Incidence of Clefts in New York City

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Perhaps no other congenital malformation has intrigued plastic surgeons more than cleft lip and cleft palate. In an effort to elucidate the various factors responsible for these anomalies, increasing use has been made of vital statistics from many parts of the world. A partial list of several investigations is found in Table 1. Most surveys have recorded cleft lip and palate as a single incidence. It has been shown conclusively, however, that the primary palate (lip, anterior septum, and premaxilla) develops from the fourth to the seventh week of gestation and in a different manner from the secondary palate (hard and soft palate) which is formed from the seventh to the twelfth week. Therefore, it would appear appropriate to separate these two entities when recording their occurrence, as well as the combination of cleft lip and palate.

In order to obtain more meaningful data from a statistical standpoint, the total number of live births occurring in New York City have been examined for an 11-year period, 1952 through 1962 (Table 2). This was greatly facilitated through the assistance of the Department of Health, City of New York, which maintains a record of every malformation listed on live birth certificates in addition to the following information: weight, sex, parity, race, and certificate number.

The incidence of cleft lip, cleft lip and palate, and cleft palate is tabulated in Table 3. Cleft palate is more prevalent in females regardless of race. The overall incidence of cleft lip and cleft palate in whites compared to nonwhite is almost 2:1. Cleft lip occurred almost four times as frequently in the white male as in the pigmented male.

The incidence reported herein is lower than that found in most other studies. Contributing to this is the fact that the method used by the authors in the preparation of statistical data is imperfect. Ivy (*2*) found a 16% error in under-reporting when reviewing Pennsylvania's vital health statistics. In addition, an estimated 30% of all congenital malformations are not reported in birth records. This was shown to be true in New York City when a survey of all records was taken for 1958–1959. Only 70% of the total number of birth defects appeared on birth certificates while 8.7% and 22.7% were found on fetal death and infant death certificates, respectively. Table 4 illustrates the marked discrepancy be-

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TABLE 1. Incidence rates, 1864 to 1964.

Year	*Investigator*	*Total Births*	*Incidence*
1864	Frobelius, Russia	180,000	1:1,525
1929	Peron, France	100,889	1:942
1931	Gunther, Germany	102,834	1:1,000
1939	Fogh-Andersen, Denmark	128,306	1:665
1942	Grace, U.S.A.	202,501	1:800
1944	Mueller, U.S.A.	567,504	1:770
1949	Hixon, Canada	655,332	1:943
1950	Ivy, U.S.A.	583,690	1:762
1960	Rank and Thomas, Australia	96,510	1:600
1961	Sesgin and Stark, U.S.A.	27,087	1:1,289
1961	Gylling and Siovio, Finland	43,461	1:543
1964	Conway and Wagner, U.S.A.	1,823,244	1:1,260

TABLE 2. Total number of live births in New York City, 1952 to 1962, according to race and sex.

Groups	*Total Births*	*%*	*Male*	*Female*
White	1,478,315	81	761,667	716,648
Nonwhite	344,929	19	174,575	170,354
All groups	1,823,244	100	936,242	887,002

TABLE 3. Incidence of cleft lip and palate in New York City, 1952 to 1962, according to sex and cleft type.

Groups	*Cleft Lip and/or Palate*	*Cleft Lip*	*Cleft Lip and Palate*	*Cleft Palate*
White				
Male		1:2800	1:2600	1:4000
Female		1:5100	1:4100	1:3600
Average	1:1156	1:3600	1:3100	1:3760
Nonwhite				
Male		1:7600	1:5800	1:5000
Female		1:6000	1:7100	1:4250
Average	1:1960	1:6800	1:6400	1:4600
Total				
Average	1:1260	1:3950	1:3500	1:3900

tween the actual recording of some malformations on all records compared to those listed on birth certificates alone.

The ten most frequently occurring anomalies listed on birth certificates in New York City are reported in Table 5. It will be seen that

TABLE 4. Frequency of selected malformations obtained from all vital records and from birth records only. From the New York City Department of Health records, 1958–1959.

Anomaly	*All Records*	*Birth Records Only*
Hydrocephalus	310	116
Monstrosity	318	30
Digestive system	234	40
Circulatory system	598	88

TABLE 5. The ten most common anomalies recorded on birth certificates in New York City, 1952 to 1962.

Anomaly	*Male*	*Female*	*Total*
Club foot	1,873	1,520	3,393
Polydactylia	1,163	961	2,124
Cleft lip/palate	847	610	1,457
Hypospadias	1,154	7	1,161
Spinabifida-meningocoele	502	533	1,035
Hemangioma nevus	382	397	799
Umbilical hernia	233	456	689
Mongolism	267	349	616
Hydrocephalus	364	221	585
Anencephalus	207	267	474

cleft lip and/or palate rank third, following club foot and polydactylia. This is at variance with the findings reported by Sesgin and Stark (*4*) in a ten-year study of all viable newborn infants at St. Luke's Hospital, New York City, in which cleft lip and/or palate ranked ninth. They stated, however, that the latter was not a random population, since the ratio of white to colored births was approximately equal. That this will influence statistics has been succinctly demonstrated by several investigators (*1, 3*). In New York City, the percentage of nonwhite births has climbed steadily during the period of our survey. From a low of 15% in 1952 (24,000 of 164,000), it has increased to 24% in 1962 (39,000 of 165,000) for an overall average of 19% (Table 2). When the relative incidence of certain malformations is reviewed by race during a two-year period, it is readily apparent that the present trend of births will alter the list of the most frequent malformations in future studies (Table 6).

