

Trends in the modes of delivery and their impact on perinatal mortality rates

Tendência das formas de resolução da gravidez e sua influência sobre as taxas de mortalidade perinatal

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Keywords

Cesarean section. Natural childbirth. Perinatal mortality (public health). Fetal mortality. Neonatal mortality (public health). Vaginal delivery.

Abstract

Objective

To determine changes in the incidence of vaginal deliveries, cesarean sections, and forceps deliveries and their potential association with fetal, early neonatal, and perinatal mortality rates over time.

Methods

A retrospective study was carried out and the occurrence of deliveries supervised by university services between January 1991 and December 2000 was determined. Data regarding fetal, early neonatal, and perinatal deaths were assessed using obstetric and pediatric records and autopsy reports.

Results

Of a total of 33,360 deliveries, the incidence of vaginal deliveries, cesarean sections, and forceps deliveries was relatively steady (around 60, 30, and 10%, respectively) while, at the same time, there was a marked reduction in fetal mortality (from 33.3 to 13.0‰), early neonatal mortality (from 30.6 to 9.0‰), and perinatal mortality (from 56.4 to 19.3‰).

Conclusions

The marked reduction in perinatal mortality rates seen during the study period without an increase in cesarean sections indicates that the decrease in perinatal mortality was not impacted by cesarean section rates. The plausible hypothesis seems to be that the reduction in perinatal mortality of deliveries performed under the supervision of university services was more likely to be associated with better neonatal care rather than the mode of delivery.

Descritores

Cesárea. Parto normal. Mortalidade perinatal (saúde pública). Mortalidade fetal. Mortalidade neonatal (saúde pública). Parto vaginal.

Resumo

Objetivo

Aferir as variações das taxas de parto normal, cesárea e parto fórceps, bem como das taxas de mortalidade fetal, neonatal precoce e perinatal ao longo do tempo e verificar as possíveis inter-relações entre elas.

Métodos

Estudo retrospectivo que avaliou as taxas dos partos realizados em hospitais localizados em Ribeirão Preto, SP, no período de janeiro de 1991 a dezembro de

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Received on 18/2/2003. Reviewed on 9/10/2003. Approved on 7/11/2003.

2000. Os dados sobre mortalidade fetal, neonatal precoce e perinatal foram obtidos por meio de registros obstétricos, pediátricos e de necrópsias.

Resultados

Em um total de 33.360 partos realizados, houve relativa manutenção das taxas de parto normal, cesárea e fórceps (em torno de 60%, 30% e 10%, respectivamente), ao mesmo tempo em que houve nítida redução das taxas de mortalidade fetal (de 33,3 para 13,0‰), neonatal precoce (de 30,6 para 9,0‰) e perinatal (de 56,4 para 19,3‰).

Conclusões

Verificou-se evidente redução das taxas de mortalidade perinatal, sem aumento das taxas de parto cesárea. Desse modo, pode-se afirmar que a redução temporal da mortalidade perinatal observada nessa casuística não sofreu influência da taxa de cesárea. Parece que a redução da taxa de mortalidade perinatal dos partos realizados e supervisionados seja mais uma relação direta da melhora do atendimento neonatal do que da via de parto.

INTRODUCTION

A remarkable development is currently seen in medicine due to technical advancements and better understanding of physiological processes. In obstetrics, these developments have been extensively applied to pregnancy and delivery, offering greater safety to the mother and the fetus.^{3,11}

Over the past few decades, changes in obstetric management related to the mode of delivery have been the subject of numerous studies in the scientific literature. Special emphasis has been given to the abusive increase in cesarean sections in recent years.^{1,7} The development of effective antimicrobial agents, allied to advancements in surgical and anesthetic techniques, has rendered cesarean section a safe option to the obstetrician, preventing many maternal and fetal injuries.² However, the indiscriminate increase in cesarean sections, often performed without scientific basis, has become a multifactorial issue of difficult control.^{3,11}

