THE PUZZLE OF CESAREAN CHILDBIRTH IN PUERTO RICO

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During the last decades cesarean deliveries have become one of the most common surgical interventions around the World (1). Originally conceived as an emergency action to save the life of a fetus, is at present employed to cope with an increasing series of problems related with pregnancy, labor and delivery. As a result, many countries have experienced an enormous increase in the proportion of surgical deliveries (2 - 7). One of the countries showing one of the highest levels and rates of increase is the United States of America although it seems that its rate has steadied during the last years (4).

In Puerto Rico, studies undertaken during the 1970's indicated a high incidence and an increasing trend in cesarean childbirth (8,9). However, these studies were not intended to produce Island-wide estimates for they were based on fragmentary data. A study in which all the 1980 live birth certificates were examined, demonstrated that Puerto Rico was probably the country with the highest rate of surgical deliveries of the World (10). Data obtained by the Department of Health of Puerto Rico from public and private hospitals (11) and the results of a survey carried out in 1982 (12) indicated that this surgical procedure had increased dramatically during the last decades and that undoubtedly Puerto Rico had the highest incidence in the World. Data from the 1982 survey, for example, showed that the proportion of cesarean childbirths had increased continously from 5.4 percent for the period of 1960-64 to 27.4 percent for the trienium of 1980-82 (12).

The fact that Brazil has a higher "in hospital" cesarean rate than Puerto Rico could be misleading (7). It must be reminded that in Brazil an unknown but sizable proportion of all live births are "at home" deliveries whereas in Puerto Rico more than 99 percent of all live births are hospital deliveries. Thus, if in Puerto Rico the proportion of at home deliveries were similar to that of Brazil, the "in hospital" rate of Puerto Rico would be much higher than that of Brazil. A good example is the case of Netherlands where almost 40 percent of all deliveries occurred at home. In this country the overall cesarean rate in 1985 was 6.6 percent as compared with an "in hospital" cesarean rate of 10.4 (13).

In 1989, a new item about the type of delivery was introduced into the Puerto Rican live birth certificate. The data obtained from this question indicates that cesareans have continued to increase. On the other hand, the results of the studies undertaken in 1980 and 1982 indicates that there were marked geographical differences in the incidence of cesarean deliveries throughout the Island and that some groups of the population were markedly more "at risk" than their counterparts (10,12). The fact that mothers of the highest socioeconomic strata as well as those who had received the best prenatal care were those who had the highest incidence of surgical deliveries were among the puzzling results of these studies (10,12).

Motivated by these unexpected findings, this study aims to try to disentangle the great puzzle constituted by cesarean childbirth in Puerto Rico. Thus, the main objectives of this research are:

1. to identify such subgroups of the population which are more "at risk".
2. to examine the relationship between adequacy of prenatal care and cesarean childbirth.
3. to determine which pregnancy medical risks and delivery complications are the best predictors of cesarean deliveries.
4. to examine the association between cesarean childbirth and the outcome of pregnancy.

METHODS

The data to be utilized was derived from a computer tape file of the 1991 live births obtained from the Office of Health Statistics of the Department of Health of Puerto Rico. These data should be considered preliminary until the official Annual Vital Statistics Report for 1991 be published by this agency.

In addition to the new item about the type of delivery introduced into the live birth certificate since 1989, other questions were reformulated to obtain more accurate information. The items about mother's pregnancy medical risks and delivery complications, for example, were changed from "open ended" to "precoded" questions to standardize the response.

This study is a descriptive one in which the proportion of cesarean childbirths will be utilized for between groups comparisons. Regression analysis will be utilized also.

RESULTS

According to the 1991 data, 31.6 percent of all deliveries were cesareans. Although this represents a relatively small increase over the 1989 and 1990 figures (30.1 and 31.0 respectively) it indicates that this surgical procedure has continued increasing. Of the 19,388 cesarean deliveries registered in 1991 over 41 percent were repeated cesareans a figure almost identical to those reported for the two previous years. This proportion of repeated cesareans is much higher than in the United States and probably one of the factors contributing to the high overall rate of surgical deliveries in the Island. In the United States the proportion of repeated cesareans was in 1989 of 28 percent (4) as compared with the figure of 42 percent in Puerto Rico.

