

Fetal and Infant Mortality in Botucatu City, São Paulo State, Brazil: Evaluation of Maternal - Infant Health Care

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Abstract—In Brazil, neonatal mortality rate is considered incompatible with the country development conditions, and has been a Public Health concern. Reduction in infant mortality rates has also been part of the Millennium Development Goals, a commitment made by countries, members of the Organization of United Nations (OUN), including Brazil. Fetal mortality rate is considered a highly sensitive indicator of health care quality. Suitable actions, such as good quality and access to health services may contribute positively towards reduction in these fetal and neonatal rates. With appropriate antenatal follow-up and health care during gestation and delivery, some death causes could be reduced or even prevented by means of early diagnosis and intervention, as well as changes in risk factors and interventions. Objectives: To study the quality of maternal and infant health care based on fetal and neonatal mortality, as well as the possible actions to prevent those deaths in Botucatu (Brazil). Methods: Classification of prevention according to the International Classification of Diseases and the modified Wigglesworth's classification. In order to evaluate adequacy, indicators of quality of antenatal and delivery care were established by the authors. Results: Considering fetal deaths, 56.7% of them occurred before delivery, which reveals possible shortcomings in antenatal care, and 38.2% of them were a result of intra- labor changes, which could be prevented or reduced by adequate obstetric management. These findings were different from those in the group of early neonatal deaths which were also studied. Adequacy of health services showed that antenatal and childbirth care was appropriate for 24% and 33.3% of pregnant women, respectively, which corroborates the results of prevention. These results revealed that shortcomings in obstetric and antenatal care could be the causes of deaths in the study. Early and late neonatal deaths have similar characteristics: 76% could be prevented or reduced mainly by adequate newborn care (52.9%) and adequate health care for gestational women (11.7%). When adequacy of care was evaluated, childbirth and newborn care was adequate in 25.8% and antenatal care was adequate in 16.1%. In conclusion, direct relationship was found between adequacy and quality of care rendered to pregnant women and newborns, and fetal and infant mortality. Moreover, our findings highlight that deaths could be prevented by an adequate obstetric and neonatal management.

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I. INTRODUCTION

THE infant mortality has been a global focus in recent decades. The aim of the United Nations Millennium Development Goal [1] is to reduce under-five mortality worldwide by two thirds from 1990 to 2015, reaching by 2015 a rate of 30 deaths per thousand live births in all countries [2].

Fetal and neonatal mortality rates are, considered highly sensitive indicators of health care quality. In Brazil, although programs have been established since the 80s in order to improve the quality of health care rendered to women and children, such as the Program of Full Health Care for Women (PAISM, in Portuguese language acronym) and the Program of Full Health Care for Children (PAISC, in Portuguese language acronym), the rates have still been considered incompatible with the country development and represent a great challenge for Public Health. Moreover, reduction in infant mortality rate has also been part of the Millennium Development Goals, a commitment made by countries, members of the United Nations (UN), including Brazil [3].

In Brasil, the Unified Health System (SUS, the Portuguese-language acronym) was implemented by the 1988 Constitution, and is based on the principle of health as a citizen's right and duty of the state. The development of primary health care, or basic care as it is called in the SUS, has been the subject of much attention in Brazil. The primary health care model aims to provide universal access and comprehensive health care, coordinating and expanding coverage to more specialized levels of care (e.g. specialized care and hospital care), and implementing intersectoral actions for health promotion and disease prevention [4].

The rates of fetal deaths in Brazil also have reduced. However, preventable stillbirths still occur. For example, of all stillbirths occurred in Brazil, in 2007, about 30% occurred in babies who weighed more than 2.5 kg, indicating potentially avoidable conditions [5].

The causes of such deaths are multifactorial, but adequate actions, such as the access and good quality of health services may contribute positively towards reduction in fetal and neonatal rates. With appropriate antenatal follow-up and gestational and childbirth care, some death causes could be reduced or even prevented by means of early diagnosis of changes and risks and intervention.

Classification of deaths which could be prevented or reduced is an important tool to evaluate the performance of health services, as preventable deaths are influenced, at a certain level, by quality of maternal and infant health care rendered in the health system [6].

Studies have reported that about 70% of neonatal deaths can be prevented by adequate health care. Also, most fetal deaths can be prevented [7], [8].

II. OBJECTIVES

The objective of this study was to evaluate the quality of care rendered to maternal and infant health, both during antenatal follow-up and at the time of childbirth, and classify fetal and infant mortality according to its prevention in the city of Botucatu/SP, from 2008 to 2012. Moreover, a comparison among these death groups was also made.