Until the 1960's, the increase in cesarean section rates had a direct impact on decreasing perinatal mortality in most developed countries.¹¹ However, the decrease in perinatal mortality cannot be explained only by increased cesarean section rates. There are many factors that has had a critical role during this period.¹⁰ These factors include advancements in prenatal care and education of pregnant women, use of corticosteroids to induce fetal pulmonary maturity, introduction of ultrasonography as a noninvasive method for fetal assessment, use of more effective tocolytic agents, improved obstetric care, progress in the electronic evaluation of fetal well-being, and improved neonatal care.^{5,8,10,11,13}

Based on that, it can be assumed that the trends in the mode of delivery and fetal and perinatal mortal-

ity rates over time characterize important parameters for the prospective assessment of an obstetric unit, allowing for early and adequate detection and adjustments of possible deviations in standardized managements based on up-to-dated scientific knowledge. In addition, it allows determining the impact of variations in cesarean section rates on parameters indicative of perinatal mortality.

The purpose of the present study was to determine variations in the occurrence of vaginal deliveries, cesarean sections, and forceps deliveries, and their potential association with fetal, early neonatal, and perinatal mortality rates over time. The study focused on variations in the occurrence of cesarean sections and their impact on perinatal mortality rates.

METHODS

A retrospective study was carried out to determine the occurrence of vaginal deliveries, cesarean sections, and forceps deliveries, as well as fetal, early neonatal, and perinatal mortality rates from January 1991 to December 2000. Obstetric care was carried out at two hospitals as described below. Until 1998, all deliveries were performed at the university hospital (of Medical School), where high and low risk obstetric care was provided. After the implementation of the *Sistema Unificado de Saúde* (SUS - Brazilian Unified Health System), the university hospital has provided only high risk care. Parturients considered to be at low risk were transferred to the Mater Hospital, a maternity hospital for the care of SUS low risk pregnant women by the same group of professionals. From 1998, the total number of deliveries corresponded to the sum of deliveries performed at the Mater Hospital and University Hospital.

Data regarding fetal and neonatal death from ob-

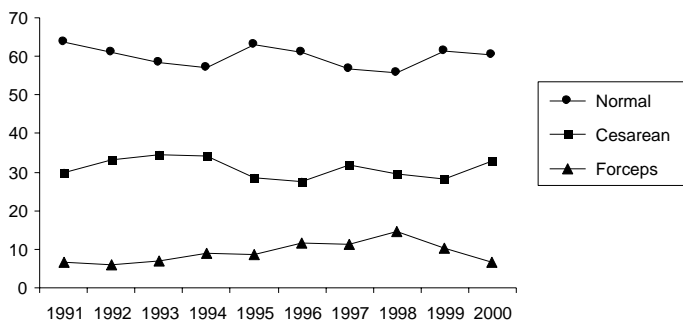


Figure 1 - Relative rates (%) of mode of delivery performed under the guidance of the DGO-FMRPUSP between 1991 and 2000.

stetric and pediatric records and autopsy reports were assessed monthly. Data were collected longitudinally on a daily basis by assistants (medical students) of the Department of Obstetrics by means of an active search in the Obstetrics Center, Nursery, and Pathology Service of the Medical School. Assistants' work was supervised by an adviser throughout the data collection period. The results were presented at monthly meetings in order to assess the Department of Gynecology and Obstetrics' performance for the diagnosis of some situations requiring an immediate solution. Data were collected in a raw form with no exclusion criteria.

Since the hospitals in the study were university ones, medical residents and students were supervised by faculty members and assistant physicians during the 10-year-period of study. During the daily visits, all procedures and managements were evaluated, such as indications for a certain mode of delivery and techniques used, and the likelihood of unnecessary cesarean sections was eliminated or controlled as much as possible. High cesarean section rates were due to the fact that high obstetrical and perinatal risk patients are referred to tertiary care hospitals. Regarding the impact of Health Ministry's policy of reducing cesarean rates implemented since 1998, it is noteworthy to clarify that, since the university hospital has had its own standards for cesarean sections and that they remained unchanged, this policy had no impact on the rates.