The proportion of cesarean childbirths varied considerably throughout the Island. The highest figures was recorded among mothers residing in the "municipio" of Las Piedras (42 percent) followed by those of the "municipios" of Toa Baja and Bayamon with 41 percent. On the other hand, the lowest figures corresponded to mothers of the "municipios" of Jayuya (14 percent), Loiza (17 percent) and Santa Isabel (18 percent).

Correlates of Cesarean Childbirth

According to the 1991 data the rate of cesarean deliveries increased as mother's age increased (Table 1). As expected, the highest proportion of primary cesareans was recorded among primiparae dropping sharply among mothers of second parity and stabilizing after that. In the case of repeated cesareans, its

incidence declined continously as parity increased. On the other hand, legally married mothers were more "at risk" than consensually married and unwed mothers.

(Table 1)

Mother's schooling and father's occupation, two of the most commonly used socioeconomic indicators of the couple, showed a direct association with the incidence of surgical deliveries. In the case of mother's schooling no important differences were observed among the groups who had not completed the high school level but among those who at least had completed 12 years of school the rate increased considerably as schooling increased (Table 2). Almost half of mothers with 16 years of school completed or more delivered through a surgical intervention as compared with 19 percent for those with less than 12 years of schooling.

A notable difference in the incidence of surgical deliveries was found between mothers not in the labor force and working mothers; the last group having the highest risks.

On the other hand, a strong association was found with respect to husband (or father of child, in the case of unwed mothers) occupation. Mothers whose children had fathers with "white collar" occupations had the highest incidence of surgical deliveries whereas those whose children had fathers with agricultural jobs had the lowest proportions (Table 2).

Another striking finding in this study was the extraordinary high rate of cesareans deliveries occurring in private hospitals as compared with public institutions (Table 2). The proportion of this

type of delivery in private hospitals was more than twice that of public ones, both for primary as well as for repeated cesareans. And more important, while the incidence of cesareans in public institutions seems to have steadied (21.1 percent in 1990 and 20.8 in 1991), in private hospitals continues to increase (47.1 percent in 1990 and 49.0 in 1991).

(Table 2)

One is really overwhelmed by the enormous variability between private hospitals. Among the group of private hospitals reporting the occurrence of 50 or more live births, the cesarean rates varied from a low of 27 percent in a hospital delivering 947 newborns to a high of 73 percent in one with 293 live births. In 13 of the total of 34 private hospitals included in Table 3 more than 50 percent of the infants were surgically delivered and in six this proportion surpassed 60 percent.

(Table 3)

This degree of variability is not observed among public hospitals (Table 4). The lowest cesarean rates were recorded among municipal hospitals in which that of San Juan showed the smallest figure (16 percent). It should be remarked that in the supra-tertiary University District Hospital located at San Juan and to which the most Island-wide complicated cases are referred, the incidence of cesarean deliveries was only 27 percent.

(Table 4)

A logistic regression analysis (14) showed that the type of hospital was the most important predictor of cesarean childbirth

among all the variables considered in the previous sections. In other words, it seems that to deliver in a private hospital is the most important determinant of a surgical intervention. According to this analysis, all other demographic and socioeconomic variables as well as those related to prenatal care were of much less importance.

In trying to look at explanations for the so high level of cesareans in private hospitals as compared with public ones a regression analysis was undertaken by separate for these two types of institutions. In the case of public hospitals a close association was found between surgical deliveries, on the one hand, and mother's age and parity on the other. Among private hospitals, however, these relationships were extremely weak. It seems that the high level of cesarean childbirths in private hospitals as well as its high variability are due to something inherent to them and probably to the obstetricians working there.

