

## Original Article

# Appropriateness of Cesarean Sections using the RAND Appropriateness Method Criteria

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## Abstract

**Background:** The aim of this study was to identify the appropriateness of cesarean sections, performed in Tehran hospitals using standardized Rand Appropriateness Method (RAM) criteria.

**Methods:** In this study we used the RAM criteria. In order to prepare the list of cesarean scenarios, clinical guidelines were selected, and the Appraisal of Guidelines for Research and Evaluation was used to choose the most appropriate. Two panels were held with the participation of related specialists. The scenarios derived through this method were compared with data existing in the medical records of 250 women who underwent cesarean sections in selected hospitals affiliated with Tehran University of Medical Sciences. The appropriateness rate of the cesarean sections was calculated.

**Results:** Out of 250 cases of cesarean sections performed, 91 (36.4%) were inappropriate, 41 (16.4%) were equivocal and 118 (47.2%) were considered to be appropriate. Appropriateness differed between public and private hospitals, which were statistically significant.

**Conclusion:** This study shows that as with many other health services, cesarean section has many scenarios that there are different opinions about them and no decision about presenting these scenarios as yet. Moreover the result of study showed the rate of inappropriate cesarean sections in this study is one of the highest reported rates from different communities.

**Keywords:** Appropriateness, cesarean section, RAM

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## Introduction

Inappropriate and unnecessary procedures are those not medically required by the patient.<sup>1,2</sup> Studies show that a large proportion of healthcare offered is inappropriate or unnecessary, ranging from 15% to 30% in many countries, and as high as 40% in some private clinics.<sup>3,4</sup>

The cesarean section is one of the most common surgical procedures performed on women throughout the world.<sup>5</sup> In comparison with normal vaginal delivery, not only is the mortality rate higher with a cesarean section<sup>6</sup> but there are also higher rates of complications, including infection, uterine rupture, hemorrhage, and higher costs.<sup>7</sup>

The prevalence of cesarean sections is on the rise in many countries.<sup>8,9</sup> More than 50% of all deliveries occurring in private hospitals in South American countries such as Chile, Argentina, Brazil,

and Paraguay are cesarean sections.<sup>10</sup>

The cesarean section rate is increasing globally. Studies have shown that apart from clinical indications, other factors affect this rate. The increase seems to be related to factors such as the mother's characteristics and socio-economic status, preference, social factors such as advertisements, mode of admission, increasing mean age of marriage, as well as physician preferences.<sup>11–14</sup> The continuous global rise in this rate is one of the most disputable topics in the field of maternal health care. During the last two decades many high and low income countries have aimed at decreasing the rate of cesarean sections.<sup>15</sup>

According to the WHO, about 15% of deliveries have medical or scientific justification for a cesarean section<sup>16</sup> and values above this should be considered as inappropriate and unnecessary.

In 2005, 47% of all deliveries in Iran and 52% of all deliveries in Tehran were via cesarean section,<sup>17</sup> significantly more than the 35% reported in 2000.<sup>18</sup> There are few previously published evidence-based recommendations for the management of cesarean sections in Iran. A 2004 protocol published by the Ministry of Health and Medical Education lacked details and information expected in an evidence-based clinical guideline.<sup>19</sup> There is limited research on the determining factors that cause such high rates. In a recently published paper we have reported the development of appropriateness criteria for cesarean sections in Iran.<sup>20</sup> In this study we aim to assess the proportion of cesarean sections conducted in hospitals affiliated with Tehran University of Medical Sciences (TUMS) as well as hospitals located in the TUMS catchment area using the appropriateness criteria.

