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Review

Models of childbirth care and cesarean rates in different countries

ABSTRACT

The paper reports the results of a literature review on cesarean rates and models of childbirth care in different countries according to their utilization of technology. There were reviewed 60 studies published between 1999 and 2010 retrieved from the Brazilian Federal Agency for Support and Evaluation of Graduate Education (CAPES) and ProQuest databases. The Brazilian model of childbirth care relies on the physician-patient relationship, level of technology utilization and cesarean delivery.

DESCRIPTORS: Cesarean Section, statistics & numerical data. Perinatal Care, trends. Review.

INTRODUCTION

Models of childbirth care and cesarean rates have been discussed since the 1980s.[6,18,22,34] The complexity of factors involved in child delivery and childbirth care has raised questions ranging from the quality of obstetric care to the meaning of childbirth to women.[5]

According to the World Health Organization (WHO), childbirth care aims to keep the mother's and her child's health, with minimal medical intervention, and ensure their safety.[a] The WHO recommends health providers get involved in the birth of a child only when necessary. Despite this recommendation, cesarean rates are increasing in several countries, and many international and national studies have been conducted to understand this trend.[1,5,7,10,15,17,20]

Cesarean delivery is a surgical procedure originally designed to reduce the risk of maternal and/or fetus complications during pregnancy and labor. It is not a risk-free procedure[37] in spite of its improved safety. Cesarean sections were first only performed in dead women to save their fetus but now it has performed to protect the mother and her child in complicated situations. While most authors agree cesarean sections should not be performed when there is no medical indication, some claim that improvements in surgical techniques, infection prevention and blood transfusions would permit to indicate it to meet the mother's and/or her family's needs.[28,29]

Cesarean rates are increasingly common almost worldwide. The main reasons for this increase reported in the literature are social, demographic, cultural and economic characteristics of pregnant women[2,20] associated with the mother's request and factors related to health care models in some countries including aspects of medical practice, medical preferences[1] and economic interests of different actors involved in this process.[9,22]

[a] World Health Organization. The World Health Report 2005. Geneve; 2005. Recém-nascidos nunca mais passarão desapercebidos; p.95

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Different countries have unique characteristics as to health care organization, public health priorities, health policies and level of state intervention and involvement at different levels of care. Social, economic and educational differences of their populations are also relevant. Prenatal care is shaped to these characteristics, determining the model of childbirth care. The model of hospital childbirth care together with non-consensus medical interventions[14] have been questioned by the society and academic community,[24] and compelling criticism has been centered on obstetric practice.

In this context, the present review aimed to describe models of childbirth care and related cesarean rates in some countries.

METHODS

Aspects related to the history of international recommendations on cesarean rates are here summarized. Then, obstetric care in some countries is categorized based on their level of intervention following the classification proposed by Wagner[43] (2001), and their recent cesarean rates are presented. Finally, the model of childbirth care in the Brazilian health system is described, as well as cesarean rates in the public and private sectors.

In this study a literature review was carried out in the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES – Brazilian Federal Agency for Support and Evaluation of Graduate Education) and ProQuest databases and the main publications on childbirth care comprising the period 1999–2010 were retrieved. The search strategy included the following descriptors: "cesarean," "delivery," "cesarean rates," "health systems," "health model," "models of care," "perinatal care," "decision making factors," "determinants," in Portuguese and "cesarean section," "statistics & numerical data," "perinatal care, trends" in English. There were retried 65 articles, of which 44 were selected to be reviewed as they addressed care models and types of delivery.

Some relevant studies from a period earlier than the study period were included to offer conceptual support.

RESULTS

International recommendations about cesarean rates

In the late 1970s and early 1980s an international collaboration group was established to examine childbirth care, and in 1985, the "Conference on Appropriate Technology for Birth" was held with WHO coordination. This meeting was a milestone in public health and women's rights advocacy, and its recommendations (Fortaleza consensus) sought to promote actions for change in the organization and model of obstetric care. The report recommended, among others, women's involvement in the design and evaluation of programs, women's free choice of birth position, the presence of doulas during labor and delivery and the end of certain medical procedures during labor/delivery (e.g., routine episiotomy and drug induction of labor).[13]

The WHO has argued since this first meeting that lower rates of perinatal mortality are seen in countries where cesarean rates are below 10% and rates above 10%–15% are not justifiable.[44] The WHO recommendation that optimal cesarean rates should not be higher than 10% to 15%[44] was published in The Lancet and is a reference up to this date; however, it does not differentiate countries and regions with specific cultural characteristics and distinct health systems. Moreover, this recommendation has not been updated despite the new available technologies, changes in women's behaviors as their insertion in the labor market has become more significant, the increased availability of health information (scientific or otherwise), and better schedule management by health providers.