Prenatal Care, Newborn Physical Condition and Cesarean Deliveries

If prenatal care were, as it was conceived, a valuable preventive health practice and if cesarean childbirth were a function of the health condition of the mother at delivery, one should expect that the better the prenatal care received by the mother the lower the incidence of surgical deliveries. The data gathered since 1989 demonstrated that this is not the case in Puerto Rico. As shown in Table 5, the percentage of cesarean childbirths increased as the number of prenatal visits increased and the earlier the care the higher its incidence. Kessner index (15) which seems

to be the best indicator of adequacy of prenatal care that can be obtained from the birth certificate, corroborates that adequate prenatal care is, surprisingly, inversely associated with surgical delivery.

(Table 5)

It seems that cesarean childbirth has little to do with the newborn physical condition at birth as determined by his weight, gestational age and Apgar Score. Table 6 demonstrated that the percentages of low birthweight and heavy weights were slightly higher for infants born through a surgical procedure than for those vaginally delivered. Less important differences were found with respect to gestational age and the five-minutes Apgar score.

(Table 6)

Pregnancy Medical Risks and Delivery Complications

According to the 1991 data, the proportion of cesarean childbirth increased with the number of pregnancy risks as well as with the number of delivery complications (Table 7). It is noteworthy that almost 20 percent of those mothers for whom neither medical pregnancy risks nor delivery complications were reported had their newborns through a surgical intervention. Of this group, 68 percent were repeated cesareans, a fact that tends to indicate that the discredited idea that "once cesarean, always cesarean" still prevails among a substantial group of physicians in Puerto Rico. The 1991 data also demonstrated that delivery complications seems to be more important determinants of cesarean deliveries than pregnancy medical risks.

(Table 7)

The most frequent pregnancy medical risks reported since 1989 were, in order of importance: pregnancy related hypertension, anemia, diabetes, chronic hypertension and uterine bleeding. On the other hand, the most common delivery complication were: cephalopelvic disproportion, meconium (moderate to heavy), premature rupture of membranes, breech presentation and fetal distress.

Cesarean childbirth rates are presented on Table 8 according the occurrence of each of the above ten risks. These data demonstrated that cephalopelvic disproportion and breech presentation were strongly associated with surgical deliveries and when accompanied by other complications the proportions increased even more. On the other hand, when moderate to heavy meconium was the unique complication present during the delivery the cesarean rate reached its lowest value.

Pregnancy medical risks were also associated as expected, with the incidence of cesarean deliveries but their associations were weaker. In addition, there were no important differences in the predictive power between the leading pregnancy risks.

(Table 8)

CONCLUSIONS

Cesarean childbirth continued to increase in Puerto Rico. By 1991, almost one third of all deliveries were of this type and thus, the Island continues to be the leading country in the World.

As in previous studies, cesarean childbirth rates varied considerably throughout the Island. On the other hand, its

incidence increased with mother's age, decreased as parity increased and was clearly associated with mother's marital arrangement; legally married being more "at risk" than consensually married and unwed mothers.

An unexpected result of this and previous studies was the direct relationship between mother's socioeconomic status and cesarean deliveries; mothers of the highest socioeconomic strata having the highest rates.

Another puzzling finding was the inverse relationship between adequacy of prenatal care and surgical deliveries. Mothers who began their care in the first trimester of pregnancy, those who made the prescribed number of prenatal visits as well as those who had an adequate care as assessed by Kessner Index had the highest incidence of cesareans.

The enormous cesarean rates among private hospitals as well as the extraordinary variablity betweem them, was another striking outcome of this research. In fact, a logistic regression analysis demonstrate that to deliver in a private hospital seems to be the most important determinant of cesarean childbirth. This relationship which has been observed year after year since 1980, should be a matter of serious public health concern.

