

Analysis of the structural adequacy of maternity hospitals in Piauí, Brazil, 2018-2019

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Abstract

Objectives: to evaluate the structure and adequacy of maternal healthcare facilities in Piauí.

Methods: cross-sectional study in 26 hospitals with more than 200 births/year between 2018-2019. The structure was assessed by direct observation and interview with manager; in four domains: physical aspects, human resources, equipment, and drugs. Fisher's chi-square/exact tests were used to assess differences in adequacy of structure.

Results: only 46.2% of the maternal healthcare facilities had pre-delivery, parturition and immediate post-partum room. Pediatricians (73.1%) and anesthesiologists (61.5%) were the least present professionals on-duty regime. Regarding drugs, magnesium sulfate and oxytocin were observed in 76.9% of hospitals. Overall adequacy was 23.1%, being higher in maternal healthcare facilities in the capital ($p=0.034$) and in private ones ($p=0.031$).

Conclusions: Data show inequalities in the structure of maternity hospitals of the state. The absence of health professionals, essential drugs, and appropriate physical structure can expose women and newborns to unnecessary and avoidable risks.

Key words *Structure of services, Maternity hospitals, Maternal healthcare, Quality of health care*



Introduction

Despite advances in the last three decades, 300,000 maternal deaths are estimated annually, worldwide.¹ Most of these deaths are due to frequently preventable causes, such as bleeding complications, hypertensive disorders, infections and abortion.² Among the strategies for reducing maternal morbidity and mortality, the improvement of access to quality obstetric services stands out, especially for deliveries assisted by qualified professionals.^{1,3} Despite the near universality of women who undergo at least one prenatal visit and deliveries that occur in a hospital environment in Brazil, the number of maternal deaths remains high,⁴ casting doubts on the quality of care offered.

The conceptual framework proposed by Donabedian,⁵ based on the structure-process-outcomes triad, has been extensively used to assess the quality of health services. The dimension of the structure involves the resources necessary for adequate health care, including physical infrastructure, equipment and supplies, as well as qualified human resources. Although alone it does not determine the final quality of the care provided, there is a consensus that the adequate structure increases the probability that the process (activities between health professionals and patients) and the results (product or effect of care) will be of better quality in several health areas.^{3,6,7}

Since 2008, the Brazilian National Health Surveillance Agency (Anvisa) has established, through Resolution of the Collegiate Board (RDC – Portuguese acronym) n° 36, minimum parameters for the operation of obstetric and neonatal care services in Brazil. Assuming the humanization of care and the reduction of risks to users, the resolution specified physical and operational aspects of the services, such as physical infrastructure, human resources, equipment and materials necessary for care. The document emphasizes the description and regulation of the PPP Room (pre-delivery, parturition and immediate post-partum), a private space for the woman and her companion that allows the clinical periods of childbirth to be assisted in the same environment.⁸

Data on care during labor and birth have shown limitations in the structure of maternity hospitals in the country, which are still far from what is recommended by public policy. In 1999, a case-control study in maternity hospitals in Belo Horizonte (MG) showed that both aspects of the service structure and the care process were associated with perinatal mortality from preventable causes.⁹ Another study, which evaluated 67 maternity hospitals in Rio de Janeiro (RJ) in 2005, observed that aspects of the physical structure were less frequent in services of lesser complexity. In addition, there was better adequacy for newborn care than for assistance to women.¹⁰

A nationwide survey with a sample of public and private maternal healthcare facilities from all regions of Brazil, carried out between 2011 and 2012, showed geographic inequalities in the provision of hospital services related to childbirth. The South and Southeast regions had more structured hospitals, with satisfactory proportions in several of the aspects evaluated. On the other hand, the North, Northeast and Central-West regions showed greater problems in the structure, with less qualification of health professionals, less availability of equipment and lower quantity of supplies needed for childbirth. Drugs considered essential, such as surfactant and coagulant and hemostatic drugs for women, were less found in public hospitals in inland municipalities.^{11,12}

Even considering the importance of knowledge of the organization and the characteristics of regional health care networks, there is little information about maternal and childcare in Piauí. The scarce evidence demonstrates greater inadequacy of prenatal care among older pregnant women and among those with lower education¹³ and a high proportion of cesarean deliveries among women at low obstetric risk (it went from 34.4% in 2000 to 52.1% in 2011).¹⁴ The objective of this study was to evaluate the structure and adequacy of obstetric and neonatal care services in Piauí.