The International Federation of Gynecology and Obstetrics (FIGO) Committee for Ethical Aspects of Human Reproduction and Women's Health affirmed, in 1999, that there was no scientific evidence supporting cesarean for non-medical reasons. Medical institutions have been since highly concerned about increasing cesarean rates due to several factors, such as physicians' fear of legal actions, psychological and social and cultural aspects of pregnant women and financial incentives for doctors.[25]

In contrast to FIGO guidelines, the American College of Obstetricians and Gynecologists (ACOG) has issued a guideline stating that, given there was no significant evidence about the risks and benefits of cesarean sections, American doctors can ethically perform a cesarean delivery when they judge it will provide a greater level of health and well-being to the mother and her child than vaginal delivery. The ACOG has also recommended American doctors not to perform a cesarean when they do not agree with the patient's request and are not able to convince them otherwise, and they should refer these patients to another provider.[4] More recently the ACOG reinforced this with a new recommendation, ethically approving cesarean sections on demand.[3]

Is there an optimal cesarean rate?

Almost all members of the Organization for Economic Cooperation and Development of European Countries (OECD)[b] have cesarean rates above the 10% to 15% recommended by WHO in 1985.[44]

[b] Organization for Economic Cooperation and Development. Health at a Glance. OECD Indicators 2005. Paris; 2005

Some African countries have low cesarean rates.[a] This fact can be explained by lack of medical care and access barriers to health care. In parts of Africa it is estimated that one in every 12 women die from obstetric causes, possibly due to limited access to medical and hospital care.[35] This is especially true in the Sub-Saharan Africa, in countries such as Burkina Faso, Rwanda and Ethiopia.[16]

Many authors argue that the optimal rates proposed by the WHO in 1985 are a reference only rather than a normative goal.[6] According to the WHO Family Health and Community manager in 2001, the WHO recommendation is quite reasonable based on expert opinion and medical knowledge at that time.[6] He contends that countries with high-risk populations (and low socioeconomic development) would have need of performing higher cesarean rates than other countries, whereas those with low-risk populations may have an excess rate and would require local assessment of the optimal rate.[6]

Models of childcare and cesarean rates

The clinical determinants of cesarean sections seem to be associated to maternal and fetal health conditions, which are considerably similar in different parts of the world.

In a recent study, Mendoza-Sassi et al[34] found risk factors for cesarean sections are not consistent when examined individually, and they suggested a combined analysis of patient's behavior and medical practice within the care model.

The increase in cesarean rates over the past 20 years and differences between countries should be contextualized and analyzed in terms of social and cultural factors as well as the health care model as they could have an influence over the choice of the delivery mode.[c]

The models of childbirth care have different characteristics such as: forms of payment of health providers, funding for the system, provision of care staff, birth setting, conflicts of interest, reserve labor market, among others. The model adopted in a given setting has strong influence over the choice of delivery mode, both by the woman and the health provider assisting childbirth. The model of obstetric care has a major role in the physician-patient relationship, economic incentives, utilization of medical technology and cesarean rates.[21,22] Aspects related to malpractice lawsuits[10] and physicians' perception of the mother's desired delivery mode[17] also influence medical practice. Few studies have examined economic and incentive-related factors that may be associated to physicians' interests and their decision for a cesarean section and these factors should be analyzed according to the prevailing medical model and forms of payment for services in a given country, region or clientele.[8,22]

Wagner[43] (2001) classified the models of childbirth care into three categories:

- a highly medicalized model based on high technology and low involvement of midwives, found in the U.S., Ireland, Russia, Czech Republic, France, Belgium and urban areas of Brazil;
- a less medicalized model, so-called "humanized care," characterized by greater involvement of midwives and low level of interventions, found in the Netherlands, New Zealand and Scandinavian countries;
- an intermediate model, found in Great Britain, Canada, Germany and Australia.

