

Temporal variations in suicide attempt rates: A hospital-based study from India

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ABSTRACT

Background: Temporal variations of suicide attempts can help to better understand correlates of suicidal behavior. This study attempted to find the diurnal, weekly, and seasonal variations in suicide attempts at a tertiary care hospital in India. **Materials and Methods:** This record-based study was conducted among patients evaluated at a crisis intervention clinic over a 4-year period at a tertiary care teaching hospital in Southern India. Patients who attempted suicide in recent past and had been medically stabilized were evaluated in this clinic. The distribution of suicide attempts across the time of the day, the day of the week, and month of the year was assessed. **Results:** Of the 407 patients who were included in the analysis, the frequency of suicide attempts varied across time of the day ($\chi^2 = 134.504, P < 0.001$). The most common period of the day for the attempt was evenings (6 pm to 9 pm). There were no significant temporal associations between month of the year or day of the week and suicide attempts though peaks were observed for June among the months and Sundays among days of the week. **Conclusion:** Diurnal variations exist in the suicide attempts. This has implications on clinical caseloads on emergency departments, especially during the times when staffing might be sub-optimal.

Keywords: India, periodicity, seasons, suicide/statistics and numerical data

Introduction

Suicide is a complex phenomenon associated with multiple bio-psycho-social correlates.^[1] Suicides are among the most common causes of death in the younger population.^[2] It has emerged as a critical public health problem which primary care physicians can help addressing, as distressed patients visit them weeks and months before the attempt.^[3] In developing nations like India, majority of individuals contact primary care providers for health issues. Moreover, studies show individuals contact primary care providers before their suicide attempts than with mental health specialists.^[4] The rates of suicide attempts far outnumber the rates of completed suicides.^[5] Suicide attempts

pose a significant health-care burden and contribute to significant economic costs.^[6,7] Suicide attempts occur in all strata of the society and are often brought to primary care services for initial management. Detecting and treating risk factors for suicide like depression in primary care may be effective in preventing suicide. A better understanding of suicidal behaviors may shed light on effective strategies for suicide prevention.

It has been postulated that seasonal climatic variation can influence rates of suicide.^[8-12] Several investigators have found peak rates of suicides in the spring season,^[11,13-15] though data from elsewhere suggests a lack of association between seasonality and suicide attempts.^[16] Several models have been suggested to explain this temporal relationship, the main ones among them being the bioclimatic model and the sociodemographic

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model.^[17] The bioclimatic model proposes that the seasonality of suicides could be attributed to increased neuronal activity in early spring season,^[18] while the sociodemographic model based on Durkheimian principles which proposes that higher levels of social and occupational activity governed by seasonal changes especially in rural areas explain the peak of suicides in spring and specific days of the week.^[13] Furthermore, seasonal recurrence of psychiatric disorders and biological vulnerability of these individuals with seasonal variations had been noted.^[19]

In addition to the season, the frequency of suicide attempts across the days of the week has also been evaluated. Many studies suggest that the frequency of suicide peaks on Mondays.^[20-23] there is a suggestion that Wednesdays may also be related to greater suicide rates.^[24] In terms of time of the day, suicide attempts have been more frequent in the afternoons or evenings.^[25-27]

The bioclimatic conditions, as well as sociodemographic vicissitudes, are quite different in India than the Western world, with predominantly agrarian society and less pronounced winters in Southern India. Thus, this study attempted to find the association of month of the year, day of the week and time of the day with a frequency of suicide attempt among suicide attempters receiving treatment in a general hospital.

Materials and Methods

Setting of the study

The present study was conducted in the Department of Psychiatry of a tertiary care multi-specialty teaching hospital in South India. Patients with suicide attempts who are brought to the hospital are seen in the emergency services and are initially managed by the medical or surgical specialties. After medical stabilization, the patients are referred to the crisis intervention clinic (CIC) (run by the Department of Psychiatry) for further evaluation and intervention. The clinic is manned by a resident, a consultant and a social worker from the Department of Psychiatry. The cases are evaluated in detail by the resident using a structured questionnaire obtaining information from the patient, family members, and medical records. The data collected includes demographic information, date and time of the attempt, reason and method of attempt, and several other suicide-related attributes. Adequate privacy is provided to the patient during the evaluation process, and confidentiality is maintained. Social worker inputs are sought for addressing psychosocial issues. The further management plan includes inpatient or outpatient treatment using one or more of pharmacotherapy, psychotherapy, and rehabilitation.

