

# Caesarean section in the Islamic Republic of Iran: prevalence and some sociodemographic correlates

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العملية القيصرية في جمهورية إيران الإسلامية، معدل الانتشار وبعض الارتباطات الاجتماعية والديموغرافية

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الخلاصة: هدفت الدراسة إلى استقصاء معدل انتشار العملية القيصرية في جمهورية إيران الإسلامية في مختلف الولايات، وإلى مقارنة الخصائص الاجتماعية والديموغرافية للمتزوجات، ممن أجري لهن عملية قيصرية، وممن لم يجرن العملية القيصرية. وقد حلل الباحثون المعطيات التي استمدوها من المسح الصحي والديموغرافي الإيراني لعينة ممثلة من الإيرانيات المتزوجات (بلغ عددهن 17 991) ممن ولدن أطفالهن بين أيلول/سبتمبر 1998 وتشرين الأول/أكتوبر 2000. ومن بين مجمل الولادات كان 35.0٪ منها بعملية قيصرية. وقد كان النسوة اللاتي أجري لهن العملية القيصرية أكثر تقدماً بالعم، وأكثر تعليماً، وتزوجن في سن أكثر تأخراً، ولديهن عدد أقل من الولادات بالمقارنة باللواتي ولدن ولادة طبيعية. أما التفاوتات بين ولاية وأخرى في المعدلات فقد كانت مرتبطة ارتباطاً معتد به إحصائياً بمؤشرات التنمية الاقتصادية والاجتماعية.

**ABSTRACT** The aim of this study was to investigate the prevalence of caesarean section in the Islamic Republic of Iran in different provinces and to compare the sociodemographic characteristics of married women with and without caesarean section. Data were analysed from the Iranian Demographic and Health Survey of a representative sample of married women ( $n = 17\ 991$ ) who delivered a baby between September 1998 and October 2000. Overall, 35.0% of deliveries were by caesarean section. Women having a caesarean section were older, better educated, married at a later age and with lower parity than those who delivered normally. Provincial variations in rates were significantly correlated with indices of socioeconomic development.

## Césarienne en République islamique d'Iran : prévalence et corrélats sociodémographiques

**RÉSUMÉ** Le but de cette étude était d'examiner la prévalence de la césarienne dans différentes provinces de la République islamique d'Iran et de comparer les caractéristiques sociodémographiques des femmes mariées ayant subi et n'ayant pas subi de césarienne. Les données analysées provenaient de l'enquête démographique et sanitaire réalisée en Iran sur un échantillon représentatif de femmes mariées ( $n = 17\ 991$ ) qui avaient accouché entre septembre 1998 et octobre 2000. Globalement, 35,0 % des accouchements avaient été réalisés par césarienne. Les femmes ayant subi une césarienne étaient plus âgées, plus instruites, s'étaient mariées plus tard et avaient une parité moins élevée que celles qui avaient accouché normalement. Il existait une corrélation significative entre les variations provinciales des taux et les indices de développement socioéconomique.

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## Introduction

Caesarean section (CS) is an important lifesaving operation under circumstances when vaginal delivery might pose a risk to the mother or baby [1]. The World Health Organization (WHO) puts the acceptable rate of CS at between 10% and 15% of all births in developed countries [2]. Some authors have suggested an even lower figures of 6%–8% [3].

There are, however, indications of a rise in the use of CS in circumstances when it is not medically recommended. Such inappropriate use is not only costly in terms of health resources but may also endanger women's lives. Concerns have been raised by the wide national and regional variations in CS rates, along with evidence of a rise in the proportion of babies delivered by CS in most developed and some developing countries [4–10]. It is feared that the procedure is frequently performed for reasons other than medical necessity. A number of national and international organizations have been established to raise public awareness of the dramatically increased incidence of CS operations and their potential cost, such as the International Caesarean Awareness Network [11].

In the Islamic Republic of Iran, the past 2 decades have witnessed a sharp increase in the number of CS operations. Despite frequent expressions of concern by the national media and health authorities, little systematic effort has been made to ascertain the extent of the problem and to identify its possible causes. The aim of this study was to investigate the prevalence of CS in the Islamic Republic of Iran, to document its regional variations and to identify the sociodemographic characteristics of women who underwent CS by comparing them with women who had a normal delivery.