Each of these models and countries has distinctive medical and social behaviors, and cesarean rates.

In the group of countries with a highly medicalized model of care, cesarean rates have been most extensively studied in the U.S. as they are the most common surgical procedure among women. In the U.S., the cesarean rate progressively increased from 1970 until mid-1980s when it peaked at 25%. After that it declined to 22.6% in 1991 and 20.7% in 1996 due to an increase in vaginal births in women with previous cesarean sections, encouraged by government programs. But then the rates have rebounded due to increased rates in women without previous cesarean (primary cesarean section) and a reduction of vaginal delivery in women with previous cesarean sections. In 2000 it reached 22.9%[32] and increased continuously until 2004, when 1.2 million women underwent cesarean sections accounting for 29.1% of all deliveries.[23,33] U.S. studies attribute this high rate to the practice of defensive medicine with doctors afraid of malpractice lawsuits, and the mode of delivery is a patient choice.[19] Recent data show new high rates of about 31.8% in 2007.[11,a]

In the U.S. model of care, obstetricians provide childbirth care, including prenatal care and vaginal or cesarean delivery, mostly in in-hospital settings. Patients are seen by doctors of their choice at private clinics and by the obstetrician on duty in public maternity hospitals. In this model, the cesarean rate in private settings can be determined by physician convenience,[42] including their time availability, schedule management, and form of payment. Physicians caring for patients with private insurance are better paid and perform more cesareans than those assisting women in the U.S. public health system.[22] Patients with private insurance can choose their doctor while those who seek care in the public sector have a doctor assigned to them. The former allows scheduling a cesarean section but not the latter.

[c] Patah LEM. Por que 90%? Uma análise das taxas de cesárea em serviços hospitalares privados do município de São Paulo. [doctoral thesis]. São Paulo: Escola de Administração de Empresas de São Paulo da FGV; 2008.

Caesarean sections on demand increased by 42% in the U.S.[d] between 1999 and 2002. In the light of that, the National Institutes of Health (NIH) held a conference to discuss the risks and benefits of cesarean sections[40] with the following conclusions:

- there is insufficient evidence to assess the risks and benefits of cesarean sections on demand compared with vaginal delivery; any decision to perform a caesarean section on demand should be made on an individual basis and carefully and ethically contemplated;
- given the risks of placenta previa and placenta accreta (abnormal location and adherence of the placenta in the uterus during pregnancy), a cesarean section on demand is not recommended in women who want many children;
- cesarean on demand should not be performed before 39 weeks of gestation or without confirmation of fetal lung maturity.

These conclusions were interpreted as an encouragement to "naturalization" of cesarean section and stirred great controversy among U.S. nursing bodies.[27, 30]

Many European countries have reported high rates of cesarean sections since the 1990s. They have a diversity of models of care (Table) with specific regulations for midwives[e] whose autonomy and freedom of action are not even across Europe.

The Netherlands and Britain are more favorable to midwife care while in Belgium, categorized as having a highly medicalized model according to Wagner, midwives are still not widely accepted.[31]

In Belgium, the health system offers financial incentives to encourage obstetricians to provide childbirth care, paying them by procedure. Though it could be provided by licensed midwives, 94% of deliveries are assisted or supervised by obstetricians.[31] The cesarean rates are low in Belgium but they have been increasing, from 10.5% in 1990 to 15.9% in 1999 up to 17.8% in 2004.[b]

In France, where health care is run by the state, there has been a similar growing, but lower rates. The cesarean rate was 16.1% in 1999 and increased to 18.8% in 2003.[f]

Among countries with the lowest levels of medical intervention during labor and delivery, the Netherlands stands out among other developed countries. The level of medical interventions is low and about 30% of low-risk woman give birth at home. Obstetric care is provided by midwives; when they suspect there might be childbirth complications, the mother is referred to a hospital. The Dutch model has showed that effective birth care can be provided outside the hospital by midwives.[26] Although they are still low, cesarean rates has been rising, from 7.4% in 1990 to 13.5% in 2002, remaining at 13.6% in 2004.[g]