Procedure of the study

Data extraction for this case-record based audit utilized the consecutive records of all patients registered at the CIC over a period of 4 years was done by one of the researchers (SS). The data extraction was done using a structured proforma to gather details about demographic characteristics of the patient,

including age, gender, marital status, educational and employment status, family type, and residential background (rural vs. urban). The date and time of the suicide attempts were extracted from the records. Those self-harm attempts which could be clearly identified as suicidal behaviors as per definition of Silverman *et al.*^[28,29] were selected for further analysis.

Statistical analysis

For the purposes of analysis, the numbers of suicide attempts were enumerated across hours of the day, days of the week, and months of the year. The time of the suicide attempt as per self-reports was divided into 3 h epochs, into 0:00–2:59 am, 3:00–5:59 am, 6:00–8:59 am, 9:00–11:59 am, 12:00–2:59 pm, 3:00–5:59 pm, 6:00–8:59 pm, and 9:00–11:59 pm for convenience of comparison. One sample Chi-square (χ^2) test was used to analyze trend variation over time of the day, days of the week and months of the year. Missing value imputation was not done, and differences were considered statistically significant for $P < 0.05$.

Results

The analysis was done from CIC data from October 2009 to September 2013, i.e., over a 4 years period. A total of 442 patients with self-harm attempts were registered in the clinic. Of them, information about the time of attempt was not available in 19; and the definition of suicide attempt was not met in another 16. Hence, the analysis was carried out among 407 patients (92.1% of the sample). The characteristics of these 407 patients are shown in Table 1. A slight majority of the patients were males, were married, and were employed. A large majority of the patients belonged to nuclear family and rural background. Interpersonal issues were the most common

Table 1: Characteristics of the patients (n=407)

Variable	n (%) or mean (±standard deviation)
Age in years	26.9 (±9.7)
Male gender	218 (53.6)
Currently married	206 (50.6)
Completed years of education	8.6 (±4.4)
Employed [†]	214 (53.4)
Nuclear family [‡]	277 (68.7)
Rural background [§]	359 (89.3)
Reported reason of attempt	
Interpersonal issues	254 (62.4)
Psychiatric/physical illness	69 (17.0)
Love related	33 (8.1)
Financial	30 (7.4)
Others	21 (5.2)
Method of attempt	
Pesticide	250 (61.4)
Plant poison	87 (21.4)
Prescription drug overdose	30 (7.4)
Physical methods including hanging	24 (5.9)
Others	16 (3.9)

^{†‡§}Data not available for 6, 4, and 5 patients, respectively

stated reason of attempt, and pesticide poisoning was the most common method of attempt.

The distribution of the 407 patients across the time periods of the day is depicted in Figure 1. A statistically significant variation with time of attempt was observed ($\chi^2 = 134.504, P < 0.001$), and the attempts were most common in the evening time between 6:00 pm and 8:59 pm. The distribution of suicide attempts across the various days of the week is shown in Figure 2. Numerically, the highest proportion of suicide attempt in this population occurred on Sundays, but the differences were not statistically significant ($\chi^2 = 7.897, P = 0.289$). Similarly, the distribution of suicide attempts across the various months of the year is shown in Figure 3. The greatest proportion of suicide attempts occurred in the months of June and least proportion in December though the differences were not statistically significant ($\chi^2 = 15.418, P = 0.164$).

Discussion

Seasonal variations in suicide have long been documented, with the various hypothesis proposed. Moreover, these studies help in providing information on various preventable and modifiable factors of suicide. Strategies based on the season variables need to be used in designing and training of suicide prevention programs for relevant professional groups which include primary health-care providers other than mental health professionals. This study aimed at identifying the association between frequency of suicide attempts treated at a general hospital and the time of day, day of the week, and month of the year.

