



TO STUDY THE EFFECT OF LUNAR PHASES ON BLOOD PRESSURE IN NON HYPERTENSIVE CHILDREN

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ABSTRACT

Background - The concept of this project was picked up from the fact that if moon has its influence on the massive water sources all over the world in the form of high rise tides in the sea, due to gravitational force of moon on earth and the geostationary loci in respect to earth-sun-moon it should also have some influence on human body. And if it does have any influence, it should be measurable with the most vital parameter, picturing the entire circulatory system of our body, that is the blood pressure.

Objectives - Non hypertensive children visiting Gauhati Medical College, Guwahati were opted to look for fluctuations in blood pressure in two distinctly antithetical days, the new moon and the full moon of the lunar cycle.

Materials and methods - This was a hospital based cross sectional study conducted in the Department of Paediatrics, Gauhati Medical College, Guwahati from 1st July 2016 to 31 august 2016 on 100 children chosen by simple random probability sampling.

Result - Fluctuations of blood pressure were seen both during full moon and new moon phases of the lunar cycle. 50th percentile of height with 99th percentile of BP were taken as expected value for each age group from 6 to 10 years. Taking 95% CI (3.841 – 6.635), in SBP, 80% children among 6 year old (P value 0.025 – 0.01), 85 % children among 7 year old (P value <0.01), 80% children among 8 year old (P value 0.025 – 0.01), 65% children among 9 year old (P value 0.05 – 0.10) and 45% children among 10 year old (P value 0.05 – 0.10) showed fluctuation in SBP in new moon and full moon. Like wise for DBP, 70% children among 6 year old (P value 0.05 – 0.10), 90% children among 7 year old (P value <0.01), 85% among 8 year old (P value 0.025 – 0.01), 65% among 9 year old (P value 0.025 – 0.01) and 90% children among 10 year old children (P value <0.01) showed fluctuation in DBP in new moon and full moon.

Conclusion - Statistically significant fluctuations were found for SBP in age group 6,7 and 8 years and for DBP in age group 7, 8, 9, 10 years in new moon and full moon.

KEYWORDS : moon, children, blood pressure, lunar cycle, hypertension

INTRODUCTION

Hypertension remains the world's leading health problem due to its risks, cardiovascular and renal complications and relatively high morbidity and mortality. The risk of cardiovascular disease at 115/75 mmHg doubles with each increment of 20/10 mmHg [1]. High blood pressure (hypertension) donot just affect adults, it affects infants, children, adolescents too and recently the number is in rise. Essential(primary) hypertension is the most common form of hypertension in adults. Systemic hypertension is rare in infants and young children, but when present it is of secondary type [3]. Children with average systolic or diastolic blood pressure more than or equal to 90 percentile but less than 95 percentile for age, sex and height and atleast at three different occasions are considered as pre-hypertensives [3].

As this is a cross sectional study with exposure and outcome both occurring at the same time, the exposure here is the different phases of the lunar cycle and effect is assessed as any blood pressure variations. Moon has been mysteriously influencing earth and its habitants in various ways from its inception. Moon has been known to affect human behaviour [4]. Modern findings of lunar cycle's influence can be reconciled with pre-modern beliefs in the moon's power through a mechanism of sleep deprivation. Prior to the advent of modern lighting the moon was a significant source of nocturnal illumination that affected sleep-wake cycle, tending to cause sleep deprivation around the time of full moon. This partial sleep deprivation tend to evoke mania, hypomania or seizure disorders [18]. A study postulated that breast surgery performed during the waxing moon, or particularly at full moon, is associated with a poorer outcome [7]. Relation of this celestial object to other aspects of human behavior and physiology along with increased patient consultations for anxiety and depression has also been talked about [15]. Hypertension is the most common cause of abdominal aortic aneurysm. Relationships and chronobiology of acute aortic

rupture or dissection, abdominal aortic aneurysms rupture has been seen most frequently during the waxing moon period [9].

Different phases of moon affect human physiology in subtle ways. Other than full moon and new moon, the lunar cycle has been divided into 4 phases and the relation of each phase has been closely studied with any affect in 24 hour ambulatory blood pressure and circulatory system in non-hypertensive adults [2]. Circadian variations in the incidence of hypertension and coronary events and along with the association of the effect of lunar cycles on the incidence and in-hospital prognosis of acute coronary syndromes is affirmative [6]. Along with incidence of acute coronary events, subgroup analysis of mortality, post infarction angina, effect on diabetics and hypertensives were done which showed an increased trend in new moon days [6]. The gravitation of the moon plays pivotal roles in the occurrence of the acute myocardial infarction. An interesting study investigated the effect of the gravitation of the moon on acute coronary events (AMI). Gravitation of more than 399864 km away was determined to be weaker gravitation. It was confirmed that the number of AMI patients significantly increased at weaker gravitation periods in this multicentre trial. In conclusion these results suggest that the gravitation of the moon may have an influence on the occurrence of AMI [10]. Fertility, menstruation, birth rates were correlated with the lunar cycle and melatonin levels along with human behavior like traffic accidents, crimes and suicides. It was suggested that melatonin and endogenous steroids mediate the described cyclic alterations of physiological processes [11].