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## Materials and Methods

### Appropriateness criteria

The study on appropriateness criteria was conducted in 2008 and consisted of two parts. In the first stage, we followed a modified version of the RAND Appropriateness Method (RAM)<sup>21</sup> to develop appropriateness criteria for cesarean sections in Iran.<sup>20</sup> RAM involves developing sets of clinical scenarios or criteria, after which decisions are made about the level of care or service that is appropriate for those scenarios and criteria. We searched the literature to identify available clinical practice guidelines and evidence summaries. We used a validated Farsi translation of the Appraisal of Guidelines for Evaluation and Research (AGREE) tool<sup>22</sup> to appraise the guidelines with comprehensive coverage, and as a result selected two clinical guidelines<sup>23,7</sup> and extracted scenarios about cesarean sections from the selected clinical guidelines.<sup>20</sup> Consensus development methods were used for identifying appropriate, equivocal, and inappropriate scenarios for conducting a cesarean section. As a result, 294 scenarios relevant to cesarean section were identified and 191 scenarios were considered as appropriate, of which 125 scenarios were agreed upon.<sup>21</sup>

### Population and setting

In the second part of the current study we assessed the medical records of 250 women who underwent cesarean sections in eight hospitals in central Tehran and compared the medical records with the criteria developed through the first phase of the study.

We calculated the sample size based on estimating the prevalence of cesarean sections at about 50%, compared to the appropriate rate of around 15%. We assumed the portion of factors that affected the rate of inappropriate cesarean sections to be at least 10%, thus we estimated a sample with 250 medical records.

We over-sampled delivery cases from private hospitals as a higher proportion of cesarean cases happen in private hospitals (60%) than in public hospitals (40%).<sup>17</sup> We selected medical records according to this ratio (150 cases in private hospitals and 100 cases in public hospitals).

### Sampling

We conducted a simple stratified sampling in which we used the hospital as the stratification factor. TUMS covers a population of over two million in the south and southwest greater Tehran area. According to the Infants Office of the Ministry of Health of Iran, out of 12700 women delivered in hospitals affiliated with TUMS in 2009, the number of cesarean sections was 7003 cases (55.6%).

This rate was higher in private hospitals, and we know that some of the women were referred to non-TUMS affiliated hospitals for delivery as well.

There are 16 hospitals affiliated with TUMS, of which five offer delivery care. We selected four hospitals located in central and south Tehran. One hospital in east Tehran (Arash) was excluded from the study as it was located in northeast Tehran and geographically away from the other hospitals (all other hospitals were located within or near the TUMS's catchment area). There are 11 private hospitals within the geographical catchments area of the TUMS, of which four hospitals that had at least 100 beds and performed at least five cesarean sections per week agreed to participate in the study (Table 1). We determined the number of required cesarean sections from each hospital using the cesarean section rate of the hospital in the previous year. We conducted data collection from September to December 2008. Cases were collected consecutively until the pre-defined sample was complete for the hospital.

### Data extraction

We designed a specific form to collect the information from medical records. Two trained midwives collected the data prospectively from the patients' medical records (one midwife for private and another for public hospitals) using pre-defined checklists. At this stage no judgments were made by the midwives about the appropriateness, and only factual data were extracted from the records. Where medical records were incomplete (e.g., insurance status, previous delivery) the ward personnel completed the data by asking the patient. One gynecologist (SH) revised the completed forms and assigned the indications recorded on the form to the clinical scenarios identified in the previous phase of the study. This physician was blinded to the hospital where the cesarean section had been performed. Two investigators (RO, FH) jointly matched the appropriateness of cesarean sections with the scenarios extracted from the panel of experts.

### Statistical analysis

We used the Chi-square test for univariate analyses, and multinomial logistic regression (backward selection) for multivariate analysis of the data in which the appropriateness of the cesarean section performed on the patient was the outcome measure.

### Ethical issues

This study was approved by the Ethics Committee of TUMS. The research was conducted in coordination with the senior administration at each hospital.