Britain, Canada and Germany are among countries with an intermediate model of care, combining extensive use of medical technology and low level of intervention, that been investigating cesarean rates and its causes. Their model of care relies on the involvement of midwives and general practitioners for childbirth care, but home birth is not as common as in the Netherlands. In Britain, cesarean rates increased from 11.3% in 1989–1990 to 15.4% in 1994–1995 and to 17.0% in 1997–1998,[h] reaching 22% and 23% in 2003–2004.[i] This increase can be attributed to the practice of defensive medicine due to fear of lawsuits for medical errors, increasing maternal age,[9] and improved socioeconomic condition of the population.[2]

Canada has a universal public health system. Childbirth care is provided by doctors and midwives and funded by the government. The cesarean rate was 17.5% in 1995, rising to 20.9% in 2000 and 23.4% in 2002.[38] In 2000, the Ontario Women's Health Council, concerned about these increasing rates, established a Cesarean Section Working Group. Twelve critical factors for reducing these rates were identified, including cultural changes (reinforcing the idea that vaginal childbirth is physiological), multidisciplinary team work and changes in obstetric practices.[j]

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[d] Health Grades. Number of "patient choice" c-sections rises by 25 percent. Health Grades Study Finds. New York; 2004[cited 2007 Sep 22]. Available from: http://www.healthgrades.com/media/DMS/pdf/PatientChoiceCSectionsRiseJune2004.pdf

[e] European Parliament European Council. Directive 2005/36/EC of the European Parliament and of the Council of 7 September 2005 on the recognition of professional qualifications. *Off J Eur Union*. 2005 Sept 30[cited 2007 Oct 25]:1-121. Available from: http://eur-lex.europa.eu/LexUriServ/site/en/oj/2005/l_255/l_25520050930en00220142.pdf

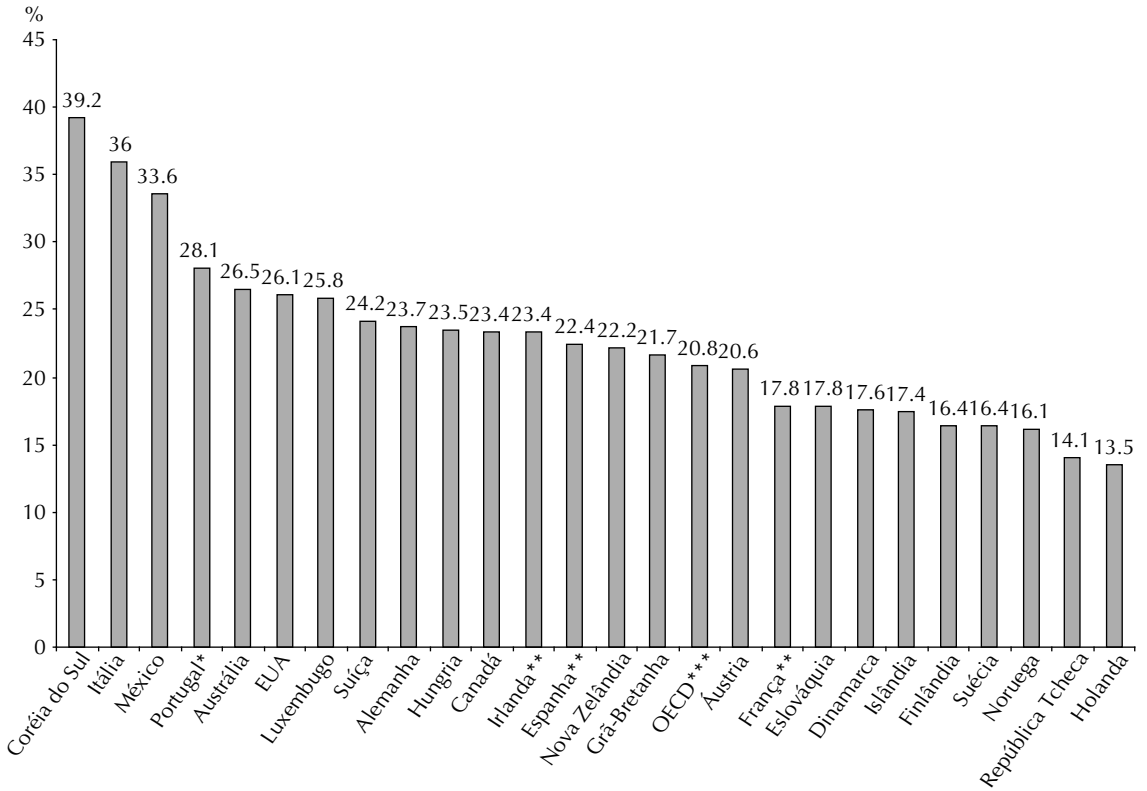
[f] World Health Organization. World Health Statistics. Paris; 2007[cited 2007 Dec 10]. Available from: http://www.who.int/whosis/whostat2007.pdf