Fetal mortality was calculated by dividing the total number of deaths of fetuses with more than 20 weeks of gestation (when the date of the last period was unknown, a fetal weight greater than 500 g was considered) by the total number of stillbirths and live births during a given period. Early neonatal mortality was obtained by dividing the total number of deaths of newborns aged less than 7 days by the total number of live births during a given period. Perinatal mortality was

calculated by dividing the total number of deaths of fetuses with more than 28 weeks of gestation (when the date of the last period was unknown, a fetal weight greater than 1,000 g was considered) plus the number of deaths of newborns aged less than 7 days by the total number of stillbirths and live births during a given period.

RESULTS

Between January 1991 and December 2000, a total of 33,360 deliveries were performed at the two hospitals studied. The occurrences of vaginal deliveries, cesarean sections and forceps deliveries are shown in Figure 1. A relative uniformity in the distribution of these rates was seen during this period. Vaginal deliveries rates ranged from a maximum of 63.6% in 1991 to 55.8% in 1998, with a mean of 59.9%. Cesarean section rates fluctuated between 34.6% in 1993 and 27.5% in 1996, with a mean of 30.8%. Forceps deliveries ranged from 5.9% in 1992 to 14.6% in 1998, with a mean of 9.3%.

Figure 2 shows fetal, early neonatal, and perinatal mortality rates and there were seen wide variations during the period studied. Fetal mortality rates ranged from a minimum of 13.0‰ to a maximum of 33.3‰, with a mean of 22.7‰. Early neonatal mortality rates ranged from 9.0 to 30.6‰, with a mean of 19.7‰, and perinatal mortality rates ranged from 19.3 to 56.4‰, with a mean of 37.8‰.

As for fetal mortality, it remained high until 1994 (30.2‰ in 1991 and 32.4‰ in 1994) followed by a decrease to 21.2‰ in 1995 and an increase to 29.4‰ in 1997. However, a clear decline in fetal mortality rates was observed from 1998 to 2000 (13.0‰).

An increase in early neonatal mortality was seen up to 1995 (from 21.5‰ in 1991 to 30.6‰ in 1995).

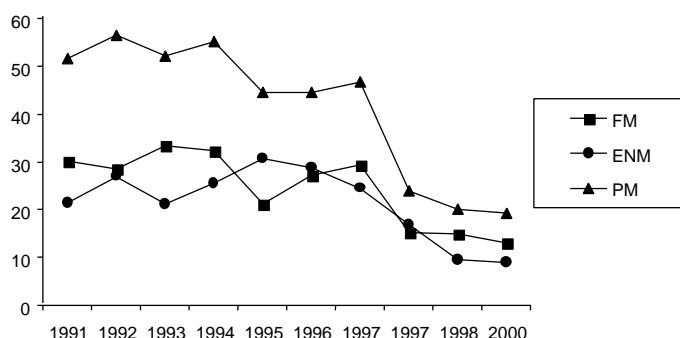


Figure 2 - Rates (%) of fetal mortality (FM), early neonatal mortality (ENM) and perinatal mortality (PM) of deliveries performed under the guidance of the DGO-FMRPUSP between 1991 and 2000.

However, there was a progressive decrease from 1996 to 2000, up to 9.0‰.

With respect to perinatal mortality, changes were even more evident and significant. Up to 1994, these rates remained at a fairly high level (51.6‰ in 1991 and 55.1‰ in 1994), decreasing to 44.4‰ in 1995 and then rising to 46.7‰ in 1997. However, a sudden decline was observed from 1998 on, up to 19.3‰ in 2000.

Therefore, a decline in fetal, early neonatal, and perinatal mortality was seen during the 10-year study period while the distribution of vaginal deliveries, cesarean sections, and forceps deliveries remained relatively stable during the same period.