III. METHODS

It is a descriptive and cross-sectional study with collection of secondary data on all fetal and neonatal deaths occurred in the municipality of Botucatu/SP, from 2008 to 2012, based on the Information System on Mortality (SIM, in Portuguese language acronym).

The Brazilian Health system has implemented several information systems addressing different areas: epidemiology, demographics, service production and other functionalities. To record the Brazilian experience as accurately as possible, the SUS has developed a number of important national programs in the health area in the last 30 years [9]. They are information systems with free public access through passwords for health professionals: - The System of Information on Mortality (SIM), providing information on deaths, including the infant mortality; - The Department of Informatics in the SUS (DATASUS, the Portuguese language acronym) - registers, compiles and disseminates data on health from the SUS.

ANC was performed in 16 Basic Health Units (BHU), which are primary health care centers, and outpatient clinics of the Public University Hospital – Clinics Hospital (CH), which are secondary health care centers. The follow-up of high-risk pregnancies was performed in the outpatient clinics.

Births took place in two maternity hospitals in the city, the CH and a hospital affiliated with the SUS.

A database was built using Microsoft Office Excel 2007 (Washington, USA), and analyzed by the Statistical Analysis System (SAS, North Carolina, USA), version 9.2 [10].

The Chi-square test was used to evaluate the association among variables. The significance level was 5% ($\alpha = 0.05$) for rejection of the null hypothesis.

Following the ethical principles established in the Helsinki Declaration, this study was evaluated and approved by the Research Ethics Committee (REC) of Botucatu Medical School/UNESP.

In order to evaluate prevention of deaths, 2 classifications were used. To evaluate neonatal deaths, the List of Preventable Causes of Deaths for those less than 5 years old was used according to the ICD-10 [11], of the Ministry of

Health. However, that classification cannot be used for fetal deaths. Therefore, the classification of preventable fetal deaths was performed based on the Classification of Wigglerworth (1980), modified by Keeling et al. [12].

In order to evaluate adequacy of quality of antenatal and childbirth care, indicators were established by the authors. Antenatal follow up was considered adequate when: antenatal follow up was accomplished, its beginning was early, the number of visits was adequate for gestational age, full guidelines were followed including routine exams (Table I). Delivery care was considered adequate when: auscultation and register of fetal heart beats before delivery were performed, the health professional at delivery was the obstetrician, maternal blood pressure was measured, uterine dynamics was monitored and uterine cervix was touched. Also, in neonatal death, the pediatrician cared for the child at birth.

TABLE I
COMPLEMENTARY EXAMS ROUTINELY RECOMMENDED IN BRAZIL
ACCORDING TO TRIMESTERS OF GESTATION [13]

| Trimester | Exams |
|-----------|---|
| First | Cervical colposcopy and laboratorial exams: blood typing; serology for Human Immunodeficiency Virus (HIV), Syphilis and Hepatitis B; stool culture test; complete blood count; urine culture and fasting blood glycemia |
| Third | Serology for Syphilis and AIDS, and if necessary for Toxoplasmosis and Hepatitis B; urine culture and fasting blood glycemia |

IV. RESULTS

A total of 84 fetal deaths and 62 neonatal deaths were analyzed. Among these deaths, 40 (64.5%) were early neonatal and 22 (35.5%) were late neonatal. These findings are in agreement with others already reported in the literature [14], [15].

In Botucatu, fetal mortality rate reached its highest value of 10.5‰ in 2009. Early neonatal mortality rate ranged from 4.1‰ to 5.5‰ along the study years. Late neonatal death had the highest rate of 5.2‰ in 2008 and the lowest rate of 2.3‰ in 2011.

The analysis of prevention of neonatal deaths (Table II) showed that approximately 76% of deaths in the city could be prevented or reduced through adequate health care, and most of them (52.9%) could be mainly prevented by and adequate newborn health care, followed by an adequate health care for gestational women (16%). Only 15.7% of deaths would not be prevented by adequate actions of health care.

The classification of prevention of fetal deaths (Table III) showed different characteristics. Among fetal deaths, about 57% occurred as a result of shortcomings in antenatal care, and 38.2% were a result of intra labor changes, which shows shortcomings in obstetric management or in newborn care. Only 1.2% had malformations which could justify the death.

