CESAREAN CHILDBIRTH IN PUERTO RICO: A WORLD RECORD

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ABSTRACT. Fragmentary data have indicated that the incidence of cesarean deliveries increased considerably in Puerto Rico during the past decade. In the present study the authors aimed to ascertain a valid estimate of the incidence of cesarean childbirth for which purpose they used data from the birth certificates. They found that in spite of the fact that this source of information tends to undercount cesarean delivery, apparently Puerto Rico has the highest rate of the world. In 18.2% of all the live births certificates of 1980 a cesarean procedure was reported. In the United States the corresponding figure for the same year was 16.5%.

The incidence of cesarean childbirth was more frequent among urban and metropolitan residents as well as among mothers who utilized private medical facilities. The cesarean rate was also positively associated with the socio-economic status of the mother. The incidence of cesarean delivery increased with mother's age but declined as parity increased. U-shaped relationships were observed between the cesarean rate and such newborn characteristics as gestational age, weight, and body length. A direct association existed between the percentage of surgical delivery and the number of prenatal visits made by the mother. Similarly, the earlier the prenatal care began the higher the cearean rate. *(Key Words: Pregnancy complications, Maternal age, Rural/Urban status)*

In the past decade, cesarean delivery has become one of the most common surgical procedures (1). Originally considered a last resort in saving the life of a fetus, cesarean childbirth is now employed to deal with an increasing variety of conditions associated with pregnancy, labor, and delivery.

A recent report analyzing current trends in cesarean rates and their implications indicates that many countries have experienced a dramatic rise in the proportion of births by cesarean delivery. However, both the rate of increase and the resulting incidence show significant international differences. The incidence rates registered among the select group of countries studied ranged from 2.5% (Holland) to 13.9% (Canada) (1).

The United States has undergone the sharpest rise: the cesarean rate increased threefold in the course of a decade, reaching 16.5% in 1980 (2). This rising trend occurred in all of the nation's regions as well as among different types and sizes of hospitals. Because the increase was not limited to women with particular characteristics of age or race, no groups were identified as being particularly "at risk". Nevertheless, the marked rise in cesarean childbirth has triggered a growing debate concerning its causes and possible consequences.

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In Puerto Rico, the incidence of cesarean delivery has also been a matter of concern. In the last ten years, fragmentary data have indicated a high cesarean rate and a trend toward greater reliance on surgical delivery. A doctoral dissertation which analyzed the data from a sample of 19 private hospitals in 1971-72 found that 15 of these had rates of more than 10%, whereas 8 had rates which varied between 20 and 30% of all deliveries (3). Another study covering a sample of fourteen hospitals within the San Juan Metropolitan Area found that the average cesarean rate for this group rose from 23.5 to 32.5% betwen 1974 and 1977 (4).

Although these data described only small and possibly biased samples, they focused attention on an issue requiring further study. The present study therefore was directed to ascertain the incidence of cesarean childbirth in Puerto Rico and to identify those geographic, institutional, demographic, and medical factors that are related to this phenomenon.

METHODS

The statistics office of the Puerto Rico Department of Health does not code information on the type of delivery (vaginal, forceps, cesarean, etc.) from the birth certificates. The only information which is coded and included in the computer tape which is utilized by the Department of Health to prepare the births tabulations pertains to labor and delivery complications. Thus a listing of all those live births occurring in 1980 in which these complications were reported (more than 18,000 cases) was prepared and all these certificates were examined. This search yielded 13,229 birth certificates in which the performance of a cesarean procedure was clearly reported and an additional 54 cases in which, although no such information was given, other data on the certificate demonstrated that this surgical intervention had indeed been performed. A group of 148 doubtful cases was not included in the total of cesarean births. A total of 13,282 cesarean live births deliveries was thus identified for which all the data required for the design of the statistical tables were obtained.