## Methods

The data used in this national study were taken from the Iranian Demographic and Health Survey (DHS), which was conducted by the Statistical Centre of Iran (SCI) and the Ministry of Health and Medical Education (MOHME) in October 2000 [12,13]. At the time of the study the Islamic Republic of Iran was divided into 28 provinces, which varied enormously in terms of population size, ethnic composition and level of development [14]. Using a detailed questionnaire adapted from the standard instruments used in other DHS studies, the survey covered a sample of 114 000 households taken from urban and rural areas of all 28 provinces of the country. Using maps and sampling plans developed by the SCI and the MOHME, 2000 urban and 2000 rural households were selected in each of the 28 provinces. Tehran metropolitan area, which is part of Tehran province, but accounts for about 12% of the total and one-fifth of the urban population of the Islamic Republic of Iran, was treated as an independent province represented by a sample of 2000 urban households.

The survey covered around 97 000 currently married women aged 10–49 years. Among these, 17 991 (8205 urban and 9786 rural) women had given birth to a child during the 2-year period (1998–2000) preceding the survey. They constitute the group used in this paper. Data were collected through face-to-face interviews at the respondents' home by trained health workers acting under the supervision of senior experts from the SCI and the MOHME. The variables analysed were: woman's age, age at marriage, husband's age at marriage and duration of marriage; woman's level of education, years of schooling and economic activity; residency (urban or rural); place of delivery (home or hospital/delivery centre,

public or private hospital); number of pregnancies, number of children ever born and number of living children.

### Statistical analysis

Data were analysed using descriptive statistics to calculate crude CS rates (as a percentage of all births). As the Iranian DHS used the same sample size for all the provinces without taking into account their population (which varied from 0.5 million to over 8 million) the crude CS rates were adjusted by the estimated urban and rural population size of different provinces. Pearson correlation coefficients were used to indicate the relationship between CS rates and the sociodemographic characteristics of women and provinces. Significance of differences in CS rates and correlation coefficients were tested by the Student *t*-test. All calculations were done using *SPSS*, version 11.

## Results

### Overall prevalence

Table 1 shows the crude and weighted CS rates for urban, rural and total populations of all 28 provinces as well as Tehran metropolitan area. It also presents crude CS rates by place of delivery, i.e. public versus private hospital by province.

Of 17 991 women who had given birth to a child during the 2-year period of observation, 4882 (27.1%) had undergone CS. For urban women there were 2954 CS out of 8205 births (36.0%) and for rural women 1928 out of 9786 (19.7%). CS prevalence rates adjusted for population size of provinces were 35.0% for the total, 41.9% for urban women and 22.5% for rural women (Table 1).

Unless specified otherwise, weighted CS rates are presented in the rest of the paper.

### Variations by province and urban-rural residence

The 28 provinces plus Tehran city differed markedly in terms of CS rates (Table 1). In terms of overall CS rates, only 2 of the 29 provinces fell below the 15% ceiling recommended by the World Health Organization [2]. The lowest rate (6.1%) was in the south-eastern province of Sistan-va-Baluchestan which is generally regarded as the least developed region of Islamic Republic of Iran. The second lowest CS rate (13.5%) was in the neighbouring, and equally undeveloped, province of Hormozgan. Overall, all but 1 of the 8 provinces (Fars) with a weighted overall CS rate less than 25% fall below the national average in terms of human development index and its various components (data not shown) [14].

In every province CS rates were lower in rural than urban areas. In urban areas, CS rates ranged from 8.9% (in Sistan-va-Baluchestan) to 57.6% (in Gilan), whereas the range for rural areas was from 3.6% (in Sistan-va-Baluchestan) to 42.3% (in Mazandaran). In urban areas, the CS rate of only 1 province (Sistan-va-Baluchestan) was below 22% while in 9 provinces over 45% of births involved CS. In rural areas the CS rate fell below 15% in 6 provinces while it exceeded 30% in 8 other provinces.