[g] World Health Organization. Regional Office for Europe Caesarean section per 1000 live births. European health for all database (HFA-DB). Copenhagen; 2006[cited 2009 Oct 31]. Available from: http://www.inisphoedata.ie/phis/indicators/tables.php?resID=855

[h] Scotland. Department of Health. Why mothers die. Report on confidential enquires into maternal deaths in the United Kingdom, 1997-1999. Edinburgh; 2001. [cited 2007 Feb 10]. Available from: http://homepages.ed.ac.uk/asb/SHOA2/confidential_enquiries.htm

[i] Scotland. Department of Health. Government Statistical Service, 2005. NHS Maternity Statistics, England: 2003-2004. Edinburgh; 2005[cited 2009 Sep 22]. Available from: http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsStatistics/DH_4107060 (Statistical Bulletin, 2005/10).

[j] Cesarean Section Working Group. Attaining and maintaining best practices in the use of caesarean sections. Toronto: Ontario Women's Health Council; 2000. [cited 2007 Sep 12]. Available from: http://www.echo-ontario.ca/echo/images/PDFs/d_stream/sexual-and-reproductive-health/owhc_rs_csectionbestpractices_en.pdf



Source: Adapted from Organization for Economic Cooperation and Development. Health at a Glance. OECD Indicators 2005. Paris; 2005.
Notes:
* For Portugal, only births in public hospitals are included, so the results may be overestimated.
**2001 Data.
*** The OECD data are averages of the leading countries in this group

Figure 1. Proportion of cesareans per 100 live births. Organization for Economic Cooperation and Development of European Countries, 2005.

Cesarean rates in Germany has increased, from 19.8% in 1999, to 20.9% in 2000 and reaching 25.9% in 2004.[b] An economically developed country, Germany has a health system supported by the state through assessment funds (sick funds) that provide health insurance to the population. Financing and provision of health services are based on contracts between sick funds and organizations of health care providers.

The Brazilian model of childbirth care

Brazil has showed increasingly high cesarean rates over recent years: from 38.9% in 2000 to 46.5% in 2007. Preliminary data for 2008 show a rate of 48.4% (Figure 2).[k]

In the Brazilian model childbirth care is defined as a technological or medical event, where pregnant women are treated as patients and births are mostly in-hospital assisted by doctors.[14] Hotimsky et al[24] identified that cesarean rates have been strongly determined by the organization of obstetric care in both public and private health system, where there are two distinct scenarios with individual models of childcare.

A small proportion of the population (25.9%) has private health insurance[l] and may choose medical providers and negotiate with them the desired form of care. These clients, supported by the Supplementary Health Care System or who pay out-of-pocket, is generally assisted by the same doctor during prenatal and childbirth care and have a close doctor-patient relationship. In private practice the same physician provides thorough prenatal and childbirth care. However, Hotimsky et al[24] points to the burden on obstetricians including long working hours including a private practice, shifts in public hospitals, delivery

[k] Brazilian Ministry of Health. SUS Department of Information Technology Health Information. Brasília; 2008 [cited 2009 Nov 10]. Available from: www.datasus.gov.br
[l] Instituto Brasileiro de Geografia e Estatística. Pesquisa Nacional por Amostra de Domicílios 2003. Rio de Janeiro; 2003 [cited 2008 Apr 9]. Available from: http://www.ibge.gov.br/home/estatistica/populacao/trabalhoerendimento/pnad2008/default.shtm

Table. Proportion of cesarean sections per 100 live births in selected countries. 1990–2005.

