Full moon and crime

C P THAKUR,   DILIP SHARMA

Abstract

The incidence of crimes reported to three police stations in different towns (one rural, one urban, one industrial) was studied to see if it varied with the day of the lunar cycle. The period of the study covered 1978-82.

The incidence of crimes committed on full moon days was much higher than on all other days, new moon days, and seventh days after the full moon and new moon. A small peak in the incidence of crimes was observed on new moon days, but this was not significant when compared with crimes committed on other days. The incidence of crimes on equinox and solstice days did not differ significantly from those on other days, suggesting that the sun probably does not influence the incidence of crime.

The increased incidence of crimes on full moon days may be due to "human tidal waves" caused by the gravitational pull of the moon.

Introduction

Fourteen years after man first landed on the moon that planet remains as mysterious as ever. Exposure to the moon has been credited with removing warts and freckles and curing leprosy, and it has also been held responsible for lunacy, accidents, and many other illnesses.[1] Many do's and don'ts have been advised for days of the full moon in ancient Indian literature.[2] According to Pliny the Elder the "moon produces drowsiness and stupor in those who sleep outside under her beams"[3] and to Plutarch "everybody knows that those who sleep outside under the influence of the moon are not easily awakened but seem stupid and senseless."[4] Many modern workers have found a significant correlation between phases of the moon and aggressive behaviour,[5] menstruation,[6 7] delivery,[8 9] birth weight,[10] injuries,[11] suicides,[12 13] homicides,[14-16] and hospital admission for affective symptoms.[17] Others, however, could not find any correlation between lunar cycle and seclusion of psychiatric patients,[18] number of suicides,[19 20] copulation,[21] untoward events,[22] child behaviour,[23] and antisocial behaviour.[24]

We reported that the incidence of poisoning was significantly higher on full moon days than on other days.[25] Continuing that work, we undertook a study to investigate the influence of phases of the moon on the incidence of crimes committed on different days of the year from 1978 to 1982. This paper reports the results.

Materials and methods

Sample size—Sample size was decided on the basis of a two sided test of the hypothesis of equality of the incidence of crimes reported during the five years. At the 5% level of significance the power of the test was set at 90% for an expected difference of 20% in the incidence of crime between full moon and non-full moon days. The sample size was established at 154 full moon days. Statistical analysis of background variables was carried out to assess the difference in the incidences of crime between these two days.

Selection of police stations—We randomly selected Gaya Sadar,

Department of Medicine, Patna Medical College, Patna, India

C P THAKUR, MD, FRCP, professor of medicine
DILIP SHARMA, MB, BS, postgraduate student

Correspondence and requests for reprints to: Professor C P Thakur, Fraser Road, Patna-800001, India.

Kirtya Nand Nagar, and Sonari police stations of Bihar State. These three police stations are at least 300 km apart.
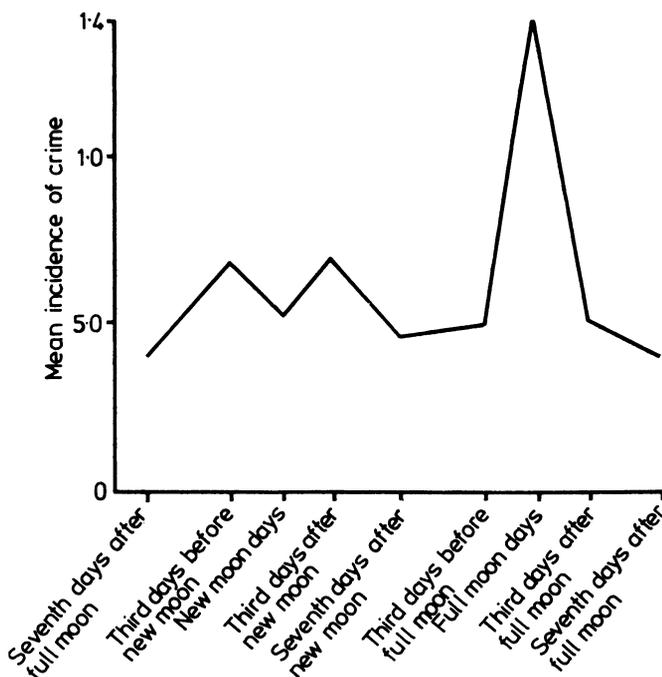
Collection of data—The number of crimes reported on each day during 1978-82 was noted by one of us. Data from all three police stations were pooled and the crimes coded and analysed by computer using a basic programming method. The numbers of full moon days, non-full moon days, new moon days, third days before the new moon, third days after the new moon, seventh days after the new moon, seventh days after the full moon, third days before the full moon, third days after the full moon, all days minus full and new moon days, solstices, and equinoxes were calculated from the Gregorian calendar and the number of crimes committed on these days recorded. To determine the trend in each police station the crimes committed on full moon and non-full moon days in these areas were also analysed and evaluated statistically.

