Amarnath. Pulse rate is one of the vital that is commonly examined. It also gives approximate sympathetic stimulation in Amarnath Yattris. We had pulse rate parameter for the study because it gives the changes in cardiovascular system with increasing altitudes of Amarnath Mountains. Effect of high altitude on cardiovascular system is very important changes in Yattris to prevent complications and to treat Acute Mountain Sickness which is commonly develop during yatra. In some of the Amarnath pilgrims very dangerous complications like arrhythmias were precipitated in susceptible patients at altitude as a consequence of sympathetic activation. That's why it is very important to know the severity of sympathetic activation. Pulse rate is one of the easiest methods to determine it in Yattris. So our study was focused on pulse rate variation at 5 different altitudes during Amarnath yatra. Hypokalemia caused by respiratory alkalosis and diuretics, right ventricular pressure overload as a consequence of pulmonary hypertension, worsening myocardial ischemia, and heart failure were other cardiovascular complications noted in Yattris. The initial cardiovascular response to altitude results in an increase in cardiac output with tachycardia, no change in stroke volume, whereas blood pressure may temporarily be slightly

increased. After three days of acclimatization, cardiac output returns to normal, but heart rate remains increased in Yattris. Peak of this arterial pulse approximates the systolic blood pressure. The pulse can be distorted and damped by reflected, resonance, or standing waves and differences in the elastic properties. The size of the normal arterial pulse is affected by the left ventricular ejection volume and the rate of ejection, as well as the elasticity or distensibility of the peripheral arteries. More the distance from the heart to a peripheral artery, more will be the distortion of the arterial pulse peripherally. At sea level, oxygen saturation of Amarnath pilgrims remains 98 to 100 percent, but at 14,000 feet, the saturation levels drops to 80 percent due to hypobaric air, resulting in increased cardiac output. This increase is done by 10 to 30 percent increase in heart rate. To maintain appropriate oxygen delivery to tissues pulse rate gets increased. Hypoxia increase pulse rate in Amarnath Yattris by stimulating sympathetic nervous system. Hypoxic pulmonary vasoconstriction mediates ventilation-perfusion matching in the lungs and reduce shunt fraction to improve systemic arterial oxygen tension. Hypoxia also results in the release of epinephrine within minutes to hours of initial exposure and the high epinephrine causes high cardiac output, too. In Amarnath Yattris, the changes on pulse rate depends on numerous factors, including the overall change in elevation from an individual's normal baseline, degree of hypoxia, rate of ascent, rate of acclimation, exercise intensity, genetics and age.

MATERIAL METHODS

A total of 75 subjects of both male and female of five different age groups were selected from healthy diagnosed Amarnath Yattris for this comparative study. An informed consent was taken from each Amarnath Yattris before the comparative study. Places of work were P0-Department of Physiology, P1-Amarnath Yatri Base Camp Jammu (1073 feet), P2-Base Camp Srinagar (5000 feet) P3 -Amarnath Yatri Base Camp Pahalgam (7500 feet), P4- Amarnath Yatri Base Camp Chandanwari (9500 feet), P5-Holy Amarnath Cave (12756 feet). The study was done at 5 different altitudes on the journey to Holy Amarnath cave in July 2014. Amarnath Yattris were advised to take 15 minutes bed rest before taking pulse rate. Pulse rate of selected healthy informed Amarnath Yattris were recorded at five different altitudes two times in 7 P.M. and 9 P.M. and then average of these two was taken as case value. As in our study case and control were same so basal pulse rate recorded before Amarnath yatra were taken as control value. Pulse rate were measured manually by putting the three fingers index finger middle finger and ring finger pulp on radial artery against radial bone while keeping forearm in mid-pronated and wrist joint semi flexed. Pulse rate were counted for one minute when the patient is in a resting lying down position. Wrist second watch was used as the only

apparatus for this study.

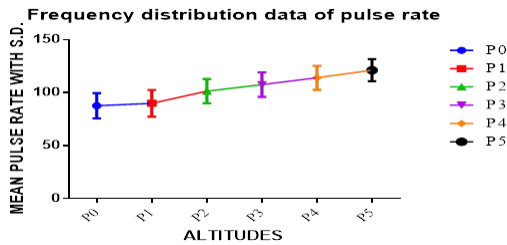
RESULT:

Comparative study of pulse rate of Amarnath Yatris at five different altitude resulted in significant increase. Increase in pulse rate were maximum at Holy Amarnath cave (12756 feet) and minimal increase were noted at Jammu Base Camp(1073 feet) while at Pahalgam increase in pulse rate was more in comparison to Jammu Or lower base camp. In our study increase in pulse rate were related to increase in heights of base camps or altitudes. These increases in pulse rate were remained for three days after darshan to Holy Amarnath cave. Mean pulse rate before start of yatra was 87.6±11.9 per minute. This value was taken as control value and it was recorded at altitude less than 500 feet from sea level. At altitude 1073 feet there was minimal increase 89.9±12.5 per minute pulse rate was noted.

TABLE: MEAN PULSE RATE WITH S.D. OF 75 AMARNATH YATRIS AT 5 ALTITUDES

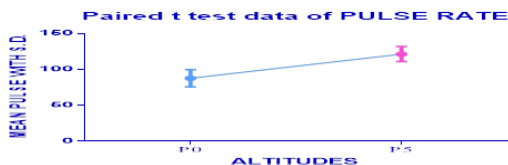
LOCATION (Amarnath Yatris Base Camp)	Altitude (feet)	Code	Mean Pulse Rate	S.D.
Department of Physiology	500	P0	87.6	11.9
Jammu	1073	P1	89.9	12.5
Srinagar	5000	P2	101.4	11.4
Pahalgam	7500	P3	107.5	11.4
Chandanwari	9500	P4	114	11.3
Holy Amarnath Cave	12756	P5	121.2	10.3

At Srinagar as shown in table mean pulse rate of Yatris was 101.4 per minute with standard deviation 11.4, while at Pahalgam it was 107.5 per minute with S.D 11.4 and at Chandanwari mean pulse rate was 114 per minute with S.D. 11.3. These pulse rate recordings showed increasing pattern with increasing altitudes among Amarnath Yatris. Mean pulse rate of Amarnath Yatris were recorded 121.2±10.3 at Holy Amarnath cave.



GRAPH SHOWING PATTERN OF PULSE RATE OF AMARNATH YATRI WITH ALTITUDES

In this graph, P0, P1, P2, P3, P4, P5 are different altitudes as shown earlier table, taken on increasing pattern. This clearly shows rise in mean pulse rate follows the same pattern of altitudes. It means that effect of increasing altitude on pulse rate of Amarnath Yatris was increasing which may be due to excessive activation of sympathetic nervous system. This sympathetic stimulation was due to multiple factors like cold exposure, hypoxia, and emotional excitement, excessive curiosity to see Holy cave, exertion, rapid ascent, and hypobaric atmosphere. All these factors were present in case of all subjects.



There were significant rise in pulse rate was noted in all the Yatris at cave(12756 feet) in comparison to their control values at altitude less than 500 feet as showed in paired t test.

CONCLUSION

Comparative study of pulse rate of Amarnath Yatris at five different altitude resulted in significant increase. In our study increase in pulse rate were related to increase in heights of base camps or altitudes. These increases in pulse rate were remained for three days after darshan to Holy Amarnath cave.

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