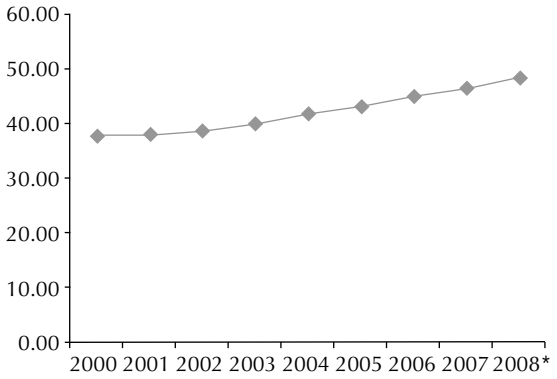
Country	1990	1995	1997	1999	2000	2001	2002	2003	2004	2005
Belgium	10.5			15.9					17.8	
France				16.1	17.1	17.9	18.7	18.8		
Netherlands	7.4						13.5		13.6	
England	11.3	15.4	17			22		23	22.7	
Canada		17.5			20.9		23.4			26.1
Australia	17.5				23.3		26.5			
Germany				19.8	20.9	22	23.6	24.8	25.9	

Source: Adapted from the World Health Organization

care in private hospitals and sometimes teaching and research, and no time available to wait for regular labor, making them opt for cesarean delivery. Care is paid by the patient, either out-of-pocket or through private insurance. The model of private medical care is based on a close doctor-patient relationship, where the patient can choose her medical provider and opt for an elective cesarean section so that she will be assisted by this same provider.[21] These patients are unwilling to accept care from other providers and demand to be assisted by their own doctor during childbirth.[b]

However, most Brazilian population is served by the state-run Sistema Único de Saúde (SUS – National Health System), which provides outpatient and hospital care in public services. Hotimsky et al[24] assert that pregnant women with no health insurance or no access to private services often do not have the option of choosing the doctor who will assist them and are not likely to have the power to negotiate the type of delivery desired. These patients are routinely assisted during childbirth by a medical provider other than the one providing prenatal care. This lack of continuity between prenatal and childbirth care in the public service can be a contributing factor for cesarean sections due to lack of information at the time of delivery on the current and previous pregnancies. In addition, the provider on duty at SUS-affiliated hospitals does not establish a proper relationship with the woman in labor as they have not met before.[24] There are reports that in some public hospitals, a woman should not be in labor from one shift to another, and all cases have to be "fully managed" during the same shift.[m]

The increase in cesarean rates in Brazil predominantly from 1970s points to the importance of identifying and studying factors associated with the choice of type of birth delivery. There are several actors and stakeholders in the chain of delivery care influencing the entire health care process. These actors and stakeholders, including physicians, patients and insurers (health insurance for patients and professional liability insurance for



Source: DATASUS
(Brazilian National Health System Database)
Note: * 2008 Preliminary data.

Figure 2. Proportion of cesarean sections per 100 live births. Brazil, 2000–2008.

physicians for medical malpractice), hospitals and the government, through health policies, determine the utilization of medical procedures, and there is a need to identify the each actor/stakeholder's motivation and its effect on utilization.[41]

In the private health care system, some issues characteristic of metropolitan areas and large urban cities of Brazil have made the doctor-patient relationship more complex and conflicted with health insurance companies mediating the contractual relationship between client and doctor, greater involvement of civil society through movements toward empowerment and human rights advocacy and greater access of clients to information.

Access to information has increased worldwide, and in Brazil it has led to changes in health care decisions. Before, patients with symptoms would seek a doctor who would establish a diagnosis and recommend a treatment. Patients would accept this advice without further questioning and the decisions were made by the medical team only. In contrast, nowadays, during the

[m] Freitas PF. The epidemic of caesarean sections in Brazil, factors influencing type of delivery in Florianópolis, South Brazil. [doctoral thesis]. London: London School of Hygiene and Tropical Medicine; 1999.

first prenatal visit, doctor and patient usually discuss a birth planning, including preferences for anesthesia, episiotomy, forceps, cesarean section, breastfeeding and other aspects relevant to the client, who has now access to this information.[4]