The present study suggests that the maximum number of suicide attempts occur in the evening time. In a previous study, evening occurrence of suicide attempts has been reported.^[25] The person concerned is likely to be in the company of family members in the evenings, and quarrels due to interpersonal conflicts may possibly trigger the suicide attempt. This diurnal variation can be attributed to sociorelational factors or due to diurnal worsening of mood disorders which can be addressed when individuals visit primary care provider.^[30] The present findings suggest that interpersonal conflicts were the most common reported reasons of a suicide attempt. The other study from India looking at timings of suicide attempts gave a considerably wide time interval of 12 noon to midnight as the most common time for suicide attempts.^[20] Knowledge of such timings when suicides are more likely to happen can help health-care providers in planning the emergency services, as late evening predominance suicide attempts would call for the emergency team to be more alert during this period. Late evenings are the time when the emergency staffing might be sub-optimal.

Regarding the distribution of suicide attempts across the days of week, Sunday was the peak day though statistical differences were not found in this study. Weekend suicides have been observed in many previous studies, their association with employment status, and alcohol use had been investigated. Another study from Israel

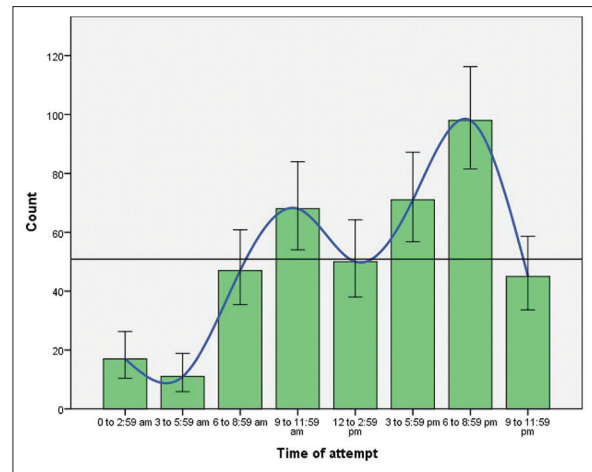


Figure 1: Suicide attempts at the various times of the day

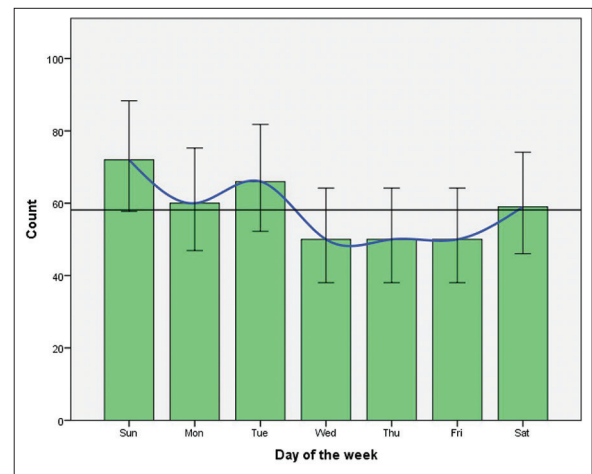


Figure 2: Suicide attempts at the different days of the week

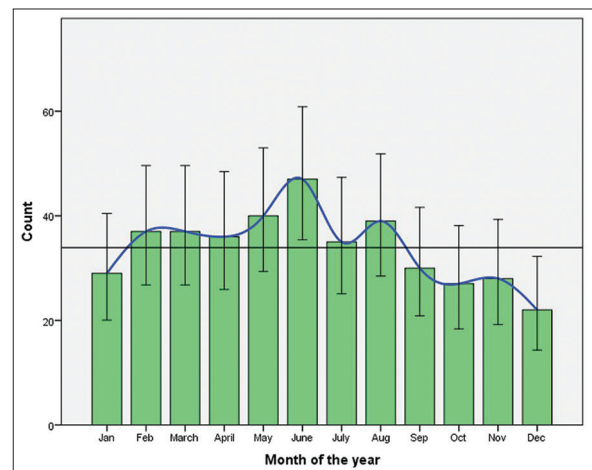


Figure 3: Suicide attempts during the different months of the year

had similar findings of Sunday as the day of peak rates of suicide attempts,^[31] though many other studies from the West have found Monday to be associated with peak rates of suicide.^[20-23] Indian society being agrarian in nature does not subscribe to office-based

week schedule beginning on Mondays. Hence, additional stresses accumulated on the beginning of workday after a weekend is less of a concern in this population. A robust relationship of the day of the week with the suicide attempts was not found in this study probably because majority of the present population belonged to a rural background.