Lunar cycle and its phases is an external factor which might influence blood pressure. The authenticity of external influences actually having an impact on homeostatic mechanism and blood pressure variation in human has already been established [12]. The lowest levels of systolic

and diastolic blood pressure measured at home were observed in July. The longest daytime length was recorded in June, while the highest outdoor temperature and indoor temperature were recorded in August, indicating that the longest daytime length preceded and the highest environmental temperature bagged with the lowest level of blood pressure. The shortest daytime length is in December. The lowest outdoor and indoor temperature were observed in January, while the highest levels of self-recorded systolic blood pressure and diastolic blood pressure were in January and December, respectively. These findings indicate the importance of a seasonal effect, i.e. daytime length and the environmental temperature, on the blood pressure of individuals [13]. Short term exposure to air pollution has been associated with obvious changes in blood pressure and emergency department visits for hypertension [14].

Usually the systolic blood pressure varies between 90-127 mmHg in the children of age group 1-10 years. As the blood pressure gradually rises with age, the heart rate and respiratory rate gradually decreases. This is due to gradual shift of systemic vascular resistance to a higher stage and side-by-side fall of pulmonary vascular resistance to a lower stage [15]. This transition is very important to be scrutinized as any pathology of the vascular system in young age would aggravate in adolescence or adult age. Hypertension is a known risk factor for coronary artery disease and the presence of childhood hypertension may contribute to the early development of CAD.

Apparently there seems to be much gap and need of knowledge about the way circadian and circatrigintan rhythm (synodic month) also called as the lunar cycle, effects the human physiology, a parameter of which we have considered here is blood pressure.

MATERIALS AND METHODS

STUDY DESIGN –

This was a hospital based cross sectional study

STUDY LOCATION –

The study was conducted in the Department of Pediatrics, Gauhati Medical College, Guwahati.

DURATION OF STUDY –

The study was carried out in the month of July and August, 2016.

Month of July: July 3 – new moon
July 18 – full moon

Month of August: August 1 – new moon
August 18 – full moon
August 31 – new moon

STUDY POPULATION AND SAMPLING DESIGN –

A simple random probability sampling is done. Hundred (100) children, outpatient and inpatient, of the Pediatrics department of Gauhati Medical College and Hospital were attended on 2 specific lunar days, 15 days apart (Out of 100, 24 children were from Out patient department and the rest 76 patients were from in patient department). One of the specific lunar day was a full moon day, and the other a new moon day.

Around 25 children were assessed (recording of blood pressure) on one visit. These 25 same children were re-assessed 15 days later. Followed by assessment of a new set of 25 children.

INCLUSION CRITERIA –

1. Subject of either sex.
2. Patient attending the Out Patient Department.
3. Inpatient admitted subjects.

4. Subjects between the age group of 1-10 years (more preferably 5-10 years)

EXCLUSION CRITERIA –

1. Patients with pre-hypertension
2. Patients with hypertension
3. Patients with cardiovascular diseases
4. Patients with underlying renal diseases.

ETHICAL CONSIDERATION –

The study was approved by the Institutional Ethics Committee, Gauhati Medical College, Guwahati, Northeast, India. The study was conducted under the guidance of the Head of Department, Gauhati Medical College. Also due permission was attained from the Principal and Chief Superintendent, Gauhati Medical College, Guwahati.

METHODOLOGY AND STUDY PROCEDURE –

1. Around 25 children were assessed (recording of blood pressure) on one visit. These 25 same children were re-assessed 15 days later. Followed by assessment of a new set of 25 children(details mentioned below).
2. As the sample size is 100 and there are 5 age groups, 20 children in each age group were accommodated.
3. As the age group of the subject is 6-10 years (preferably), and the patient is a minor, the attendant to the patient or the informant was explained the entire procedure and the need to follow up.
4. If the informant volunteered for the study, their consent was taken in the Informed Consent Form.
5. The study subject was seated at rest with the help of his/her mother or father or seated on the lap of the attendant.
6. The blood pressure was checked 10 minutes after arrival to the hospital in the out-patient department or 10 minutes after visiting the subject in the in-patient ward, so as to calm down the child before taking the blood pressure reading.
7. Auscultatory method was used for recording the BP. A mercury sphygmomanometer was used for the same. The manometer was kept at the level of the heart before measuring the blood pressure.
8. A cuff of appropriate size was selected on the basis of upper arm circumference such that cuff bladder length cover 80% to 100% of the circumference of the arm.
9. Blood pressure was measured from both the upper arms and one lower limb to maintain adequacy.
10. BP was measured 3 times, over a period of 10 minutes. The average of all the 3 readings were used to represent the child's BP.
11. The measurements were recorded in the Case History Record form.