In the world the studies show that about 73% of neonatal deaths and 44% of stillbirths occurred around the time of labour and birth [16]. On neonatal deaths worldwide the main causes are infection, immaturity and asphyxia, account for 87% of neonatal deaths [17] and new evidence suggests that

demographic factors are also important role in neonatal mortality [18].

TABLE II
EVALUATION OF PREVENTION OF NEONATAL DEATHS, ICD-10

| Adequate actions | | N ³ | % |
|------------------------------|---|----------------|-------|
| Preventable ¹ | Reducible through adequate care to pregnant women | 6 | 11.76 |
| | Reducible through adequate care to women at delivery | 4 | 7.84 |
| | Reducible through adequate care to newborns | 27 | 52.94 |
| | Reducible through adequate actions concerning diagnoses and treatment to pregnant women | 2 | 3.92 |
| Not Preventable ² | Causes not well defined | 4 | 7.84 |
| | Other causes (not clearly avoidable) | 8 | 15.68 |

Based on [11].

¹ p value < 0.001; ² p value = 0.25; ³missing frequency= 11

TABLE III
EVALUATION OF PREVENTION OF FETAL DEATHS AND GAPS IN HEALTH CARE

| Group by cause ¹ | Type of Death | Possible gaps in health care services | N ² | % |
|-----------------------------|--|--|----------------|------|
| 1 | Before labor | Nonattendance or inadequate antenatal care and adverse maternal conditions | 46 | 56.7 |
| 2 | With congenit malformation | Gaps in the follow-up pregnancy or in genetic counseling | 1 | 1.2 |
| 3 | Conditions associated with prematurity or immaturity | Gaps in the diagnoses | 0 | 0 |
| | | Gaps in antenatal care/ neonatal care or before delivery | | |
| 4 | Labor death, post-delivery neonatal death – newborn weighing more than 1.000 g, or death in the first 4 hours; evidence of birth trauma or hypoxia | Gaps in the delivery or neonatal resuscitation | 31 | 38.2 |
| | | Gaps in antenatal care/ neonatal care or delivery. | | |
| 5 | Other conditions | Gaps in antenatal care/ neonatal care or delivery. | 3 | 3.7 |

Based on Classification of Wigglesworth, modified by [12];

¹ p value < 0.001; ² missing frequency= 3

Concerning adequacy of maternal and infant health care, according to the criteria used for this study, a low adequacy of care at the time of delivery was found. It was better, however, than that of antenatal care. The best adequacy rates were found in the group of fetal deaths, 23.8% in antenatal care and 33.3% in delivery as shown in Fig. 1. However, they are still considered very low.

When just adequacy of antenatal care between the 2 groups of deaths was considered, no statistically significant difference was found between them ($p= 0.25$). Also, no statistically significant difference was found between groups concerning adequacy of childbirth care ($p=0.06$).

In the evaluation proposed by the study to analyze prevention, a direct relationship was found between adequacy and quality of care rendered to pregnant women and newborns and occurrence of deaths.

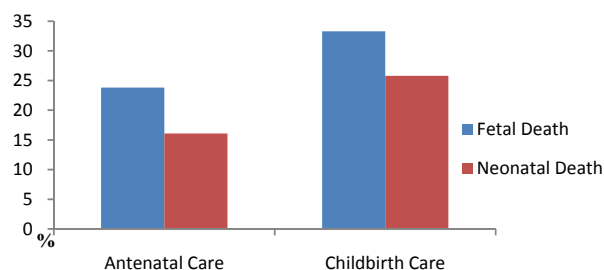


Fig. 1 Percentage of adequate care according to the type of death.

V. CONCLUSIONS

As a result of the changes described above, Brazil has been successful in terms of improving in antenatal care visits for all women.

Despite such progress, the fetal and neonatal mortality rates are high in Brazil, indicating that there is still much room for improvement.

The study of fetal deaths is of great importance, as this study showed that their causes are different from those of neonatal deaths. Moreover, prevention of fetal deaths has different characteristics of that from neonatal deaths, and therefore, actions towards health, aiming at prevention of these 2 types of death must also be different.

Conclusions based on the findings of this study show that the quality of antenatal and childbirth care should be the target of emergence actions in the city in the field of primary and hospital care to pregnant women and newborns.

The study associated the influence of inadequate quality of antenatal and childbirth care on mortality and neonatal mortality rates. These deaths could be reduced by improvement in actions towards maternal-infant health care, aiming at reducing infant mortality and meeting the Millennium Development Goals.

COMPETING INTERESTS

The authors declare no competing interests.

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