There was a significant positive correlation ( $r = 0.84$ ,  $P < 0.001$ ) between the CS rates of urban and rural areas of the 28 provinces.

### Variations by public-private affiliation of the delivery facility

The majority of births for the sample of women in this study took place in a hospital or specialized delivery centre (14 325, 79.6%), mostly public hospitals or maternity facilities affiliated with the provincial universities of medical sciences and other

Province	Total CS deliveries				CS deliveries by region				CS deliveries by place of delivery					
	U		% CS		Urban		Rural		Private hospital		Public hospital		Home	
	Total	% CS	Total	% CS	Total	% CS	Total	% CS	Total	% CS	Total	% CS	Total	% CS
Markazi	493	38.1	39.2	44.9	247	31.3	45	62.1	426	37.5	22	37.5	4	4
Gilan	418	47.1	47.3	57.5	200	37.6	64	57.9	350	44.2	6	46.7	6	6
Mazandaran	477	49.1	48.9	56.3	231	42.3	103	58.8	368	46.7	111	38.3	111	111
Azarbajjan East	607	33.8	40.1	49.4	243	23.4	72	61.3	424	38.3	225	31.5	225	225
Azarbajjan West	699	21.2	24.6	33.0	282	13.2	24	44.3	450	31.5	76	25.4	76	76
Kermanshah	562	24.2	27.9	33.0	227	18.2	62	38.6	424	25.4	197	28.4	197	197
Khuzestan	931	21.7	27.2	34.4	366	13.5	114	35.8	620	28.4	79	26.5	79	79
Fars	544	22.1	25.3	31.8	220	15.4	56	36.5	409	26.5	164	32.6	164	164
Kerman	615	25.2	26.7	36.7	286	15.2	80	37.7	371	32.6	138	30.0	138	138
Khorasan	617	25.4	27.7	36.0	283	16.5	103	46.2	376	30.0	23	38.0	23	23
Isfahan	471	38.2	41.7	44.8	223	32.3	78	61.3	370	38.0	846	18.0	846	846
Sistan-va-Baluchestan	1234	6.1	6.1	9.1	561	3.6	28	33.7	360	18.0	158	30.9	158	158
Kurdestan	602	22.8	24.3	30.9	269	16.2	2	55.5	442	30.9	40	35.7	40	40
Hamadan	544	33.1	34.4	40.9	225	27.6	14	53.3	490	35.7	85	34.4	85	85
Chaharmahal	652	30.5	31.7	43.1	269	21.7	15	81.9	552	34.4	149	26.3	149	149
Lordestan	653	20.8	22.5	28.2	291	14.9	54	36.3	450	26.3	101	25.0	101	101
Ilam	625	21.8	23.0	27.4	274	17.4	12	64.5	512	25.0	267	26.6	267	267
Kohgiluyeh	806	19.2	18.2	28.6	371	11.3	10	60.0	529	26.6	69	23.8	69	69
Bushehr	715	21.0	21.9	26.3	331	16.4	30	22.9	616	23.8	135	32.6	135	135
Zanjan	610	26.1	27.6	38.4	268	16.4	3	50.7	472	32.6	50	49.2	50	50
Semnan	481	43.2	46.5	51.7	240	34.9	12	59.5	419	49.2	33	37.7	33	33
Yazd	490	35.3	35.9	36.9	293	33.0	187	41.1	270	37.7	312	17.0	312	312
Hormozgan	867	13.3	13.5	23.0	365	6.2	68	36.7	487	17.0	48	42.6	48	48
Tehran province	597	42.2	44.0	48.3	267	37.3	65	76.8	484	42.6				

Table 1 Caesarean section (CS) delivery rates by province, urban/rural residence and public/private place of delivery (concluded)

