Original Article

Monthly Pattern and Distribution of Births in a Teaching Institution of Northern India

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ABSTRACT

Background: Seasonality in frequency of birth is a world-wide phenomenon that reflect behavioral and biological determinant of reproduction. **Aim:** To assess pattern of birth occurring in a medical college hospital according to calendar months. **Materials and Methods:** Log books of delivery room were retrieved and all singleton live births occurring in each month for the calendar years 2002-2009 (8-year) was extracted. Data collection was carried out by the investigators during the period February-April 2010 and data management using software statistical package. Analysis was carried out by calculating average birth per month for the period under study and standard index as well as quarter-wise details was also tabulated. **Result:** It was observed that there was a progressive rise in total number of births occurring in the hospital from 5840 (avg. 486.66/month) from the year 2002 to 8205 (avg. 683.75/month) in 2009. Maximum birth occurred during the months of August (avg. 774/month) followed by September (avg. 735/month) and October (avg. 705/month) respectively and least in the month of April (avg. 445/month) with a $P<0.05$. Quarter (q) wise distribution showed maximum birth during q3 (July-September=30%) followed by q4 (October-December=27%), q2 (April-June=22%) and q1 (January-March=21%) respectively. **Conclusion:** It can be concluded that peak birth in the months of August-September-October as observed in present study implying that there is increased conception during the winter months of December-January-February. Within study limitations, findings may facilitate advocacy, counseling, planning and delivery of family welfare service in a more efficient and effective manner particularly related to mobilization of human resource, inventory control, logistics, streamlining family planning services at institutional and community level keeping in mind the monthly pattern of hospital deliveries.

KEY WORDS: Behavior, communication, conception, delivery, demography, family planning, fertility, human resource, months, pattern, reproduction, seasonality, time

INTRODUCTION

Seasonality in frequency of birth is a world-wide phenomenon[1,2] akin to occurrence of incidence of infections. These patterns reflect the behavioral and biological determinant of reproduction. Various birth seasonality patterns have been described for different countries. European type [(major early spring peak (April) with a minor autumn peak)], the American type [(with one major peak in autumn (August-September) and minimum in spring (March-May)] and the Japanese type (similar to European type with the spring peak much exaggerated). The European pattern is also been found in Canada and Australia.[3,4]

Evolving changes in the birth rhythm pattern have also been reported. In most cases, there is a common trend towards a decrease in spring births and increase in autumn births, with a decline in amplitude and subsequent loss of seasonality.[5] The putative hypotheses of multi-factorial in origin have been proposed for this occurrence and can be broadly grouped into three categories: (1) seasonality due to social factors (marriage, holidays, contraception, etc) that influence the frequency of intercourse; (2) seasonality due to climatological factors that directly affect human fecundity; and (3) seasonality due to energetic factors that principally affect female fecundity.[6] There is limited medical literature available to describe birth pattern in our setting. With this background a retrospective record based study was undertaken to assess birth frequency and distribution

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according to calendar months occurring in a medical college hospital of northern India.

MATERIALS AND METHODS

General setting

The state of Haryana in India has 21 districts with a population of 253.5 lakhs (94% following Hindu (including Sikh) religion); and primary agrarian based occupation residing in rural (65.2%) areas. Important health related indicators of the state are as follows: 76% literacy rate; sex ratio of 877 (0-6 years: 830 females/1000 males); per capita income: Rs. 109,227 (India: 60,972); birth rate: 22.3; death rate: 6.6; and infant mortality rate of 48/1000 live births. The level of institutional delivery stood at 66.6% (India) and 69.9% in the state of Haryana.

Study setting

This retrospective study was conducted in one of the publically funded teaching hospital of northern India situated in Rohtak district which provides specialist's tertiary care services to patients largely belonging to lower/middle socio-economic strata of both urban and rural setting. Currently, this hospital caters to an avg. daily OPD attendance of 5000 patients and more than 80,000 annual admissions for population residing in Rohtak and 5-6 adjoining districts. Rohtak is situated approximately 70 km (43 miles) from national capital, New Delhi.

Data collection and statistical analysis

As there was no digitalization of records, log books of delivery room were retrieved and all singleton live birth occurring in each month for the calendar years during 2002-2009 (8-year) was extracted after taking permission from authority. All meticulous care is taken in recording the event and maintaining records. Data collection was carried out by investigators during the period February-April 2010 and data management using statistical software package. Personal/identifying details were not recorded. Analysis was carried out by calculating average birth per calendar month for the period under study and standard index as well as quarter-wise details was also tabulated. Data was analyzed with the hypothesis that number of births occurring in each calendar month had no relation to the calendar month. Chi-square test was undertaken and considered significant at $P<0.05$.

Using a standard index, data were standardized to a common month length-in this case 30 days-using the equation: (N/d) x 30; where N is the total number of births in a given month during the entire 8-year time frame and d is the number of days in that month. Considering a year as equivalent to a circle of 360°, each month would be equivalent of a 30° sector, hence a standardized month length of 30 days was chosen to reflect this preference over 31 days (as used by Russell et al, 1993).[7] Distribution of births was also analyzed according to quarter time frame (q1 [January-March]; q2 [April-June]; q3 [July-September]; q4 [October-December] using standard index.