Birth registration data are subject to reporting errors as all data obtained from informants (records, questionnaires, interviews, etc.). In Puerto Rico these errors are well within the tolerable limits in almost all the items contained in the birth certificate. Mother's place of residence has been argued to be one of the more affected as it is well known that some people living outside those municipalities which they believe have the better public hospital services will give as their place of residence the address of some relative living in the area in order to secure access to these services. This tendency, however, varies directly with the degree of specialization of the medical service being sought, and thus, prenatal care and delivery services which are regular services offered in public hospitals throughout the Island are probably among the less affected. In addition, this bias is obviously not present among the group of certificates pertaining to deliveries of the private hospitals of these municipalities. Thus, the cesarean rates by municipalities would be only seriously affected if among those non-resident women getting these services in such municipalities the proportion of cesarean deliiveries were unusually high. There is no reason to believe this is the case.

The most serious limitation of this study is probably, the omission in the birth certificate of the datum about the cesarean intervention. From the beginning we were well aware that under these circumstances we were underestimating cesarean childbirths in Puerto Rico.

RESULTS

Our data suggest that Puerto Rico is probably the country with the highest rate of cesarean deliveries in the world. In 1980, this proportion was estimated at 18.2% utilizing the birth certificate as a source of information. In the United States, which was thought to have the world's highest rate the proportion of cesarean deliveries was 16.5% for the same year (2).

Although Puerto Rico's small size and regionalized system of health care tend to facilitate and equalize access to service, certain health indicators vary by place of residence (e.g. general mortality, infant mortality). This is also the case with the incidence of cesarean childbirth. When cesarean rates were analyzed by place of residence of the mother we saw that higher rates generally occur among residents of the northeastern area of the Island, in the more densely populated, urbanized municipalities surrounding the capital, San Juan. Conversely, those municipalities whose residents exhibit low rates tend to cluster in the rural, mountainous interior of the Island (Figure 1).

When the data were aggregated by health region, marked disparities emerged. The Ponce region, in the south, has the lowest proportion (12%) whereas the Metropolitan region (including San Juan and adjacent municipalities) had the highest rate (25%), more than 37% higher than the mean of the Island as a whole.

Urban-rural residence is also associated with this type of delivery. The proportion of cesarean live births was 21% for urban mothers as compared with 15% for rural mothers (Table 1).

These residential differences prevail when the data are broken down by type of hospital. Although data from the United States indicate a "very weak" relationship between cesarean delivery rates and hospital ownership, (1) such is not the case in Puerto Rico, where the rate for private institutions (24.0%) is considerably higher than that for public hospitals (14.3%).

This difference is observed in each of the six health regions but is particularly pronounced in Bayamón and Mayaguez, where the likelihood of a cesarean delivery is more than twice as high in a private hospital than in a public one. Meanwhile, the San Juan region continued to have the leading position both in public and private hospitals whereas the Ponce region showed the lowest rates.

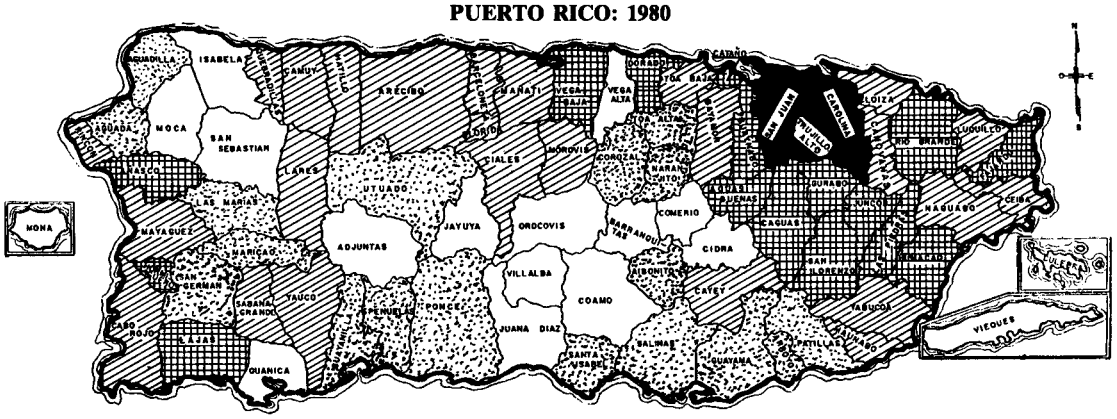
A negative relationship existed between the cesarean rate and parity. The highest figure was recorded among primiparae (22.2%) whose rate was two times higher than that observed among mothers with five or more live births (10.6%).