**Table 1.** Characteristics of the selected hospitals.

Hospital no.	Ownership	Teaching/non-teaching	General/special	Beds	Total sample	Appropriate Cesarean (%)	CI
1	Public	Teaching	General	365	25	12 (48%)	28.42–67.58
2	Public	Teaching	General	530	20	11 (55%)	33.20–76.80
3	Public	Teaching	Special	111	30	19 (63%)	45.72–80.28
4	Public	Non-teaching	General	108	25	17 (68%)	49.71–86.29
5	Private	Non-teaching	General	100	45	20 (44.5%)	29.98–59.02
6	Private	Non-teaching	General	171	52	17 (32%)	34.69–69.31
7	Private	Non-teaching	General	144	32	16 (50%)	32.68–67.32
8	Private	Non-teaching	General	94	21	6 (29%)	9.59–48.41
<b>Total</b>					<b>250</b>	<b>118 (43.20)</b>	<b>36.86–49.14</b>

**Table 2.** Demographic characteristics of the women who underwent cesarean sections.

Variables	Frequency (%)
Age (years)	
19–24	68 (27.2%)
25–34	147 (57.8%)
>35	35 (15%)
Married age (years)	
<18	37 (14.8%)
18–35	209 (83.6%)
>35	4 (1.6%)
Pregnancy no.	
1	123 (49.2%)
2,3	109 (43.6%)
≥4	18 (7.2%)
Education	
Illiterate	3 (1.2%)
Primary/secondary school	50 (20%)
High school	144 (57.6%)
University	53 (21.2%)
Employment	
Occupied	44 (17.6%)
Indisposition after cesarean	56 (22.4%)
Medical insurance	
No coverage	52 (21%)
Complementary medical insurance	98 (49%)
No coverage	
Days hospitalized	
1	86 (34.4%)
2	94 (37.6%)
>2	70 (28%)

**Table 3.** Main reasons for cesarean section.

Cesarean scenarios	Count (%)	Appropriateness		
		Inapp* (%)	Uncer** (%)	App*** (%)
Repeat cesarean	75 (30)	12 (16)	3 (4)	60 (80)
Preterm delivery	4 (1.6)	2 (50)	1 (25)	1 (25)
Acute fetal distress	18 (7.2)	5 (27.2)	4 (22.2)	9 (50.6)
Macrosomia	7 (2.8)	2 (28.6)	2 (28.6)	3 (42.8)
Multiple gestation	6 (2.4)	0 (0)	0 (0)	6 (100)
Breech + other abnormal presentation	38 (15.2)	5 (13)	13 (33)	20 (54)
Dystocia of soft tissues	23 (9.2)	3 (13)	9 (39)	11 (48)
Mother's characteristics	36 (14.4)	27 (75)	4 (11)	5 (14)
Premature rupture and membrane hemorrhage	4 (1.6)	0 (0)	2 (50)	2 (50)
Mother request	39 (15.6)	35 (89.7)	3 (7.8)	1 (2.5)
<b>Total</b>	<b>250 (100)</b>	<b>91 (36.4)</b>	<b>41 (16.4)</b>	<b>118 (47.2)</b>

\*Inappropriate; \*\*Uncertain; \*\*\*Appropriate

## Results

Table 1 shows the characteristics of selected hospitals affiliated with TUMS and appropriate rates of cesarean sections performed. According to the table, rates of appropriate cases were generally higher in public hospitals.

Table 2 presents the demographic characteristics of the sample. The mean age at marriage was 21.7 and at the time of cesarean was 26.6 years. Of these, 17.6% were employed and 79.2% were covered by medical insurance, of which 51% had complementary insurance coverage.

The main reasons for performing cesarean sections in the population under study are identified in Table 3. As seen, repeated cesarean section, breech presentation, and maternal characteristics were, in turn, the most common medical causes in the population under study. A significant proportion of cases underwent cesarean section due to maternal request.

After comparing the data extracted from medical records of women who had undergone a cesarean section with the scenarios derived from the first stage of the study with RAM, the appropriateness rate was identified in the population under study. Out of 250 cases, 91 (36.4%) were inappropriate, 41 (16.4%) were equivocal, and 118 (47.2%) were appropriate (Table 4). Appropriateness differed between public and private hospitals. The rate of inappropriate cesarean sections was 44.8% in private hospitals and 24% in public hospitals, which is statistically significant ( $P < 0.05$ ,  $df = 1$ ).