One of the few expected results emerging from this study was the strong direct association between delivery complications and cesarean childbirth. A similar but weaker relationship was also found with respect to pregnancy medical risks. However, it is a real enigma why it is that mothers of the highest socioeconomic

strata, those who had received the best prenatal care and those delivering in a private hospital were in fact the most exposed to pregnancy and delivery problems. There is an urgent need for a study in which the cephalopelvic disproportion diagnosis appearing in the birth certificates and which leads to a cesarean in almost all the cases be scientifically assessed.

All these puzzling facts seem to demonstrate that the enormous and increasing rate of cesareans in Puerto Rico has little to do with health problems and that in a great proportion of the cases non-medical factors are involved. It has been admitted that fears to suits against medical malpractice is an important factor contributing the high incidence of surgical deliveries for there are no legal problems with practicing unnecessary cesareans.

The discredited idea that "once cesarean, always cesarean" which is also a mayor contributor to the high rate of surgical deliveries, must be abandoned. In 1991, only seven percent of those mothers which had a previous cesarean delivered vaginally in Puerto Rico. In the United States the corresponding figure was of almost 20 percent in 1989 (4) and nearly 50 percent in Norway (13). Such non-medical factors, as fear for suits against malpractice, face the medical profession with serious ethical problems. Those physicians acting primarily upon such real or imaginary legal pressures or other non-medical motives are consciously practicing medical malpractice. This is hidden malpractice.

ABSTRACT

Cesarean childbirth has increased considerably in Puerto Rico during the last three decades. By the beginnings of 1960 decade only five percent of all live births were surgicaly delivered. This rate increased consistently with time reaching 32 percent in 1991. Thus, Puerto Rico is at present the leading country in this aspect.

Utilizing the 1991 live birth certificate data the author found that the cesarean rate varied considerably throughout the Island, was directly associated with mother's age, declined as parity increased and was higher among legally married mothers as compared with consensually married and unwed mothers. On the other hand, surgical deliveries were directly associated with mother's socioeconomic status and with the degree of adequacy of the prenatal care received.

The incidence of cesareans in private hospitals was more than twice that of public institutions and continued increasing whereas the rate in public hospitals seemed to have leveled off. In addition, the variability among private hospitals was really astonishing.

Pregnancy medical risk factors and delivery complications were found to be closely associated with cesarean childbirth. Among them, cephalopelvic disproportion was the most common delivery complication leading to a cesarean delivery. Breech presentation was second in importance.

KEY WORDS : Cesarean section trends, Cesarean childbirth, Cesarean section correlates, Pregnancy medical

risks, Labor and delivery complications, Prenatal care, Puerto Rico.

RESUMEN

Los partos por cesárea han aumentado de forma notable en Puerto Rico durante las últimas tres décadas. Para los comienzos del sesenta sólo el cinco por ciento de todos los nacidos vivos vinieron al mundo a través de este medio quirúrgico. A partir de esos años, el incremento ha sido contínuo y sostenido, y en 1991 la tasa alcanzó la cifra de 32 por ciento.

Basado en los datos obtenidos de los certificados de nacimiento de 1991, el autor encontró que la incidencia de partos por cesárea estaba directamente asociada con la edad de la madre, que disminuía a medida que aumentaba su paridad y que era más elevada entre madres casadas legalmente que entre las que convivían consensualmente o eran madres solteras. Por otro lado, la tasa de partos quirúrgicos aumentaba con el nivel socioeconómico así como con el nivel de adecuacidad del cuidado prenatal recibido.

La frecuencia de partos por cesarea fue más del doble en los hospitales privados que en los públicos. Además, la variabilidad entre los hospitales privados fue realmente asombrosa.

Los riesgos médicos detectados durante el embarazo así como las complicaciones asociadas con el parto, aparentemente fueron factores de gran importancia en la opción por un parto por cesarea. Entre estos, los más importantes fueron la desproporción cefalopélvica y la "presentación de nalgas".