Statistical analysis—Frequency distributions were calculated to show the numbers of crimes committed on each day. Appropriate statistical analysis was done and significance assessed by χ^2 test[26] and a confidence interval.

Results

Crimes committed on 5478 days from January 1978 to December 1982 were studied. One hundred and eighty three full moon days occurred during the period and 256 crimes were committed on those days. On 186 new moon days 94 crimes were committed, on 5295 all minus full moon days 2878 were committed, on 186 seventh days after the full moon 75 were committed, and on 5109 all minus full and new moon days 2784 were committed; on 186 seventh days after the new moon 84 were committed, and on the 30 equinox and 30 solstice days nine and 22 crimes were committed (table I).

The χ^2 value had been calculated assuming that the time factor (full moon, non-full moon days) was independent of the intensity (number of instances) of crime. Using this hypothesis expected frequencies of various cells had been calculated. In testing for the goodness of fit the χ^2 value came out as 231·65 for 3 df and gave $p<0.001$; this was highly significant and indicated that the hypothesis would be rejected outright. The confidence

Changes in mean incidence of crime on different days of lunar month.

TABLE I—*Numbers of full moon days, new moon days, seventh days after full moon, seventh days after new moon, non-full moon days, all minus full and new moon days, and equinox and solstice days according to Gregorian calendar and frequencies of crimes committed on those days during 1978 to 1982*

No of crimes	Full moon days	New moon days	Seventh days after full moon	Seventh days after new moon	All minus full moon days	All minus full moon and new moon days	Equinox days	Solstice days
0	40	114	129	119	3102	2988	22	16
1	64	56	44	52	1690	1634	7	9
2	56	11	9	13	368	357	1	3
3	19	4	3	2	99	95	0	1
4	1	1	1	0	26	25	0	1
5	2	0	0	0	9	9	0	0
6	0	0	0	0	1	1	0	0
7	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0
9	1	0	0	0	0	0	0	0
Total days	183	186	186	186	5295	5109	30	30
Crimes {Total No	256	94	75	84	2878	2784	9	22
Crimes {Mean (SD)	1·40 (1·16)	0·50 (0·75)	0·40 (0·70)	0·45 (0·67)	0·54 (0·77)	0·54 (0·77)	0·30 (0·53)	0·73 (0·99)

TABLE II—*Frequency distribution of crimes committed in three different areas and their significance*

No of crimes	Gaya Sadar		Kirtya Nand Nagar		Sonari	
	Full moon days	All minus full moon days	Full moon days	All minus full moon days	Full moon days	All minus full moon days
0	7	595	11	1258	22	1249
1	17	874	28	431	19	385
2	21	210	19	61	16	97
3	14	61	2	12	3	26
4	1	19	0	3	0	4
5	1	5	1	0	0	4
6	0	1	0	0	0	0
7	0	0	0	0	0	0
8	0	0	0	0	0	0
9	0	0	0	0	1	0
Total days	61	1765	61	1765	61	1765
Crimes {Total No	110	1584	77	601	69	693
Crimes {Mean (SD)	1·80 (1·07)	0·89 (0·86)	1·26 (0·90)	0·34 (0·59)	1·13 (1·36)	0·39 (0·71)
χ^2 with 3 df	77·41		207·3		162·9	
p Value	<0·001		<0·001		<0·001	

intervals for the population means in the cases of full moon and non-full moon days were respectively 1·40±0·17 and 0·54±0·02. These were clearly quite distinct and non-overlapping, so it might safely be concluded that the means were significantly different.