Figure 3 combines cesarean sections and perinatal mortality rates. These were combined to evidence that, during the same period, when there was a clear decline in perinatal mortality (from 51.6‰ in 1991 to 19.3‰ in 2000), cesarean section rates remained relatively stable (an increase from 29.7% in 1991 to 33.0% in 2000). The calculation of the correlation coefficient between cesarean section rates and perinatal mortality (Spearman coefficient = 0.0667) demonstrated that cesarean sections had no significant effect on the reduction of perinatal mortality.

DISCUSSION

The results of the present study allows to conclude that, in general, delivery rates distribution remained stable while the different mortality rates analyzed decreased during the 10-year study period. With respect to the mode of delivery, the rates of vaginal deliveries, cesarean sections, and forceps deliveries remained around 60, 30 and 10%, respectively, with discrete variations. However, the analysis of mortality rates showed a clear decline in fetal, early neonatal, and perinatal mortality, with a more significant decrease in the latter (from 56.4‰ in 1992 to 19.3‰ in 2000).

When these data were compared with mortality rates reported for the city of Ribeirão Preto during the same period, based on information obtained from the SEADE (Sistema Estadual de Análise de Dados Estatísticos/ State System of Data Analysis) Foundation,⁴ mortality rates of deliveries carried out under the supervision of the Medical School's Department of Gynecology and Obstetrics were found to be higher than those for the city of Ribeirão Preto. This finding can be explained by the nature of patients seen at the University Hospital, i.e., high risk pregnancies requiring tertiary care.

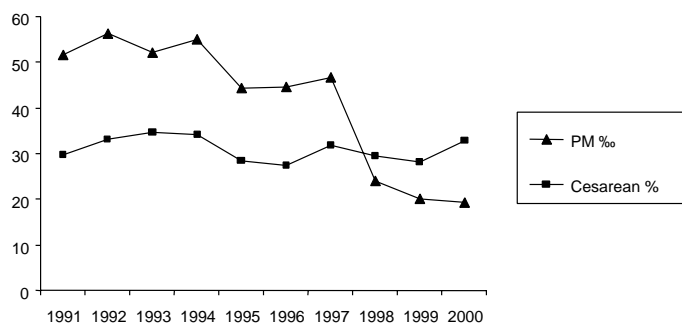


Figure 3 - Rates of cesarean sections (%) and perinatal mortality (PM, ‰) of deliveries performed under the guidance of the DGO-FMRPUSP between 1991 and 2000 (Spearman's correlation coefficient = 0.0667).

It should also be emphasized that data regarding fetal, early neonatal, and perinatal mortality were probably underestimated due to the difficulty of obtaining precise information on all deaths, since some deaths might have occurred outside the University Hospital after the patient's discharge (e.g., patients living in other cities). For these cases, autopsy might not have been performed or was performed at another setting. Also, when the mother was lost to follow-up, her data were not analyzed together with other data. However, it is assumed that this probable underestimation was constant throughout the study years and therefore did not result in variations of annual rates of fetal, early neonatal, and perinatal mortality.

One of the main points of the present study was to show that the reduction in perinatal mortality of deliveries performed under the supervision of university services was not affected by the rates of cesarean sections, which remained relatively constant along the study period. In this context, other factors should be considered in the reduction of perinatal mortality. Among them, advances in obstetrical and neonatal care, such as the consolidation of ultrasonography as a noninvasive method of fetal evaluation, use of corticoids to increase fetal pulmonary maturity and reduce respiratory diseases, and use of more effective drugs for preventing premature labor and increasing newborns' survival rate.^{5,8,10,11,13} In addition, it is important to point out the greater emphasis put on prenatal care (screening tests and treatment of maternal and fetal diseases), education of pregnant women and promotion of breastfeeding. During this same period, there has also been a remarkable advance in newborn care with development of protocols for neonatal resuscitation and prompt treatment of some potentially fatal conditions.

After the implementation of the Unified Health System in Brazil in 1998, patient care was restructured and low risk pregnant women were directly referred to Mater Hospital while high risk pregnant

women were sent to the University Hospital. As a result, nursery overcrowding was reduced and, consequently, the available resources were better allocated and local working conditions improved. Thus, there was an improvement in perinatal outcomes, which could explain the more marked reduction in perinatal mortality rates after 1998.