Province	Total CS deliveries			CS deliveries by region			CS deliveries by place of delivery			Home		
	Total	% CS	W <sup>a</sup>	Urban	% CS	Total	Rural	% CS	Private hospital	% CS	Public hospital	% CS
Ardabil	646	24.0	25.2	280	32.5	366	17.5	71	12.8	427	34.6	148
Qom	632	40.3	42.7	366	43.4	266	36.1	34	58.6	560	43.1	38
Qazvin	524	27.9	29.7	248	36.3	276	20.3	71	60.8	412	25.7	41
Golestan	688	34.4	34.9	288	46.5	400	25.8	158	41.8	433	37.3	97
Tehran city	191	50.3	50.3	191	50.3	n/a	n/a	56	66.1	131	45.0	4
All country (U)	17 991	27.2	-	8 205	36.0	9 786	19.7	1 691	50.3	12 634	31.95	3 666
All country (W) <sup>b</sup>	-	-	35.0	-	41.9	-	22.5	-	52.5	-	-	-

U = unweighted; W = weighted; n/a = not applicable.

<sup>a</sup>Weighted by proportion of rural-urban population in each province as shown by 1996 census.

<sup>b</sup>Weighted by the population size of each province as shown by 1996 census.

government agencies (12 324, 88.2%). Only 1691 (11.8%) deliveries took place in a private facility. Almost two-thirds (63.6%) of deliveries in private hospitals compared with 32.0% of those carried out in a public hospital involved CS. Nevertheless, due to the larger share of the public sector of hospital-based deliveries, almost four-fifths (82.6%) of all CSs were carried out in a public facility. On the other hand, while the relative share of the private sector of all hospital-based deliveries was less than 12% they accounted for over 17% of all CSs. As indicated in Table 1, the proportion of deliveries by CS in both public and private sector facilities varied considerably across provinces.

### Variations by sociodemographic characteristics of women

Using crude (unweighted) CS rates, women who had undergone CS differed from those who delivered vaginally in a number of personal characteristics (Table 2). Overall, women with CS delivery were significantly older, with older husbands, longer duration of marriage, more years of schooling, fewer pregnancies and fewer children ever born or living. Because of significant differences between urban and rural women in such characteristics as level of education, number of children ever born and number of living children, the data were analysed separately for urban and rural women.

#### Woman's age

Women who had CS were significantly older ( $P < 0.001$ ) than those who delivered normally in urban (27.8 versus 26.8 years;  $P < 0.001$ ) but not in rural (27.2 versus 26.9 years;  $P = 0.08$ ) areas (Table 2). Similar trends were noted with regard to women's age at marriage and duration of marriage.

The CS rate rose linearly with age of mother in urban areas (from 26.0% to 43.4% for ages 15–44 years). It fell sharply to 26.9% among

**Table 2 Sociodemographic characteristics of women who had caesarean section (CS) delivery compared with those who delivered vaginally**

Characteristic	Normal deliveries			CS deliveries			t-value	P-value
	No.	Mean	SD	No.	Mean	SD		
<i>Urban women</i>								
Age (years)	5210	26.8	6.3	2938	27.8	6.2	6.8	< 0.001
Age at marriage (years)	5243	18.4	3.7	2955	19.8	4.3	15.8	< 0.001
Husband's age at marriage (years)	4921	23.8	4.8	2884	25.0	4.8	11.4	< 0.001
Duration of marriage (years)	5448	8.5	6.7	2957	8.0	6.5	3.0	0.002
Level of education (years in school)	5191	6.1	4.6	2926	8.7	4.5	24.2	< 0.001
No. pregnancies	5248	2.8	2.1	2957	2.4	1.9	8.2	< 0.001
No. children ever born	5247	2.5	1.8	2957	2.1	1.5	10.6	< 0.001
No. living children	5248	2.0	1.0	2957	1.8	0.9	10.7	< 0.001
<i>Rural women</i>								
Age (years)	7804	26.9	6.7	1917	27.2	6.6	1.7	0.080
Age at marriage (years)	7854	17.6	3.6	1925	19.0	4.3	14.7	< 0.001
Husband's age at marriage (years)	7085	22.8	5.6	1828	23.7	5.7	5.7	< 0.001
Duration of marriage (years)	7861	9.3	7.2	1925	8.0	6.5	7.5	< 0.001
Level of education (years in school)	7772	3.0	3.4	1913	4.9	4.0	20.9	< 0.001
No. pregnancies	7861	3.4	2.6	1925	2.7	2.3	10.9	< 0.001
No. children ever born	7860	2.9	2.1	1925	2.3	1.8	12.7	< 0.001
No. living children	7861	2.3	1.2	1925	1.9	1.0	13.2	< 0.001

SD = standard deviation.

women aged 44–49 years (Table 3). In rural areas, however, the highest rate (25.1%) was seen among the very small group ( $n = 11$ ) of married females aged 10–14 years and there was only a slight and somewhat irregular rise for women aged 15–44 years.