The confidence interval for new moon days was 0·51±0·10, which was also quite distinct from the confidence interval for full moon days. Data for full moon days were quite different from all other data, and the χ^2 test yielded p<0·001 when full moon days were compared with new moon and non-full moon days. There were no obvious differences between the other days. Though there was a small rise in crime on new moon days (figure), it was not significant as compared with all minus new moon days (p>0·05) and seventh days after new and full moon days (p>0·5). There was no significant difference in number of crimes committed on equinox and solstice days and on all minus full moon days (p>0·05). The trend of crime reported from different police stations was closely similar (table II).

The mean crime rate climbed from 0·40 on the seventh days after the full moon to 0·69 on the third days before the new moon, and after falling rather abruptly to 0·52 on days of the new moon climbed again to 0·67 on the third days after the new moon. It dropped again to 0·45 on the seventh days after the new moon to remain almost steady up to 0·48 on the third days before the full moon. Thereafter, there was a rapid rise in the crime rate to 1·40 on days of the full moon, returning almost to the previous level of 0·51 on the third days after the full moon (figure).

Discussion

We suggested that the impulse to take or to give poisons may be increased on full moon days owing to increased "human tidal waves"[25] caused by the gravitational pull of the moon, which is maximum on that day because earth, moon, and sun lie in a straight line.[27] The water content of the human body exceeds 50-60% and some tidal wave is generated by the gravitational pull of the moon. These human tidal waves may cause physical, physiological, and biochemical changes in the body resulting in an increased tendency to take poisons. The same hypothesis might help explain the results of this study. The impulse to commit crimes might be increased because of these human tidal waves.

The increased incidence of crime observed on full moon days stands in sharp contrast with other days. A small peak in crimes observed on new moon days might be explained on the basis of gravitational effect, but this was not significant when compared with all days minus full or new moon days. On new moon days the gravitational pull is 23·204% less than on full moon days.[28] Hence there may be a threshold effect beyond which the effect of gravity might become more manifest. Possibly other factor(s) are contributory. The sun being far away is not able to exert any influence. There was no difference between the incidence of crime on equinox and solstice days when compared with other days, though the sun is nearest to the earth on equinox days and furthest away on solstice days. The increased incidence of crimes on full moon days could not be explained on the basis of the dark night cycle as, according to that hypothesis, it should have been higher on new moon days, as suggested by many police officials at the beginning of this work.

Different human and animal biological phenomena have been attributed to circadian (daily), circaseptidian (weekly), and circatrigintan (monthly) rhythms related to the biological effects of the rotation of the moon around the earth.[29]

In animals also it has been suggested that behavioural and developmental rhythms of some species inhabiting the intertidal zones of sea coasts have adapted to environmental cycles which are determined by the moon.[30] The anatomical and physiological correlates of circadian rhythms have been studied in greater detail. There are two types of signals: X (body temperature drive) and Y (rest-activity cycle); the Y pacemaker is situated in the suprachiasmatic nucleus of the hypothalamus, while the exact site of the X pacemaker is not known.[31] Similar studies are required to find the anatomical and physiological correlates of "human tidal waves."