This study did not find a robust association between seasonality and suicide attempts, thereby endorsing similar report from previous studies,^[16] while discordant with studies from many parts of the world.^[11,14,32] This study suggested nonsignificant peak of suicide rates in June while the only other study from India, which commented on seasonality of suicide rates found an increased rates of suicides in rainy season (typically June to August in India).^[33] This study was conducted in South India where seasonal differences in temperature and sun exposure are quite less across the year, and hence possibly significant differences were not observed.

The findings of the study should be interpreted in terms of its strengths and limitations. The strengths of the study include looking at suicide data over four successive years; assessing the temporal association of suicide attempts in terms of the time of the day, day of the week, and month of the year; and using standard statistical techniques to find the significance of temporal association. The limitations of the study include focusing on suicide attempters and not completers, data based upon chart review, difficulties in ascertaining the time of attempt accurately, a single center experience, and reliance on hospital based data rather than community-based data. However, given the limitations of the present record systems in India, a community-based approach is unlikely to be feasible in near future and hence hospital-based data may be more reliable source.

Thus, the study suggests that there are diurnal variations in suicide attempts, with evening attempts being more common. A clear demonstration of the seasonality of suicide attempts in this Indian population was not found. Further community-based studies using strengthened data reporting systems may help to better understand the seasonal association of suicide attempts in this population. Moreover, future studies may also attempt to understand temporal association of suicide attempts in specific at-risk population groups such as farmers. Suicide prevention is often considered a daunting task by public health planners, and understanding the various facets of suicide attempts may yield better answers about reducing the number of suicide attempts in the future. Seasonal variation in suicide rate addresses the need for increased support by service agencies and public campaigns for heightening awareness of suicidal behaviors in high-risk people.

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Conflicts of interest

There are no conflicts of interest.

References

- Hoffman MA. Suicide and hastened death: A biopsychosocial perspective. *Couns Psychol* 2000;28:561-72.
- Heron M. Deaths: Leading causes for 2011. *Natl Vital Stat Rep* 2015;64:1-96.
- Schulberg HC, Bruce ML, Lee PW, Williams JW Jr., Dietrich AJ. Preventing suicide in primary care patients: The primary care physician's role. *Gen Hosp Psychiatry* 2004;26:337-45.
- Luoma JB, Martin CE, Pearson JL. Contact with mental health and primary care providers before suicide: A review of the evidence. *Am J Psychiatry* 2002;159:909-16.
- Diekstra RF, Gulbinat W. The epidemiology of suicidal behaviour: A review of three continents. *World Health Stat Q* 1993;46:52-68.
- Clayton D, Barcel A. The cost of suicide mortality in New Brunswick, 1996. *Chronic Dis Can* 1999;20:89-95.
- Czernin S, Vogel M, Flückiger M, Muheim F, Bourgnon JC, Reichelt M, *et al.* Cost of attempted suicide: A retrospective study of extent and associated factors. *Swiss Med Wkly* 2012;142:w13648.
- Ajdacic-Gross V, Bopp M, Ring M, Gutzwiller F, Rossler W. Seasonality in suicide - A review and search of new concepts for explaining the heterogeneous phenomena. *Soc Sci Med* 2010;71:657-66.
- Hakko H, Räsänen P, Tiihonen J, Nieminen P. Use of statistical techniques in studies of suicide seasonality, 1970 to 1997. *Suicide Life Threat Behav* 2002;32:191-208.
- Lin HC, Chen CS, Xirasagar S, Lee HC. Seasonality and climatic associations with violent and nonviolent suicide: A population-based study. *Neuropsychobiology* 2008;57:32-7.
- Jessen G, Andersen K, Arensman E, Bille-Brahe U, Crepet P, Leo DD, *et al.* Temporal fluctuations and seasonality in attempted suicide in Europe: Findings from the WHO/EURO multicentre study on parasuicide. *Arch Suicide Res* 1999;5:57-69.
- Barker A, Hawton K, Fagg J, Jennison C. Seasonal and weather factors in parasuicide. *Br J Psychiatry* 1994;165:375-80.
- Sun J, Guo X, Ma J, Zhang J, Jia C, Xu A. Seasonality of suicide in Shandong China, 1991-2009: Associations with gender, age, area and methods of suicide. *J Affect Disord* 2011;135:258-66.
- Christodoulou C, Douzenis A, Papadopoulos FC, Papadopolou A, Bouras G, Gournellis R, *et al.* Suicide and seasonality. *Acta Psychiatr Scand* 2012;125:127-46.
- Linkowski P, Martin F, De Maertelaer V. Effect of some climatic factors on violent and non-violent suicides in Belgium. *J Affect Disord* 1992;25:161-6.
- Tietjen GH, Kripke DF. Suicides in California (1968-1977): Absence of seasonality in Los Angeles and Sacramento counties. *Psychiatry Res* 1994;53:161-72.
- Ajdacic-Gross V, Wang J, Bopp M, Eich D, Rössler W, Gutzwiller F. Are seasonalities in suicide dependent on suicide methods? A reappraisal. *Soc Sci Med* 2003;57:1173-81.
- Preti A. Seasonal variation and meteoropism in suicide: Clinical relevance of findings and implications for research. *Acta Neuropsychiatr* 2002;14:17-28.
- Lee HC, Lin HC, Tsai SY, Li CY, Chen CC, Huang CC. Suicide rates and the association with climate: A population-based study. *J Affect Disord* 2006;92:221-6.
- Lester D. Temporal variation in suicide and homicide. *Am J Epidemiol* 1979;109:517-20.