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TABLE 1

PERCENT OF CESAREAN CHILDBIRTHS BY MOTHER'S AGE, PARITY AND TYPE OF MARITAL ARRANGEMENT; PUERTO RICO, 1991

CHARACTERISTICS OF THE MOTHER	PERCENT CESAREANS			NUMBER OF LIVE BIRTH*
	TOTAL	PRIMARY	REPEATED	
Age in Years				
17 or less	16.4	14.6	1.8	5,417
18 - 19	20.2	15.9	4.3	6,995
20 - 24	27.7	18.1	9.6	20,664
25 - 29	36.3	19.8	16.5	17,938
30 - 34	42.4	19.1	23.3	9,381
35 and over	44.2	23.2	21.0	4,281
Parity				
1	34.5	34.5	---	25,294
2	34.3	8.2	26.1	19,755
3	30.7	8.1	22.6	11,470
4	20.2	8.6	11.6	4,458
5 an over	13.3	8.6	4.7	3,537
Marital Arrangement				
Legally married	37.3	21.5	15.8	39,821
In consensual unions	22.2	12.9	9.3	18,660
Unwed mothers	23.4	16.6	6.8	6,002
Total	31.6	18.5	13.1	64,516

*Excluded "not reported" in each variable.

TABLE 2

PERCENT OF CESAREAN CHILDBIRTHS BY MOTHER'S SCHOOLING LABOR FORCE PARTICIPATION AND BY OCCUPATION OF CHILD'S FATHER, PUERTO RICO, 1991

MOTHER'S CHARACTERISTIC	PERCENT CESAREANS			NUMBER OF LIVE BIRTHS*
	TOTAL	PRIMARY	REPEATED	
Years of School Completed				
0 - 6	20.8	11.4	9.4	3,076
7 - 11	18.8	11.2	7.6	18,434
12	30.0	17.4	12.6	18,184
13 - 15	40.2	23.8	16.4	14,268
16 and over	48.5	28.3	20.2	10,422
Husband's Occupation				
White Collar	40.9	23.6	17.3	17,682
Services	31.5	18.2	13.3	9,024
Manual Workers	28.6	16.7	11.9	31,300
Agricultural	18.7	9.5	9.2	2,674
Not Reported	22.5	16.9	5.6	3,836
Labor Force Participation				
In Labor Force	48.2	28.9	19.3	17,297
Out of Labor Force	25.6	14.8	10.8	47,219
Hospital in Which Delivery Took Place				
Private	49.0	28.7	20.3	24,676
Public	20.8	12.2	8.6	39,809

*Excluded "not reported" in each variable.

TABLE 3

PRIVATE HOSPITALS DISTRIBUTED ACCORDING TO THEIR CESAREAN CHILDBIRTH RATE; PUERTO RICO, 1991

CESAREAN RATE IN PERCENT	NUMBER OF HOSPITALS	MEAN CESAREAN RATE	NUMBER OF LIVE BIRTHS
Less than 30	2	27.7	1,009
30 - 39	5	37.3	2,544
40 - 49	14	45.3	11,235
50 - 59	7	55.4	6,042
60 or more	6	63.2	3,840
Total	34	49.0	24,670

TABLE 4

PUBLIC INSTITUTIONS REPORTING LIVE BIRTH DELIVERIES BY LEVEL AND PERCENT OF CESAREAN CHILDBIRTHS PUERTO RICO, 1991

INSTITUTIONAL LEVEL*	PERCENT CESAREAN LIVE BIRTHS	NUMBER OF LIVE BIRTHS
University District Hospital	26.6	2,454
Regional hospitals	19.6	19,076
Sub-regional hospitals	26.9	3,545
Area hospitals	22.6	9,181
Municipal hospitals	17.5	4,708
U.S. Government hospital	19.2	255
Total	21.1	39,219

*Exclude all Health Centers, Centers for Diagnostic and Treatment, Public Health Units and other public institutions in which, only 398 live births were delived. In these places cesareans are only perfomed under extremely critical situations (only one case in 1991).