Socioeconomic status was positively correlated with the incidence of cesarean childbirth. Cesarean rates increased consistently with mother's schooling, reaching their peak among those with college education. In this group, one out of every four live births was delivered through this surgical procedure as compared with 13% among mothers who had completed less than 8 years of school (Table 2). A similar relationship is observed with respect to the occupation of the father. Wives of white-collar workers had the highest proportion of ce-

FIGURE 1

CESAREAN RATES (IN PERCENT) BY RESIDENCE OF THE MOTHER

PUERTO RICO: 1980



CESAREAN RATES (in percent)

□ <12 ▨ 12 - 15 ▨ 16 - 19

▩ 20 - 23 ■ 24+

Cesarean deliveries were found to be associated with several demographic and socioeconomic characteristics of the mother. With respect to age, the rate was lowest among teenagers but it increased as age increased. However, among the groups of mothers 25 years of age and over the differences were very small (Table 2).

TABLE 1

CESAREAN DELIVERIES AS A PERCENTAGE OF ALL LIVE BIRTHS BY RESIDENCE OF THE MOTHER AND TYPE OF INSTITUTION

PUERTO RICO: 1980

RESIDENCE OF MOTHER	PRIVATE HOSPITAL	PUBLIC HOSPITAL	ALL HOSPITALS
Health Region			
Arecibo	22.2	15.8	18.2
Bayamón	23.1	10.4	16.0
Caguas	26.0	14.3	18.8
Mayaguez	21.9	10.8	15.2
Ponce	17.6	9.2	12.2
San Juan (Metropolitan)	29.0	22.0	25.1
Zone			
Urban	25.4	17.0	21.4
Rural	21.3	12.4	14.9
Total	24.0	14.3	18.2

sarean deliveries (22%) whereas those whose husbands had an agricultural occupation showed the lowest rate (10%). At the same time, mothers in the labor force were more "at risk" than mothers out of the labor force with respect to cesarean delivery (Table 2).

TABLE 2

CESAREAN DELIVERIES AS A PERCENTAGE OF ALL LIVE BIRTHS BY SEVERAL DEMOGRAPHIC AND SOCIOECONOMIC VARIABLES

PUERTO RICO: 1980

VARIABLES	PER CENT OF CESAREANS	ALL LIVE BIRTHS
Age of mother		
Under 20	13.8	13,165
20-24	16.9	25,174
25-29	20.3	19,195
30-34	21.4	10,487
35 and over	21.6	4,982
Parity		
1	22.2	24,839
2	18.4	21,836
3	16.5	14,469
4	11.8	6,037
5 and over	10.6	5,879
Years of school completed by mother		
Less than 8	13.3	12,249
8-11	14.0	20,974
12	19.2	21,622
13 and over	24.6	18,215
Mother's labor force participation		
In the labor force	25.0	19,501
Not in the labor force	15.7	53,559
Father's occupation*		
White collar	22.1	20,132
Blue collar		45,559
Agricultural	10.4	4,616
Not reported	18.8	2,753

*White collar includes professional, technical and kindred workers managers and administrators, sales and clerical workers. Blue collar includes services and manual worker. Agricultural includes farmers, farm managers, and farm laborers and foremen.