References

1 Loeb M. If the moon controls the tide, just think what it does to you. *Wall Street Journal* 1983 April 27.
2 Manusmriti. *The laws of Manu with the Bhasya of Medhatithi.* Vol 2. Ganga Nath Jha, transl. Calcutta: University of Calcutta, 1921:389-410.
3 Pliny the Elder. Quoted by Oliver.[32]
4 Plutarch. Quoted by Oliver.[32]
5 Anderson AC. Environmental factors and aggressive behavior. *J Clin Psychiatry* 1982;43:280-3.
6 Harmatz J, Shader RI. Correlation of human menstruation and lunar phase. *Am J Obstet Gynecol* 1975;121:1124.
7 Friedmann E. Menstrual and lunar cycles. *Am J Obstet Gynecol* 1981;140:350.
8 Witter FR. The influence of the moon on deliveries. *Am J Obstet Gynecol* 1983;145:637-9.
9 Abell GO, Greenspan B. Human births and the phase of the moon. *N Engl J Med* 1979;300:96.
10 Menaker W. Lunar periodicity with reference to live births. *Am J Obstet Gynecol* 1967;98:1002-4.
11 Templer DI, Veleber BM, Brooner RK. Geophysical variables and behavior: lunar phases and accident injuries: a difference between night and day. *Percept Mot Skills* 1982;55:280-2.
12 Taylor LJ, Diespecker DD. Moon phases and suicide attempts in Australia. *Psychol Rep* 1972;31:110.
13 Garth JM, Lester D. The moon and suicide. *Psychol Rep* 1978;43:678.
14 Rotton J, Kelly IW, Frey J. Geophysical variables and behavior. Detecting lunar periodicities: something old, new, borrowed, and true. *Psychol Rep* 1983;52:111-6.
15 Lieber AL. On the moon again. *Am J Psychiatry* 1975;132:669-70.
16 Lynch R. Homicides and the lunar cycle. *Am J Psychiatry* 1974;131:230.
17 Weiskott GN, Tipton GB. Moon phases and state hospital admissions. *Psychol Rep* 1975;37:486.
18 Gerlock A, Solomons HC. Factors associated with the seclusion of psychiatric patients. *Perspect Psychiatr Care* 1983;21:46-53.
19 MacMohan K. Short-term temporal cycles in the frequency of suicide, United States 1972-1978. *Am J Epidemiol* 1983;117:744-50.
20 Lester D. Temporal variation in suicide and homicide. *Am J Epidemiol* 1979;109:517-20.
21 Palmer JD, Udry JR, Morris NM. Diurnal and weekly, but no lunar rhythms in human copulation. *Human Biol* 1982;54:111-21.
22 Bonk JR. Don't pass the buck: the full moon is not responsible for an increase in the occurrence of untoward events in a hospital setting. *Journal of Psychiatric Nursing* 1979;17:33-6.
23 Russel MB, Bernal ME. Temporal and climatic variables in naturalistic observation. *Journal of Applied Behaviour Analysis* 1977;10:399-405.
24 Forbes GB, Lebo GR, Jr. Antisocial behavior and lunar activity; a failure to validate the lunacy myth. *Psychol Rep* 1977;40:1309-10.
25 Thakur CP, Sharma RN, Akhtar HS. Full moon and poisoning. *Br Med J* 1980;281:1684-6.
26 Swinscow TDV. *Statistics at square one.* London: British Medical Association, 1980.
27 Monkhouse FJ. *Principles of physical geography.* 7th ed. London: University of London Press, 1971:363-70.
28 Harnwell GP, Legge GJF. *Physics: matter, energy and universe, East-West student's edition (Delhi).* New York: Litton Educational Publishing Inc, 1975:1967-93.
29 Stupfel M. Biorhythms in toxicology and pharmacology. Infradian biorhythms and general discussion. *Biomedicine* 1975;22:105-11.
30 Neumann D. Tidal and lunar rhythms. *Arzneimittelforsch* 1978;28:1842-9.
31 Moore-Ede MC, Czeisler CA, Richardson GS. Circadian time keeping in health and disease: basic properties of circadian pacemakers. *N Engl J Med* 1983;309:469-75.
32 Oliver JP. Moonlight and nervous disorders. A historical study. *Am J Psychiatry* 1943;49:479-584.

