Seasonal Incidence of Cleft Lip and Palate in Czech Regions

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Experimental teratology and experimental genetics have considerably advanced our knowledge concerning the origin of cleft lip and palate in animals. In humans the matter is much more complicated and less is known about it. Many environmental factors are involved, including possibly the influence of the seasons of the year.

The latter relationship has been discussed for many diseases since ancient times. In recent years many attempts have been made to find out whether there is seasonal variation in cancer, prematurity, mental deficiency, and various congenital malformations. Several authors have searched for seasonal incidence of cleft lip and palate. Edwards (*1*, *4*) has found the seasonal dependence in cleft lip very marked in a series of 113 probands. On the contrary, Woolf and associates (*5*) and Knox and Braithwaite (*3*) found no significant differences in seasonal birth rate of any type of clefts in Utah and England.

We tried to approach this problem on the basis of the great number of cleft patients treated in the Prague Clinic of Plastic Surgery, Charles University.

Method and Material

Three thousand patients born from the years 1930 to 1963 were used as subjects. There were 870 patients with clefts of the primary palate (Group 1), 781 patients with clefts of the secondary palate (Group 2), and 1349 patients with clefts of the primary and secondary palate (Group 3). Two methods of statistical analysis were used to determine whether there were any significant differences in the seasonal variations of birth rates of cleft lip, cleft palate, and cleft lip and palate children and the general population.

First, the seasonal variations of births in the normal population of Czech regions were analyzed for a prewar period of seven years (1930–1937) and for a postwar period of the same length (1952–1960). The

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calculation of the seasonal indexes took into consideration the long-term trend of live births separately for each period in question, and the seasonal index values were then adjusted to the varying number of calendar days in a month. The obtained adjusted seasonal index values for the prewar and postwar periods did not show any difference at the 5% level, so that the simple arithmetic mean of the indexes of both series was used as a basis for further study.

Seasonal index values were computed for each of the three groups of cleft children after adjustment to the length of the calendar months. Then the monthly incidence of cleft children among live births was studied. The average monthly rate of clefts was computed as a ratio of the number of cleft children born in the period under observation to the total number of live births in the respective month (expressed per 100,000 live-born). The monthly rates reflect the true incidence of cleft children under the presumption that all cleft subjects are registered. This can be reasonably assumed as the treatment and rehabilitation are free in our country and therefore no payment problems can be expected to hamper the handicapped person or the family in seeking medical assistance. Further, the assumption can be made that, even in such cases where no medical treatment was provided, no bias exists between seeking medical treatment and month of birth.

Average monthly incidence rates were calculated for the years 1954–1961 (complete clefts and clefts of the lips) and 1952–1959 (clefts of the palate) for which periods the records were considered complete.

Findings

Seasonal index values of the cleft children in Table 1 are in general accordance with the seasonal index numbers for the live-births in the population. Differences between the lip only and the palate only groups were not significant (by the chi-square test). For lip and palate clefts, we found a significant difference (at the 5% level) between seasonal variations of cleft and noncleft subjects. The value chi-square was influenced by the difference between expected (according to noncleft seasonal variation) and actual number of cleft subjects born in January and November. In these two months, the numbers of cleft subjects observed were lower than expected. Another significant difference was found in March and April when the number of cleft children observed was higher than expected.

A comparison of seasonal index values of normal population and cleft subjects need not reveal the true differences in the incidence of this type of malformation among live-birth children in different months of a year.

Kresselman and Bailarm (*2*) demonstrated that analysis based on seasonal index values can give inconsistent results. Having at our disposal records of month of birth of cleft children for 8 years, we

TABLE 1. Seasonal index* numbers of live birth in population of Bohemia (1930–1937; 1952–1960) and cleft children.

Month	*Seasonal index of numbers adjusted for equal length of month*			
	Live births average '30–'37; '52–'60	*Complete clefts*	*Cleft palate*	*Cleft lip*
1	98.3	80.3	99.3	94.5
2	103.6	107.0	126.5	117.8
3	107.2	122.2	76.7	110.7
4	107.1	123.5	101.1	128.2
5	107.8	112.4	121.9	101.2
6	103.8	115.4	102.6	97.4
7	100.8	108.9	97.8	109.1
8	95.8	91.6	100.8	86.2
9	98.6	104.6	107.3	103.3
10	92.6	85.4	94.8	92.8
11	91.9	71.1	79.4	79.4
12	92.5	77.6	91.8	79.4
total	1200.0	1200.0	1200.0	1200.0

* $$T_i = \frac{\sum_{j=1}^{K} B_{ij}}{\left(\sum_{i=1}^{12}\cdot\sum_{j=1}^{K} B_{ij}\right):12K}\cdot 100$$

B_{ij}—actual number of births in the i-th month ($i = 1, 2 \cdots 12$) for K years
K—number of years under observation

thought that a valid test of seasonal differences would be to compare the monthly averages of cleft incidence to the whole-year average. This incidence of cleft children was calculated as a rate per 100,000 live-born in the same month and period of time (see Table 2). The expected number of cleft subjects was enumerated by multiplying the total number of live-births in the month under observation by the yearly average incidence-rate of cleft children. Differences were tested at the 5% level of significance using a χ^2-test.

An increased incidence of cleft subjects was revealed for different defects in different months: complete clefts, May; palate only, February, and lip only, October.

To prevent biased conclusions regarding the month of increased cleft defects, we studied the data year by year. The peak incidence of cleft palate was influenced by an extremely high number of this defect in February 1957 (9 defects among a total 40 for that year) and again in 1958 (10 defects among 51). In none of the remaining 6 years of the period under observation (1952–1959) was February a month of increased or peak incidence.

TABLE 2. Average monthly incidence of cleft defects in Bohemia.

Month	*Average number of cleft children born per 100,000 live-born children per month*		
	Cleft lip and palate	*Cleft palate*	*Cleft lip*
period of observation	1954–1961	1954–1961	1952–1959
1	26.4	22.2	19.3
2	36.9	37.1[a]	23.2
3	33.2	21.4	26.7
4	34.8	31.5	30.1
5	45.4[a]	31.2	19.1
6	33.7	26.8	19.8
7	36.6	24.7	28.7
8	34.5	30.1	24.0
9	34.7	26.0	28.4
10	27.3	21.1	36.1[a]
11	25.6	24.4	20.9
12	24.8	26.8	24.8
yearly average	33.1	27.0	25.1

[a] Average monthly incidence significantly higher (at 5% level of significance) than expected with respect to yearly average.

October as a month of peak incidence of clefts of the lip was found in our series only once: in 1957, 9 defects, among the year's total of 47. The remaining 6 years of the period under observation (1954–1961) did not reveal any substantial increase for this month.

Summary

Analysis of seasonal index values revealed a significant deviation of seasonal variation of lip and palate clefts from seasonal frequency of live-births in the total population. The greatest differences were found in March and April (more cleft defects than expected). The same situation prevailed when the average monthly incidence of complete cleft was studied. Here, the month of May was found to be the peak of the incidence rate for complete clefts. For all sorts of cleft defects, no statistically significant deviation of seasonal index values or monthly incidence rates could be ascertained. The findings recorded in the present study are still preliminary. The observations will be repeated as soon as records based on complete evidence of malformations revealed at birth are at our disposal for a series of years long enough to allow a study of seasonal variations.

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