Cesarean deliveries showed a U-shaped relationship with respect to length of gestation. The proportion of surgical deliveries was high at both extremes of the gestational scale, whereas the lowest rate was observed among full-term births (40 weeks gestation) (Table 3).

Surgical delivery was more frequent among newborns of both low and high birthweights. For live births of less than 2,000 g of weight the rate was 30%; this proportion declined as weight increased up to the group of 3,000-3,499 g. After this point the cesarean rate increased as weight increased. As expected, a similar relationship was observed with respect to body length (Table 3).

As a corollary of these relationships cesarean live births had lower Apgar scores than vaginal live births. Although 10% of the cesarean newborns were considered depressed at the first minute of life (Apgar Score between "0" and "6") the proportion among vaginal live births was 6%. A similar relationship prevailed for the 5-minute observation.

TABLE 3

CESAREAN DELIVERIES AS A PERCENTAE OF ALL LIVE BIRTHS BY WEEKS OF GESTATION WEIGHT, BODY LENGTH AND PRENATAL CARE

PUERTO RICO: 1980

VARIABLES	PER CENT OF CESAREANS	ALL LIVE BIRTHS
Weeks of Gestation		
Less than 36	29.2	2,569
36	24.3	1,766
37-39	22.6	17,654
40	15.4	43,057
41 or more	18.6	8,014
Weigth in Grams		
Less than 2000	29.8	1,873
2000-2499	22.1	4,736
2500-2999	17.7	17,269
3000-3499	16.3	29,920
4000-4499	22.9	3,066
4500 or more	28.7	429
Not reported	19.6	240
Body Length in Inches		
Less than 19	25.4	5,610
19	20.9	13,061
20	18.1	21,115
21	16.5	19,723
22	14.8	9,862
23	13.3	2,674
24 or more	24.9	1,015
Trimester Prenatal Care Began		
1	20.3	44,825
2	14.6	22,674
3	12.9	3,365
Number of Prenatal Visits		
0	9.5	665
1-3	13.1	4,639
4-6	14.0	17,831
7-9	17.0	21,407
10-12	24.1	8,537
13 or more	24.3	8,537

The intensity and promptness of prenatal care showed a positive relationship with surgical delivery. The lowest cesarean rates were reported among mothers who did not receive prenatal care (9.5%) and increa-

sed as the number of prenatal visits increased. Among mothers who made 10 or more visits, the incidence of cesarean births was 24%, a percentage 2.5 times greater than the figure for mothers who did not receive prenatal services. Similarly, the earlier the prenatal care began, the higher the rate of surgical delivery (Table 3).

The birth certificate does not provide a complete pattern of the complications of pregnancy, labor, and delivery which were the causes of the surgical intervention. In 29% of the cases the cause of the cesarean was not reported. Of the 9,392 cases in which a cause was given, repeated cesarean was reported as the cause in 27%, dystocia was in second place (25%), abnormal presentation was third (14%), and premature or prolonged rupture of the membranes occupied the fourth position (13%). Two other important causes were maternal medical complications (6%) and fetal distress (5%).

Discussion

The utilization of the birth certificate as source of information is likely to undercount the incidence of cesarean deliveries, as has been the case in the United States (5). In a recent publication the Department of Health of Puerto Rico reported a cesarean rate of 25% for fiscal year 1982 (6). These data were obtained from all public and private hospitals having obstetric beds. Although this information was not obtained for previous years the data for public hospitals are available since 1980. Thus, if the data for public hospitals are utilized to establish the general trend of cesarean childbirth in Puerto Rico, a reasonable islandwide estimate for 1980 would be 20% as compared with a rate of 18% obtained from the birth certificates.

In spite of its limitations, the information on the birth certificate enabled the authors to uncover numerous geographic, institutional, demographic, socioeconomic and health factors related to cesarean delivery in Puerto Rico. The results of this study indicate that age and parity are important maternal factors which are associated with cesarean delivery in Puerto Rico. Gestational age, birthweight, and body length are newborn characteristics closely associated with cesarean childbirth. Similar relationships have also been observed in the United States (1, 5).