The study findings also reflect the same trend seen worldwide. Until the 1960's, increasing cesarean section in developed countries was found to have a direct impact on decreasing perinatal mortality.¹¹ However, according to Nielsen et al⁸ (1986) who studied cesarean sections and perinatal mortality rates in Sweden between 1973 and 1981, a decrease in perinatal mortality cannot be explained solely by increased cesarean section rates, since other factors such as prenatal, obstetric, and neonatal care, socioeconomic conditions and health systems' organization contemplating referral and counter-referral of pregnant women also play an important role.¹⁰ After analyzing 93,678 births, these authors concluded that cesarean section and perinatal mortality rates do not necessarily have an inverse correlation.

The positive impact of prenatal assessment on the reduction of perinatal mortality has been emphasized by Williams et al¹⁴ (1979) in a study of 323 hospitals in California, USA. The results showed a reduction in perinatal mortality rates in those hospitals that used electronic monitoring of fetal well-being during prenatal visits for most pregnant women.¹⁴

After investigating 1,498 patients with a past history of one or more cesarean sections, Meehan et al⁶ (1989) observed that an increase of cesarean section rates was only associated with a reduction of perinatal mortality when C-sections were indicated based on restricted obstetric criteria, not due to iteration. In that study, cesarean section was again performed in 44% of the patients (first group) while the remaining 56% underwent screening. Of these, 83% had a successful vaginal delivery while a new cesarean section was performed in 17% (second group). The overall cesarean section rate in that study was 53.6%; thus, 46.4% of the infants were born by vaginal delivery. In addition, perinatal mortality was 10.6‰ in the first group and 30.3‰ in the second group. Therefore, the authors recommended a rigorous screening policy before performing a cesarean section so that perinatal mortality could be effectively reduced.

According to O'Driscoll et al⁹ (1983) and Pearson¹⁰ (1984), the increase in cesarean section rates has not contributed to reduced perinatal mortality seen in recent years. After studying 108,987 births at the National Maternity Hospital in Dublin, Ireland, O'Driscoll et al⁹ (1983) reported cesarean section rates ranging from 4.2 to 4.8% from 1965 to 1980 with no significant differences throughout the 15-year study period. On the other hand, perinatal mortality has constantly decreased from 42.1 to 36.5, 24.0, and 16.8‰, strongly evidencing that cesarean section rates has not a direct impact on perinatal mortality. In addition, the authors suggested that cesarean section rates could be an important parameter to assess the quality of care of obstetric units.

Similar to the present study, Pearson¹⁰ (1984) collected data from a university hospital that provided tertiary obstetric care to high risk pregnant women from underprivileged groups. The author studied births at the Wishard Memorial Hospital, Indianapolis, USA, between 1973 and 1982, and observed a significant reduction in perinatal mortality (from 35 to 18‰) while cesarean section rates remained stable during the 9-year study period (5.8 to 8.2%).

Wirakusumah¹⁵ (1995) analyzed 15,671 births at a maternity hospital in Indonesia between 1981 and 1990. He did not find any increase in cesarean section rates while perinatal mortality decreased during the period studied. Toth et al¹² (1999) studied 1,099 cesarean sections carried out at a perinatology center in Prague. Although cesarean section rates did not increase during this period, there was an actual reduction of perinatal mortality.

In conclusion, the decrease in perinatal mortality seen in the present study was not impacted by cesarean section rates. Therefore, other factors must have contributed to the reduced perinatal mortality during this period, such as improvement in prenatal care, education of pregnant women, advancements in obstetric care (including electronic monitoring of fetal well-being) and in neonatal care. Hence, it seems plausible that the reduction in perinatal mortality of babies delivered under the supervision of university services between 1991 and 2000 was directly associated with improved prenatal care and advancements in neonatal care rather than the mode of delivery per se.

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