Currently, almost 25% of births in Brazil take place in private hospital settings, and the cesarean rate in the private health system is around 80%.[n] In the public system that provides care to the majority of the population, cesarean rates are on average around 35%.[o] In the public system birth deliveries are assisted by doctors on duty who do not have any prior relationship with the patients and in most cases are paid regardless the number and type of deliveries performed. This duality of health systems in Brazil is translated by a wide regional disparity in cesarean rates. Regions with high insurance coverage have also higher cesarean rates. In 2006, cesarean rates in the North and Northeast regions were 34.6% and 33.8% whereas in the Central-West, Southeast and South they were 50.6%, 53.1% and 51.3%, respectively.[o] Private health insurance coverage in the North and Northeast was 38.2% and 37.3% while in the Central-West, Southeast and South was 53.3%, 54.4% and 53%, respectively.[p]

Despite different realities, both models of care show very high cesarean rates. Brazil has one of the highest rates worldwide. It should be noted that, in the public sector, although care is mostly provided by doctors, this model is similar to that of many European countries, birth deliveries are assisted by a medical provider contracted by the hospital and paid per load work rather than for productivity (except in some cases). Despite this similarity, cesarean rates in Brazil are not even close to those in European countries. Dias & Deslandes[12] highlight the paradox between cesarean rates in public services in Rio de Janeiro (Southeastern Brazil) and the organization of obstetric care in that system. Maternity hospital costs are covered by the state and providers' pay does not vary according to what type of delivery is performed. Providers work in teams where it is expected that technical limitations of one member can be counterbalanced by the expertise of another one, thus reducing the odds of choosing not to perform a vaginal delivery due to training limitations. And time of labor progression is not a pressing issue to accelerate delivery since providers work in shifts, with fixed hours, and patient care is taken up by a new team at the end of their shift. These authors have postulated that public maternity hospitals have higher than expected cesarean rates because the indications for cesarean deliveries are affected by factors related to medical training and cultural trends, which are highly complex issues in the obstetric practice.[12]

FINAL CONSIDERATIONS

Cesarean rates have been increasing worldwide since the 1980s–1990s. A significant number of academic and nonacademic studies on the subject have been published, examining it from different perspectives.[1,5,9,39] These studies rely on local contextualization and are based on the model of obstetric care and social and cultural characteristics of women assisted.

It would be simplistic, as reported in some papers, to explain the high cesarean rates as a result of medical decision only, disregarding factors related to the doctor-patient relationship, social context and current model of care, either public or private.[36] Therefore, the study of cesarean rates from an perspective calls for a socioeconomic and cultural contextualization of the population studied with an analysis of the role of all stakeholders in the chain of care. D'Orsi et al[15] point to the need to reexamine the organization of obstetric practice to promote changes in childbirth care, respecting the female physiology and the role of stakeholders.

There is no clear evidence on the optimal cesarean rates. Many countries have higher rates than those recommended by WHO 25 years ago. However, a "good birth," either vaginal or cesarean, should ensure the mother's and her child's well-being.[37] Decisions regarding the type of delivery should take into consideration the women's preferences, provided that they are able to freely choose what best suits them. Furthermore, the analyses of cesarean rates should be based on the model of care in place and social and cultural characteristics of a given society. And it should be stressed that the model of obstetric care defined by a particular country, state, region or funding entity, comprising, among others, the doctor-patient relationship, economic incentives and utilization of medical technology, greatly influence cesarean rates.

[n] Brazilian National Agency for Supplementary Health Care. Brasil tem uma das maiores taxas de cesariana na Saúde Suplementar. Brasília; 2006 [cited 2007 Mar 25]. Available from: http://www.ans.gov.br/portal/site/home2/destaque_22585_2.asp

[o] Ministério da Saúde. MS capacita profissionais para atender mães e bebês. Brasília; 2009. [cited 2009 Jun 5]. Available from: http://portal.saude.gov.br/portal/aplicacoes/noticias/default.cfm?pg=dspDetalheNoticia&id_area=124&CO_NOTICIA=10229

[p] Brazilian Ministry of Health. SUS Department of Information Technology. Indicadores e Dados Básicos (IDB) 2009. Available from HTTP://tabnet.datasus.gov.br/cgi/tabnet.exe?idb2009/f15.def

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