#### *Woman's level of education*

Women who delivered by CS had significantly more years of schooling ( $P < 0.001$ ) than those who delivered vaginally in both urban (8.7 versus 6.1 years) and rural areas (4.9 versus 3.0 years) (Table 2).

The lowest rates of CS were seen in illiterate women from rural (10.8%) and urban areas (17.4%), followed by semi-literate

women with adult literacy education (18.4% in rural and 24.1% in urban areas). Among formally educated women, the rate rose with rising level of education (Table 3).

#### *Woman's economic activity*

Despite their relatively high levels of literacy and access to educational opportunities, Iranian women are characterized by a low level of participation in the labour force. Only 17.9% (16.3% in urban and 19.3% in rural areas) of the women included in this study were economically active, i.e. employed or unemployed but looking for a job. These figures were much higher than the figures for the 1996 census. The CS rate

Table 3 Normal and caesarean section (CS) delivery rates (unweighted) by woman's age and urban/rural residence

Variable	Total			Urban			Rural		
	No. deliveries	% Normal	% CS	No. deliveries	% Normal	% CS	No. deliveries	% Normal	% CS
<i>Age (years)</i>									
< 19	1 642	78.7	21.3	662	74.0	26.0	980	81.8	18.2
20-24	5 202	74.6	25.4	2 327	67.0	33.0	2 875	80.8	19.2
25-29	5 292	71.7	28.3	2 469	62.9	37.1	2 823	79.4	20.6
30-34	3 345	70.5	29.6	1 640	60.0	40.0	1 705	80.4	19.6
35-39	1 612	70.4	29.6	749	59.7	40.4	863	79.6	20.4
40-44	662	69.7	30.3	275	56.6	43.4	387	79.0	21.0
45-49	114	84.4	15.7	26	73.1	26.9	88	87.6	12.4
Total	17 869 <sup>a</sup>	72.8	27.2	8 148	64.0	36.0	9 721	80.3	19.7
<i>Education level</i>									
Religious studies education	20	70	30.0	16	62.5	37.5	4	100.0	0.0
Illiterate	4 692	87.5	12.5	1 172	82.6	17.4	3 520	89.2	10.8
Adult literacy education	1 470	79.8	20.2	451	75.9	24.1	1 019	81.6	18.4
Incomplete primary	2 024	77.2	22.8	686	72.2	27.8	1 338	79.7	20.3
Primary	2 956	73.7	26.3	1 184	71.4	28.6	1 772	75.2	24.8
Incomplete junior secondary	1 562	70.1	29.9	869	65.8	34.2	693	75.5	24.5
Junior secondary	1 375	63.5	36.5	871	60.0	40.0	504	69.7	30.3
Incomplete secondary	863	63.2	36.8	550	59.4	40.6	313	70.3	29.7
Secondary	2 021	53.6	46.5	1 579	51.7	48.3	442	60.1	40.0
Higher education	819	39.9	60.1	739	39.4	60.6	80	45.0	55.0
Total	17 802 <sup>a</sup>	72.8	27.2	8 117	64.0	36.1	9 685	80.3	19.7
<i>No. pregnancies</i>									
1-2	9 860	68.3	31.7	4 895	60.8	39.2	4 965	75.6	24.4
3-4	4 439	76.3	23.7	2 051	66.9	33.1	2 388	84.4	15.6
5-6	1 998	79.8	20.2	775	70.7	29.3	1 223	85.4	14.6
7+	1 694	83.2	16.8	484	73.6	26.4	1 210	87.1	12.9
Total	17 991	72.9	27.1	8 205	64.0	36.0	9 786	80.3	19.7

<sup>a</sup>Data missing for some categories.

of economically active women (45.9%) was significantly higher than that of non-active women (34.1%) in urban areas ( $P < 0.01$ ). In rural areas, however, the difference between the CS rates of economically active (20.4%) and non-active (19.6%) women was not significant.