July 3(newmoon) – 1st set of 25 patients[A]
 July 18(full moon)- 1st set of 25 patients[A] + 2nd set of 25 patients[B]
 August 1(new moon) – 2nd set of 25 patients[B] + 3rd set of 25 patients[C]
 August 18(full moon) – 3rd set of 25 patients[C] + 4th set of 25 patients[D]
 August 31(new moon) – 4th set of 25 patients[D]

Therefore, each child's blood pressure was measured once in a new moon and then in a full moon –

	NEW MOON BP	FULL MOON BP
SET A	July 3	July 18
SET B	August 1	July 18
SET C	August 1	August 18
SET D	August 31	August 18

PROCESSING THE DATA –

1. The collected data is quantitative and continuous

Age (Year)	BP Percentile ↓	Systolic BP (mmHg)									Diastolic BP (mmHg)																																																		
		← Percentile of Height →									← Percentile of Height →																																																		
		5th	10th	25th	50th	75th	90th	95th	5th	10th	25th	50th	75th	90th	95th																																														
11	50th	100	101	102	103	105	106	107	60	60	60	61	62	63	63	90th	114	114	116	117	118	119	120	74	74	74	75	76	77	77	95th	118	118	119	121	122	123	124	78	78	78	79	80	81	81	99th	125	125	126	128	129	130	131	85	85	85	86	87	87	88	89
12	50th	102	103	104	105	107	108	109	61	61	61	62	63	64	64	90th	116	116	117	119	120	121	122	75	75	75	76	77	78	78	95th	119	120	121	123	124	125	126	79	79	79	80	81	82	82	99th	127	127	128	130	131	132	133	86	86	87	88	89	90	90	
13	50th	104	105	106	107	109	110	110	62	62	62	63	64	65	65	90th	117	118	119	121	122	123	124	76	76	76	77	78	79	79	95th	121	122	123	124	126	127	128	80	80	80	81	82	83	83	99th	128	129	130	132	133	134	135	87	87	88	89	90	91	91	
14	50th	106	106	107	109	110	111	112	63	63	63	64	65	66	66	90th	119	120	121	122	124	125	125	77	77	77	78	79	80	80	95th	123	123	125	126	127	129	129	81	81	81	82	83	84	84	99th	130	131	132	133	135	136	136	88	88	89	90	91	92	92	
15	50th	107	108	109	110	111	113	113	64	64	64	65	66	67	67	90th	120	121	122	123	125	126	127	78	78	78	79	80	81	81	95th	124	125	126	127	129	130	131	82	82	82	83	84	85	85	99th	131	132	133	134	136	137	138	89	89	90	91	91	92	93	
16	50th	108	108	110	111	112	114	114	64	64	64	65	66	67	68	90th	121	122	123	124	126	127	128	78	78	79	80	81	81	82	95th	125	126	127	128	130	131	132	82	82	83	84	85	85	86	99th	132	133	134	135	137	138	139	90	90	90	91	92	93	93	
17	50th	108	109	110	111	113	114	115	64	65	65	66	67	68	68	90th	122	122	123	125	126	127	128	78	79	79	80	81	81	82	95th	125	126	127	129	130	131	132	82	83	83	84	85	85	86	99th	133	133	134	136	137	138	139	90	90	91	91	92	93	93	

BP, blood pressure
 * The 90th percentile is 1.28 SD, 95th percentile is 1.645 SD, and the 99th percentile is 2.326 SD over the mean.
 For research purposes, the standard deviations in Appendix Table B-1 allow one to compute BP Z-scores and percentiles for girls with height percentiles given in Table 4 (i.e., the 5th, 10th, 25th, 50th, 75th, 90th, and 95th percentiles). These height percentiles must be converted to height Z-scores given by (5% = -1.645; 10% = -1.28; 25% = -0.68; 50% = 0; 75% = 0.68; 90% = 1.28; 95% = 1.645) and then computed according to the methodology in steps 2-4 described in Appendix B. For children with height percentiles other than these, follow steps 1-4 as described in Appendix B.

We divided the blood pressure measured into systolic and diastolic components and separately studied them on 2 degrees of freedom, new moon and full moon and evaluated the chi square value and p value for each age group.