TABLE 5

PERCENT OF CESAREAN CHILDBIRTHS BY INDICATORS OF PRENATAL CARE, PUERTO RICO, 1991

INDICATORS OF PRENATAL CARE	PERCENT CESAREAN			NUMBER OF LIVE BIRTHS*
	TOTAL	PRIMARY	REPEATED	
Number of Visits				
0 - 3	14.5	8.3	6.2	1,853
4 - 6	20.1	10.5	9.6	8,736
7 - 9	25.3	13.3	12.0	15,857
10 - 12	34.1	19.5	14.6	24,972
13 or more	47.2	31.7	15.5	12,054
Trimester of Pregnancy Care Began				
First	33.8	20.0	13.8	47,120
Second	26.7	15.2	11.5	14,578
Third and no care	18.7	10.6	8.1	2,636
Adequacy of Care (Kessner Index)+				
Inadequate	17.3	9.3	8.0	5,231
Intermediate	25.1	13.8	11.3	22,596
Adequate	37.7	22.8	14.9	36,499

*Excluding "not reported" in each variable.

+The Kessner Index combines the trimester in which the care began, the number of prenatal visits and the duration of pregnancy to produce the above three levels of adequacy of prenatal care (14).

TABLE 6

PERCENT DISTRIBUTIONS OF NEWBORNS ACCORDING TO THE TYPE OF DELIVERY AND SOME INDICATORS OF THEIR PHYSICAL CONDITION AT BIRTH, PUERTO RICO, 1991

INDICATORS	VAGINAL	CESAREAN
Birthweight, in grams	100.0	100.0
2500 or less	9.0	9.8
2501 - 4000	87.3	83.7
4001 and over	3.7	6.5
Mean	3,153 grams	3,202 grams
Number of cases*	44,109	20,383
Weeks of gestation	100.0	100.0
36 or less	12.0	12.3
37 - 41	82.0	82.4
42 and over	6.0	5.3
Mean	38.7 weeks	38.5 weeks
Number of cases*	44,128	20,388
Five minutes Apgar	100.0	100.0
0 - 6	1.3	1.6
7 - 8	7.2	8.0
9 - 10	91.4	90.5
Mean+	8.91	8.93
Number of cases*	43,941	20,342

*Excluding "not reported" for each indicator (24 for birthweight, 48 for gestational age and 233 for Apgar Score).

+Assuming Apgar Score is a quantitative variable.

TABLE 7

PERCENT OF CESAREAN CHILDBIRTHS BY NUMBER OF PREGNANCY MEDICAL RISKS AND NUMBER OF DELIVERY COMPLICATIONS PUERTO RICO, 1991

NUMBER OF DELIVERY COMPLICATIONS	NUMBER OF PREGNANCY MEDICAL RISKS			
	NONE	ONE	TWO OR MORE	TOTAL
None	19.9	28.8	40.5	21.2
One	61.0	62.9	78.0	62.0
Two or more	76.0	80.6	87.5*	78.2
Total	28.9	43.5	61.6	31.6

*The cell with the smallest number of live births (160 cases).

TABLE 8

PERCENT OF CESAREAN CHILDBIRTH BY THE OCCURENCE OF THE FIVE LEADING PREGNANCY MEDICAL RISKS AND THE FIVE LEADING DELIVERY COMPLICATIONS, PUERTO RICO, 1991

RISKS	PERCENT CESAREANS	
PREGNANCY MEDICAL RISKS	**WITH ONLY THIS RISK**	**WITH ADDITIONAL RISKS**
Pregnancy related hypertension	58.9	79.5
Anemia	47.5	82.1
Diabetes	55.0	72.9
Chronic hipertension	55.3	76.3
Uterine bleeding	40.4	73.7
DELIVERY COMPLICATIONS	**WITH ONLY THIS COMPLICATION**	**WITH ADDITIONAL COMPLICATIONS**
Cephalopelvic disproportion	97.8	99.1
Meconium	16.2	87.5
Premature rupture of membranes	33.5	88.8
Breech presentation	87.6	94.3
Fetal distress	40.4	73.7