The total number of cases of cleft lip and/or palate is found in Table 7. Cleft lip and palate occurs with slightly greater frequency than either defect alone. Although quantitatively less, cleft lip and palate occur with far greater frequency in the premature or immature child (2500 gm or 5 lbs 8 oz) if the total number of births in each weight division is considered separately (Table 8). Whether the defect in the embryo prevents

TABLE 6. Incidence of selected malformations according to race in New York City, 1958–1959.

	All Deliveries	*White*	*Nonwhite*
Cleft lip and/or palate	264	231	33
Rates/1000	0.8	0.9	0.5
Polydactylia	404	154	250
Rates/1000	1.2	0.6	3.7
Club foot	621	553	68
Rates/1000	1.8	2.0	1.0
Umbilical hernia	112	44	68
Rates/1000	0.3	0.2	1.0

TABLE 7. Total number of newborns with cleft lip and cleft palate in New York City, 1952 to 1962.

	Male	*Female*	*Total*
Cleft lip	295	168	463
Cleft lip and palate	325	202	527
Cleft palate	227	240	467
	847	610	1,457

TABLE 8. Frequency of occurrence of premature births (less than 2500 gm or 5 lbs. 8 oz.) of newborns with clefts according to ethnic group in New York City, 1958–1959. Entries are rates per 1000.

Groups	*Birth Weight*	
	Less than 2500 gm	*Greater than 2500 gm*
White	2.2	0.8
Nonwhite	1.3	0.5
Puerto Rican	1.7	0.6
All groups	1.8	0.7

normal development or poor intrauterine conditions contribute to the development of these anomalies and cause insufficient weight gain remains a moot point. In this line it is interesting to note that mothers at both ends of the age spectrum gave birth to more children with these anomalies (Table 9). It is a well-known fact that increased prematurity occurs in offsprings of these same age groups.

Malformations most commonly associated with clefts are listed in Table 10. Of interest is the fact the extremity defects (club foot, polydac-

TABLE 9. Frequency of occurrence of live births with clefts according to age of mother and ethnic group in New York City, 1958–1959. Entries are rates per 1000.

Groups	*Age of mother*					
	younger than 20	*20–24*	*25–29*	*30–34*	*35–39*	*older than 40*
White	1.3	1.0	0.7	0.9	1.1	1.9
Nonwhite	0.8	0.5	0.6	0.4	1.2	1.2
Puerto Rican	0.9	0.7	0.7	0.7	1.2	1.3
All groups	1.0	0.8	0.7	0.8	1.0	1.4

TABLE 10. Frequency of occurrence of malformations most commonly associated with clefts in New York City, 1958–1959.

Club foot	41
Hydrocephalus	22
Polydactylia	19
Misc. hand lesions	18
Ear malformations	17
Hypospadias and genito-urinary	16
Mandibular deformities	13
Eye malformations	11
Syndactylia	10
Microcephalus	9
Multiple or misc.	80
Total	256

TABLE 11. Frequency of associated malformations according to cleft type in New York City, 1958–1959.

Cleft Type	*Total*	*Associated Malformations*	
		Number	*%*
Cleft lip	463	47	10
Cleft lip and palate	527	81	16
Cleft palate	467	128	27
Total	1,457	256	18

tylia, etc.) make up over one-third of the total. Two hundred fifty-six out of 1,457 cases of cleft lip and/or cleft palate had one or more associated malformations. A further analysis reveals that multiple anomalies are more often associated with cleft palate than the other two subdivisions

TABLE 12. Percentage of associated malformations in newborns with clefts according to cleft type, sex, and whether premature or full term (birthweight of 2500 gm) in New York City, 1958–1959.

Cleft Type	*% with Associated Malformations*					
	Male		*Female*		*Combined*	
	premature	*term*	*premature*	*term*	*premature*	*term*
Cleft lip	5	40	5	25	7	31
Cleft lip and palate	8	30	13	35	10	37
Cleft palate	28	60	15	44	21	50
Total					13	40

(Table 11). Remarkably, the male infant with cleft palate is severely afflicted with multiple anomalies, especially in association with prematurity (Table 12). In addition, the male is more severely affected in all three anomalies and the incidence of association of multiple malformation is increased two to eight times, regardless of sex in the premature infants. These observations lend credence to the contention that cleft lip and cleft palate represent two genetic variants.

Perhaps a reason for the lower incidences found in our study is due to the fact that this population sample is very heterogenous, compared to that of some earlier investigators. However imperfect this method, certain trends and clues as to some factors which contribute to the occurrence of cleft lip and/or palate have been set down.

Summary

A survey of cleft lip and cleft palate as reported on live birth certificates in New York City has been presented. Race, prematurity, age of mother, and sex of the offspring all showed variations in the overall incidence of cleft lip and palate. It would seem proper to subdivide cleft lip and palate in further investigative efforts into two groups: the defects of the primary palate (lip, septum, premaxilla) and those of the secondary palate (hard and soft palate).

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