Table 2 exhibits the chi square value and p value for the systolic blood pressure over the new moon and full moon days. The observed SBP was the mean of the SBP found for the particular age group on new moon or full moon days. 50th percentile of height with 99th percentile of BP was taken as expected value for each age group from 6 to 10 years. The variations in SBP on new moon and full moon days were found significant among the age group 6, 7 and 8 years.

Table 2 Systolic Blood Pressure By New Moon And Full Moon

	FULL MOON (SBP)		NEW MOON (SBP)		Significance
6 Year	(95-121) ²	+	(112-121) ²	=	6.24 ² =6.24 P=(0.025-0.01)
	121		121		
7 Year	(99-122) ²	+	(98.2-122) ²	=	8.97 ² =8.97 P<0.01
	122		122		
8 Year	(106-123) ²	+	(102-123) ²	=	5.92 ² =5.92 P=(0.025-0.01)
	123		123		
9 Year	(113-125) ²	+	(107-125) ²	=	3.74 ² =3.74 P=(0.05-0.10)
	125		125		
10 Year	(115-127) ²	+	(111-127) ²	=	3.354 ² =3.354 P=(0.05-0.10)
	127		127		

Similarly Table 3 exhibits the chi square value and p value for the diastolic blood pressure over the new moon and full moon days. The variations in DBP on new moon and full moon days were found significant among the age 7,8,9 and 10 years. P value for the same were <0.05 with 95% CI.

Table 3 Diastolic Blood Pressure By New Moon And Full Moon

	FULL MOON (DBP)		NEW MOON (DBP)		Significance
6 Year	(66-82) ²	+	(76-82) ²	=	3.56 ² =3.56 P=(0.05-0.10)
	82		82		
7 Year	(65-84) ²	+	(64-84) ²	=	9.059 ² =9.059 P<0.01
	84		84		
8 Year	(69-86) ²	+	(71.4-86) ²	=	5.64 ² =5.64 P=(0.025-0.01)
	86		86		

9 Year	(74-87) ²	+	(68-87) ²	=	6.0914 ² =6.0914 P=(0.025-0.01)
	87		87		
10 Year	(72-88) ²	+	(68-88) ²	=	7.45 ² =7.45 P<0.01
	88		88		

In the study of Ertas G, Sonmez O, Tasal A, Erdogan E, Turfan M, Kul S, Ekmekci A, Uyarel H, Satilmis S, Bozbeyoglu E, Goktekin O, Yildirim A [The effect of the phases of the moon on blood pressure in non-hypertensive individuals] which included non-hypertensive adults(less than 40 years) [2], couldnot find any relationship between blood pressure and lunar phases, however there was no comparison among the same subjects. But our study included non-hypertensive children and also there was comparative assessment among the same subjects. Some studies which did find a correlation of lunar phases on human physiology[11], nominate melatonin and steroid levels , which are affected by the moon cycle[19], as the prime candidates to exert this regulatory function.

Table 4 and 5 shows the variations in percentage among the age groups in new moon and full moon for Systolic and Diastolic blood pressure respectively. (The normal blood pressure was taken as the 50th percentile of height with 50th percentile of BP).

Table 4

SBP	HIGH	NORMAL	LOW
6 Year	65%	20%	15%
7 Year	75%	15%	10%
8 Year	65%	20%	15%
9 Year	45%	35%	20%
10 Year	20%	55%	25%

Table 5

DBP	HIGH	NORMAL	LOW
6 Year	35%	30%	35%
7 Year	70%	10%	20%
8 Year	50%	15%	35%
9 Year	40%	35%	25%
10 Year	60%	10%	30%

CONCLUSION

Significant fluctuations were seen either in systolic or in diastolic blood pressure in two antithetical days, new moon and full moon along the course of lunar cycle. 53% children showed fluctuation of Systolic BP to higher side and 17% children showed fluctuation of Systolic BP to lower side than mean combining both the new moon and full moon days across all age groups. Similarly, 51% children showed fluctuation of diastolic BP to higher side and 29% children showed fluctuation of diastolic BP to lower side across all age groups.

DECLARATION OF INFORMED CONSENT

The authors certify that they have obtained written informed consent from all the study subjects and their guardians. The participants and their guardians have consented for the clinical information. They understood that their names and initials will not be published and due efforts will be made to conceal their identity and anonymity.

FINANCIAL SUPPORT AND SPONSORSHIP

This study was funded by Indian Council of Medical Research, New Delhi as a part of Short Term Studentship 2016-17.

CONFLICTS OF INTEREST

There is no conflict of interest.

ACKNOWLEDGMENT

The authors are thankful to the Indian Council of Medical Research for the funding and recognition.

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