We used multinomial logistic regression to assess the effects of different demographic and setting characteristics on the appropriateness of the cesarean sections performed. Adjusted for other factors, significant relationships between appropriateness, type of hospital (public vs. private) and parity ( $P < 0.01$ ) were found (Table 5). The results suggested a higher chance of having an appropriate cesarean section for mothers who gave birth at a government hospital (OR = 2.24,  $P = 0.013$ ). In addition, those mothers with

**Table 4.** Comparison of cesarean section appropriateness hospital type.

Appropriateness	Hospitals		Total
	Private	Public	
Inappropriate	67(44.7%)	24 (24.0%)	<b>91 (36.4%)</b>
Uncertain	24 (16.0%)	17 (17.0%)	<b>41 (16.4%)</b>
Appropriate	59 (39.3%)	59 (59.0%)	<b>118 (47.2%)</b>
<b>Total</b>	<b>150 (60.0%)</b>	<b>100 (40.0%)</b>	<b>250 (100.0%)</b>

$P = 0.001$ ;  $df = 1$

**Table 5.** Relationship between variables and appropriateness of cesarean section in population study.

Variables	Odds Ratio (adjusted) Appropriate/inappropriate (CI)	P-value
Age at delivery		
<18	Reference*	—
18–35	0.67 (0.13–3.41)	0.63
>35	0.098 (0.0055–1.76)	0.12
Hospital		
Private	Reference	—
Public	2.24 (1.18–4.23)	0.013
Parity (less than 1)	2.89 (1.46–5.723)	0.0024
Mother's employment		
Housekeeper	Reference	—
Government employer	0.64 (0.27–1.55)	0.32
Private employer	0.69 (0.15–3.23)	0.63
Consult with health staff before delivery		
No	Reference	—
Yes	0.92 (0.39–2.17)	0.85

Likelihood ratio statistics = -229.51;  $n = 250$ ; \*All odds ratios for each group level are computed reference categories as the comparison level

two or more parity had a higher chance of having an appropriate cesarean section ( $OR = 2.89$ ,  $P = 0.0024$ ) compared to those having their first delivery.

## Discussion

The aim of this study was to identify the appropriateness of cesarean sections performed in selected hospitals affiliated with TUMS during 2008–2009 by using scenarios derived from RAM in the first stage. The results of this study, in this stage concluded that appropriate scenarios for performing a cesarean section were found in 47.2% of cases, equivocal scenarios in 16.4% of cases, and inappropriate scenarios in 36.4% of cases (Tables 2 and 4).

Iran has one of the highest rates of cesarean sections in the world.<sup>17</sup> Our study suggested that a high proportion of cesarean sections conducted in Iran were inappropriate, even when we considered locally selected appropriateness criteria. In this study, the appropriateness of cesarean sections was compared with factors considered to affect cesarean section rates in different studies.

The results of the current study show that a significant statistical relationship exists between appropriateness of the cesarean section and type of hospital where the delivery occurred (public vs. private). Cesarean section rates were considerably higher in private hospitals compared to public hospitals (Tables 4 and 5).

This may be attributed to problems in the priorities of our health system; including equal treatment costs in different sections, lack of sufficient standards in cesarean section surgery, the tendency to obtain more income in the private sector, the large difference between payment of costs of normal vaginal delivery and cesarean section by insurance companies, lack of supervision or adequate control, as well as the lack of basic regulations to observe patient rights.

The payment costs of a cesarean section and normal vaginal delivery by insurance companies are calculated globally. Of this,

10% is paid by the patient and 90% by the insurance institutes. Another important point is that in the private sector, the costs of cesarean section which are calculated according to the California code, are four times higher than public sector and these costs are too higher than what calculated in present study.