The differences in the incidence of surgical deliveries by mother's place of residence and socioeconomic status are noteworthy. The fact that cesarean deliveries are more frequent among urban and metropolitan residents as well as among mothers of high socioeconomic status deserves special consideration. Obviously, these differences can not be attributed to differences in health risks since the groups with the higher incidence of cesareans are on the average, the more affluent and those who have better access to medical care. Thus, among them the complications of pregnancy, labor and delivery should be less frequent than among mothers of low socioeconomic status.

The explanatory variable in this contradictory relationship seems to be access to medical care. The better the access to health services and the greater the utilization of private medical facilities, the higher the rate of cesareans (Table 1 and Table 3). In fact, one of the best predictors of the rate of cesareans in this study was the type of medical facility utilized in the delivery (private vs. public) even when other important risk factors such as mother's age and parity were controlled. This explanation has important implications. If the surgical deliveries performed among mothers of high socioeconomic status in private hospitals reflect they are truly necessary and the frequency observed among other groups of mothers is limited by the poorer access to medical care, then the overall expected rate for Puerto Rico under equalized access to health services would be tremendous, indeed.

Another puzzling result of this study is the positive association between prenatal care and the cesarean rate. Although this relationship has also been observed in New York City (1), we have no satisfactory explanation for it. One might claim that the frequency of prenatal care is to a great extent a function of pregnancy complications, and that this accounts for the direct relation between services and cesarean delivery. Yet the number of prenatal visits is positively correlated with the socioeconomic status of the mother (7) and pregnancy complications generally decline as the socioeconomic level increases. Again, it seems, that access to medical services is the clue in this relationship.

The high level of cesarean childbirth in Puerto Rico should be a matter of serious concern for all the health professions. The fact that approximately one out of every five live births was delivered through this surgical procedure in 1980, increasing to one out of every four by 1982, is obviously disturbing. Much research is needed to determine the real causes of this so frequent deviation from human natural delivery. The research problem to be addressed is not one for considering the merits and aims of this surgical procedure; this is out of the question. It is neither a matter for determining the cost-benefit relationship of this intervention. This can be an important secondary problem. The main research issue in light of these astonishing figures is whether there is something wrong with Puerto Rican mothers which make them dependable to such a large extent on this surgical procedure or whether a great proportion of these deliveries are unnecessary and avoidable. This is the core question.

Resumen

Datos fragmentarios indican que los partos por cesárea aumentaron notablemente en Puerto Rico durante la última década. Este estudio tiene como obje-

tivo el determinar la tasa de incidencia de cesáreas en la Isla y el examinar algunos de los factores provenientes del certificado de nacimiento.

A pesar de que esta fuente de información tiende a subestimar los partos por cesárea, todo parece indicar que Puerto Rico tiene la tasa más alta del mundo. En 1980, este procedimiento fue anotado en el 18.2 por ciento de los certificados de nacimientos vivos. Ese año, la tasa para los Estados Unidos fue de 16.5 por ciento.

Los nacimientos por cesárea fueron más frecuentes entre madres residentes de las zonas urbanas y metropolitanas así como entre aquellas que utilizaron hospitales privados para dar a luz. La tasa de cesáreas está también asociada de forma positiva con el status socioeconómico de la madre. La incidencia de partos por cesárea aumentaba al aumentar la edad de la madre, pero disminuía al aumentar la paridad. Se observaron relaciones de tipo U entre el por ciento de nacimientos por cesárea y ciertas características del recién nacido tales como edad de gestación, peso y tamaño. En este estudio se encontró una relación directa entre la frecuencia de cesáreas y el número de visitas prenatales realizadas por la madre. Además, la tasa variaba inversamente con el trimestre en que comenzó el cuidado prenatal.

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