Vaulting over the MRCP (UK) part I hurdle—twice over

SIRAJ A MISBAH

The completion of internship and the subsequent achievement of full registration with the medical council signals the start of the climb up the postgraduate ladder. To those of us on the lowest rung of the medical hierarchy, this meant that the time for intense soul searching had arrived and we had to contemplate seriously the direction of our future careers. So it was with me in September 1982 when having just completed my preregistration year in the professorial surgical and medical units at the General Hospital, Colombo, I had to decide between throwing in my lot with the down to earth scalpel wielders or joining the high brow medical wizards. Well, having chosen the latter course the MRCP (UK) part I loomed ahead on the horizon as my immediate target.

According to the regulations of the local postgraduate institute of medicine I was ineligible to appear for the MRCP (UK) part I under the guise of the MD part I scheduled for 10 February 1983 in Colombo. (The MRCP (UK) part I paper is lent by the Royal Colleges of Physicians of the United Kingdom to the institute on an "agency" basis.) Ironically, however, I was eligible to sit for the identical paper on the same date in the United Kingdom. Notwithstanding the fact that the prospect of exercising my neurones in the midst of an English winter was not one that would endear itself to my frontal cortex, born and bred under the equatorial climes of Colombo, I decided that come February I would be in London for part I.

Initial formalities over and while Colombo and its environs prepared to celebrate Sri Lanka's 35th anniversary of independence, I emplaned at midnight on 3 February on our national carrier Air Lanka, via Zurich to London. Having expected snow covered airfields and roads the rays of the morning sun penetrating the plane at Gatwick was a pleasant surprise.

With five days to go to the day of the exam, I was initiated into London and the English way of life by a friend with whom I put up in Surrey. Travelling from the quiet residential area to bustling London was, of course, a memorable experience, and having been shown the ropes I was able to tackle it with ease. University College was my centre and scouting around twice before the date of

the paper gave me the necessary confidence to arrive on my own an hour ahead of time on 10 February. The minutes ahead enabled me to gather my forces and prepare for battle, which in the event was tough but of manageable proportions. Having, I thought, successfully negotiated part I, I was now free to see what a cold wintry London had to offer a tropical visitor. The week left for my roaming passed just as quickly and I was soon back home in sunny humid Colombo to await the postman some day in March conveying to me what the arbiters of my fate at the royal colleges had decided. Then on 15 March, having rushed home to lunch from a busy cardiac outpatients clinic, I found an authoritative letter which confirmed that I had sailed through part I.

The period of self congratulation and nostalgia over, I wrote to the local postgraduate institute inquiring whether I would be exempt from the MRCP (UK) part I component of the MD part I (which comprises the MRCP (UK) part I and a separate paper on tropical medicine) in July. The powers that be at the institute, however, decreed that I would have no such luck and would have to take the MRCP (UK) part I once again.

Battle hardened and encouraged by February's sweet smell of success I prepared for the July hurdle. Overall, the July paper was easier than the one in February and in mid-September official confirmation of my success was received. Enriched by this unique experience of hurdling twice over the MRCP (UK) part I, I believe that my observations may help future candidates prepare their strategy for part I. Therein, dear reader, lies the excuse for this essay.

Performing a busy senior house officer's job in neurology did not leave me much time to be with my books, but I thought that three months of well planned revision would suffice. On 1 November 1982, therefore, I set out on my odyssey turning page one of *Price's Text Book of the Practice of Medicine* (which was to be my bible) bent on reading it from cover to cover right through to page 1450. I did complete this daunting task of seeming himalayan proportions on 3 February 1983, the day of my departure to London. What were my reasons for choosing Price over the equally famous American textbooks such as Cecil-Loeb or Harrison? For a British examination, I believed that an up to date British textbook such as Price, which epitomised the best of current British medicine, would be ideally suited for the purpose. Furthermore, I strongly suspect that many of the contributors to Price are on the examining board for part I.

General Hospital, Colombo, Sri Lanka

SIRAJ A MISBAH, MB, BS, senior house officer in cardiology

Correspondence to: Preston Hall Hospital, Maidstone, Kent ME20 7NJ.