21. Massing W, Angermeyer MC. The monthly and weekly distribution of suicide. *Soc Sci Med* 1985;21:433-41.
22. Maldonado G, Kraus JF. Variation in suicide occurrence by time of day, day of the week, month, and lunar phase. *Suicide Life Threat Behav* 1991;21:174-87.
23. Johnson H, Brock A, Griffiths C, Rooney C. Mortality from suicide and drug-related poisoning by day of the week in England and Wales, 1993-2002. *Health Stat Q* 2005;27:13-6.
24. Kposowa AJ, D'Auria S. Association of temporal factors and suicides in the United States, 2000-2004. *Soc Psychiatry Psychiatr Epidemiol* 2010;45:433-45.
25. Kanchan T, Menezes RG. Suicidal poisoning in Southern India: Gender differences. *J Forensic Leg Med* 2008;15:7-14.
26. Logaraj M, Ethirajan N, Felix JW, Roseline FW. Suicidal attempts reported at a medical college hospital in Tamil Nadu. *Indian J Community Med* 2005;30:136-7.
27. Doganay Z, Sunter AT, Guz H, Ozkan A, Altintop L, Kati C, *et al.* Climatic and diurnal variation in suicide attempts in the ED. *Am J Emerg Med* 2003;21:271-5.
28. Silverman MM, Berman AL, Sanddal ND, O'carroll PW, Joiner TE. Rebuilding the tower of Babel: A revised nomenclature for the study of suicide and suicidal behaviors. Part 2: Suicide-related ideations, communications, and behaviors. *Suicide Life Threat Behav* 2007;37:264-77.
29. Kattimani S, Bharadwaj B, Sarkar S, Mukherjee A. Interrater reliability of the Silverman *et al.* nomenclature for suicide-related ideations, behaviors, and communications. *Crisis* 2015;36:61-4.
30. Preti A, Miotto P. Diurnal variations in suicide by age and gender in Italy. *J Affect Disord* 2001;65:253-61.
31. Modan B, Nissenkorn I, Lewkowsky SR. Suicide in a heterogeneous society. *Br J Psychiatry* 1970;116:65-8.
32. Ho TP, Chao A, Yip P. Seasonal variation in suicides re-examined: No sex difference in Hong Kong and Taiwan. *Acta Psychiatr Scand* 1997;95:26-31.
33. Mohanty S, Sahu G, Mohanty MK, Patnaik M. Suicide in India: A four year retrospective study. *J Forensic Leg Med* 2007;14:185-9.