RESULT

It was observed that there was a progressive rise in total number of births in the hospital from 5840 [(avg. 486/month; range: 353 (min)-638 (max)] in the year 2002 to 8205 [(avg. 683/month; range: 558 (min)-819 (max)] in 2009. Maximum birth occurred during the months of August (std. index=749/month) followed by September (std. index=735/month) and October (std. index=683/month) respectively and least in the month of April (std. index=445/month), details are shown in Table 1. Percentage (%) wise monthly distribution of birth is shown in Figure 1. Quarter (q) wise distribution showed maximum birth during q3 (July-September=30.3%) followed by q4 (October-December =27.1%), q2 (April-June=21.7%) and q1 (January-March= 20.7%) respectively [Figure 2]. The Chi-square analysis revealed a high degree of statistical significance ($P<0.01$) indicating that calendar months had a definite bearing on the frequency of births. When data was analyzed using quarter period, it also reveled high statistical significance between births occurring in different quarters ($P<0.01$).

DISCUSSION

A season is a division of year marked by changes in weather, ecology and hours of daylight. Seasons result from the yearly revolution of the earth around the sun and the tilt of the earth's axis relative to plane or revolution. In temperate and sub-polar regions generally four calendar based seasons are recognized namely, spring, summer, autumn and winter. According to Hindu calendar, there are six seasons namely, Hemant (pre-winter), Shishira (winter), Vasanta (spring), greeshma (summer) Varsha (rainy) and Sharad

Table 1: Births in a teaching institute for 8-year time frame, 2002-2009

Months	Avg. birth/month	Std. index	Percentage
January	519.6	502.9	7.1
February	470.0	503.6	7.1
March	482.7	467.2	6.6
April	445.1	445.1	6.3
May	516.7	500.1	7.0
June	597.9	597.9	8.4
July	691.6	669.3	9.4
August	774.1	749.2	10.6
September	735.1	735.1	10.4
October	705.9	683.1	9.6
November	639.7	639.6	9.0
December	626.6	606.4	8.5

Figure 1: Percentage of birth in a teaching institute according to calendar months, 2002-09
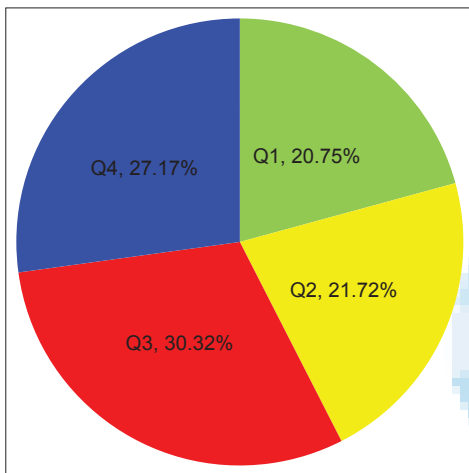

Figure 2: Proportion (%) of birth in a teaching institute according to quarter time-frame, 2002-09

(autumn) while Indian Meteorological Department report that seasons over India are classified as winter (January-February), pre-monsoon (March-May), southwest monsoon (June-Sep) and post-monsoon (October-December). The state of Haryana falls in semi-arid to humid sub-tropical climatic zone with average annual temperature ranging from 22.5-25°C (72.5-77°F); summer temperature generally shoots up to 47°C (117°F) and in winters it ranges from 5° to 9°C (41° to 48°F), occasionally dropping to freezing. The rainy season in Haryana sets in during the month of July and continues till September; 80% of the total rainfall occurs during this period, which even causes flood at times.

Eriksson *et al* (Finland) in their record based study for the period 1650 to 1950 showed two peaks of birth in March-April and another in September-October. Their notion was that this information of the seasonal variation during normal years is important for analyses of the effects of wars, famines, epidemics, or similar privations on births

and deaths.[8] Haandrikman K (Netherlands) on examining population register data for the period 1952 to 2005 reported that peak in births changed from spring to summer and subsequently to August/September, thereby shifting from the European to the American birth pattern.[9]

Our study findings corroborated with other studies in similar setting. Anand in their community based study at Ballabgarh (Haryana) reported similar finding with a peak during the month of August followed by September and least in the month of April.[10] Our data also strongly reflected the USA pattern in seasonality of birth with similar spikes and trough.[11] While another study at Pondicherry (India) from 1973 to 1981 showed maximum birth during summer months of May-July and least in the months of February-April. The authors concluded that coital frequency increases during Aug-Oct as rains sets in the region.[12] However, the present study finding are in contrast to the findings observed in Senegal where spikes were observed for the month of Feb through May.[13] Another recent Nigerian hospital based study showed slightly sinusoidal pattern of delivery with two peaks: a major peak spanning two months, April/May and another peak in October. There was nadir number of deliveries in July/August and December.[14]

The number of day in each month of a year varies from 31, 30 or 28 days and humans, unlike most other mammals, reproduce throughout the year. However after standardization of such entity it can be concluded that peak birth in the months of August-September-October as observed in present study implying that there is increased conception during the winter months of December-January-February. Some of the limitations of present study include non-availability of information on other important biological and social variables such as birth order, gestation period, caesarian/vaginal delivery, contraceptive use, socio-

demographic profile, nutritional status, etc. Other centers in different region of country may take up institutional/ community based study with larger time-frame to aid in knowledge domain.

CONCLUSIONS

The findings emerging from record based hospital study cannot be generalized still it may act as a trigger to facilitate advocacy, counseling; planning and delivery of family welfare service in a more efficient and effective manner particularly related to mobilization of human resource, inventory control, logistics, streamlining family planning services at institutional and community level.

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