#### *Number of pregnancies*

The mean number of pregnancies was lower for women having CS than those who delivered vaginally in both urban (2.4 versus 2.8) and rural areas (2.7 versus 3.4) (Table 2).

The highest CS rates were seen among women with 1 or 2 pregnancies in both urban (39.2%) and rural areas (24.4%) (Table 3). In rural areas, the rate dropped significantly as the number of pregnancies increased ( $P < 0.01$ ) so that the figure for women with 7+ pregnancies (12.9%) was almost half that of women with 1 or 2 pregnancies (24.4%). Among urban women too there was a significant difference between the CS rates of women with 1–2 (39.2%) and 3–4 (33.1%) pregnancies and those of women with 5–6 (29.3%) and 7+ (26.4%) pregnancies ( $P < 0.01$ ).

Similar urban–rural differences and trends were noted for the number of children ever born and living children (Table 2).

## **Discussion**

The results presented here show a very high prevalence of CS in the Islamic Republic of Iran. In both urban and rural areas the figures were much greater than the ceiling (15%) recommended by the WHO [2]. Iranian CS rates thus seem to be as high as those reported from Latin American countries [10,15] and some major urban centres in India [16,17], Senegal [18] and Nigeria [19].

There is evidence that this high CS rate is a relatively recent phenomenon. A study of over 600 000 births that took place in a

public hospital in Tehran found a mean CS rate of 3.1% for the 15-year period 1967–83 [20]. Normal delivery rates ranged from 95.7% in 1969 to 88.2% in 1978 with a mean of 92.6%. The relative share of CS among all deliveries increased, however, from 1.8% to 6.4% between 1967 and 1983.

Iranian women having CS differed from those who delivered normally on a large array of sociodemographic variables. On the whole, they were older, better educated, married at a relatively later age and with lower parity. These may be considered as modernization factors and confirm the evidence on the positive relationship between CS rates and level of socioeconomic development in the area of residence, as discussed below.

Urban women were almost twice as likely to deliver by CS. The wide urban–rural differences that persist despite cross-tabulations by various demographic variables suggest that social development is a major determinant of CS. To further explore the impact of provincial variations in social development on CS, we have computed correlations between various measures of social development given in the official Human Development Report for the Islamic Republic of Iran prepared by the United Nations Development Programme and Management and Plan Organization of Iran [14]. It should be noted that all of the indices included in this report were based on census data and other statistics gathered before 1998 while the data on CS rates were taken from the survey conducted in late 2000. Despite the separation in time and source of data, it is interesting to note that there was a significant correlation between provincial variations in CS rate and a variety of development indicators, the size of correlations differing in urban and rural areas. Correlations between human development index at province level and CS

rates of urban and rural women were 0.55 and 0.61 respectively. The corresponding figures for the gender development index were 0.64 and 0.68. Life expectancy at birth of both sexes correlated positively with CS rates in both urban (0.68) and rural areas (0.69–0.71). So did infant mortality rates

(–0.64 to –0.66 in urban areas and –0.65 to –0.68 in rural areas).

The potentially negative impact of high CS rates on the health of individual women and the unnecessary economic burden imposed on the health care system of Islamic Republic of Iran deserve serious attention.

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### **Mental health aspects of women's reproductive health; a global review of the literature**

This book has reviewed the research undertaken on a broad range of reproductive health issues and their mental health determinants/consequences over the last 15 years from both high- and low-income countries. Evidence from peer-reviewed journals has been used wherever possible but has been augmented with results of a specific survey initiated to gather state-of-the-art information on reproductive and mental health issues from a variety of researchers and interested parties. Valuable data from consultant reports, national programme evaluations and postgraduate research work was also compiled, analysed and synthesized.

The full text is available free online and can be downloaded from: <http://www.who.int/reproductivehealth/publications/general/9789241563567/en/index.html>