Another important finding in our study is that all repeat cesarean sections, which comprise a high percentage of cesarean sections in all studies (30% in our study), have been performed solely due to the mother having a previous cesarean section without considering the situation of the current pregnancy. In many countries, especially in the US and Europe, promoting normal vaginal delivery after previous cesarean section is one of the most important topics of discussion and also a way of limiting the cesarean section rate. Different studies show figures between 27% – 50% for normal vaginal delivery after a cesarean section, especially for women who had previously had a normal vaginal delivery or those who had one pregnancy and delivery.<sup>24</sup>

It should be noted that in the scenarios developed in the first phase of our study repeat cesareans were considered appropriate. If repeat cesareans had been subjected to close scrutiny based on evidence-based criteria, then the rate of inappropriate cesareans in our study would have been even higher than what we report here.

We noted a high rate of request for a cesarean section by women (15.6%) in our study, most from women who delivered in the private sector. Other studies reported figures that range from 6%–30%. Different factors influence this. One factor is the need to respect the desire and independency of the mother, which is a point of consideration in medical ethics.<sup>25,26</sup> Another factor is the chance of developing potential complications associated with interventional therapies, including cesarean section, and the way of responding in case the mother's desired method of delivery is not considered.

Our study had some limitations. The lack of familiarity of the authorities of health centers and institutes as well as clinical per-



sonnel and colleagues with the RAND method caused them to hesitate about preparing the list of cesarean section indications. They were also hesitant to participate in the two panel sessions, and most importantly, to discuss the topic of our study, which was about determining the appropriateness of health services and care provided, with higher authorities, which indicated their sensitivity towards their field of work and management methods. The absence of proper medical data recordings and incomplete data in the patient's medical files were also among the main limitations of this study.

One question is that if there is evidence that one method of treatment would be beneficial over the other, for example, normal vaginal delivery over cesarean section, then does the patient still have the right to demand cesarean section or not? Also, will it be possible to perform the most appropriate method of delivery by acknowledging the patient and giving her enough adequate information? We ask because in the health system, almost all sophisticated medical procedures are suggested by doctors who perform the procedures themselves, and patients usually accept their suggestion due to inadequate knowledge, information, and experience. Thus, we should pay attention to probable moral hazards, such as induced demands, that may have a great role in the figures reported in here.

The higher rate of cesarean section may reflect a type of defensive medicine in which doctors safeguard themselves from potential litigation cases.<sup>24,27,28</sup> It seems that the lack of necessary standards and sufficient insurance coverage and support encourages the doctors to provide a cesarean section, as they can more easily defend themselves against litigation than if they had provided a normal delivery.

Many studies have been performed about factors (medical and non-medical) affecting cesarean section. Systematic reviews suggest that further studies are required on the cesarean section as we lack sufficient information and standards on some important aspects.<sup>29-32</sup>

Our study suggests that reducing the cesarean section rate in Iran, or even halting its increasing rate, requires a multi-factorial approach. They should include both the standardization and development of acceptable and valid criteria as we have previously attempted. The results of this study, alongside the previous work in which the appropriateness criteria were identified, may contribute to the development of national guidelines for use in Iran. Together they demonstrate agreeable criteria for a cesarean section from the point of view of clinicians in the country at a time when even such locally developed criteria are not being followed by clinicians in practice. Obviously the impact guidelines in practice will depend on using effective implementation strategies.<sup>33</sup> Still, given the high rate of inappropriate cases in our study, interventions targeting attitudes towards cesarean sections and normal deliveries, as well as payment methods, should have an important role in controlling the cesarean section rate in Iran. We also need to plan other approaches that are likely to influence patients' demands and requests. Without coherent efforts, the cesarean section rate in Iran will continue to remain one of the highest in the world.

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A view of Ramsar, lies on the coast of the Caspian Sea, Northern Iran  
(photo by Miss E.Gholami, photographer)