Methods

This is a cross-sectional, hospital-based study in maternal healthcare facilities in Piauí, carried out between August 2018 and September 2019. All healthcare facilities with 200 births or more in the year prior to the research planning (2014) were considered eligible, since hospitals with a small number of births are likely to have a worse structure, resulting in biased estimate. Twenty-six maternity hospitals were selected, responsible for 89.4% of births in the state in 2014, declared in the Live Birth Information System (Sinasc – Portuguese acronym) of the Department of Informatics of the Unified Health System (SUS – Portuguese acronym).¹⁵

Data were collected by interviewing the managers of the selected healthcare facilities and by means of an observation script by the researchers, using a structured form that contained general characteristics of the hospital and four domains for verifying the structure of the maternity hospitals. The general characteristics evaluated were: number of deliveries per year (<1,000; 1,000 to 2,999; ≥3,000), location (capital; countryside), funding (public; private), adult ICU, neonatal ICU, clinical analysis laboratory, blood bank/transfusion agency and ambulance. The annual volume of deliveries was obtained by the sum of deliveries that took place in the 12 months immediately prior to the month of the interview or observation.

Regarding the structure, the following domains were researched: physical aspects of the hospital (reception and

welcoming room; examination and intake room; PPP Room; walking area; surgical delivery/curettage room), human resources (24-hour obstetrician); 24-hour pediatrician; 24-hour anesthesiologist; 24-hour nurse), equipment (laryngoscope/adult orotracheal tube; laryngoscope/neonatal orotracheal tube; mechanical fan; manual resuscitator; grab bar; obstetrical 'horse-type' seat; Swiss ball) and drugs (magnesium sulfate; nifedipine; hydralazine; oxytocin; misoprostol; surfactant; uterine contractility inhibitors; anti-D immunoglobulin; anti-hemorrhagic drugs; corticosteroids; antibiotics).

The maternity hospitals' structure was classified as appropriate (100% of the criteria listed above), partially appropriate (80%-99%) and inappropriate (<80%), in accordance with current legislation.^{8,16} The association between the adequacy of the structure of the maternity hospitals and the hospital's funding (public; private) and its location (countryside; capital) was analyzed. Both chi-square test and Fisher's exact test (when at least one of the frequencies was less than 5) were used to compare the categories, with a significance level of 5% ($p < 0.05$). The research project was approved by the Research Ethics Committee (opinion n° 1.554.633/CAAE n° 54277816.0.0000.5209).

Results

Table 1 shows that most (76.9%) of the 26 maternity hospitals assessed were located in the interior of the state, had exclusively public funding (88.5%) and performed between 1,000 and 2,999 deliveries per year (65.5%). Most did not offer adult ICU (88.5%), neonatal ICU (80.8%) and blood bank/transfusion agency (53.8%).

The aspects of physical infrastructure, human resources, equipment and drugs, according to the location and form of funding of the maternity, are shown in Table 2. With regard to physical infrastructure, less than half (46.2%) had PPP Room. It is also noteworthy that three public services, all located in the interior of the state, did not have a surgical delivery/curettage room. All the maternity hospitals located in the capital, as well as the private ones, had 100% of health professionals in a 24-hour on-duty regime. Pediatricians (73.1%) and anesthesiologists (61.5%) were the least present professionals in maternity hospitals across the state, with emphasis on public facilities (69.6% pediatricians; 56.5% anesthesiologists) and in the countryside (65% pediatricians; 50% anesthesiologists).

Also in Table 2, it is observed that, of the verified domains of the structure, the equipment was among the best evaluated, except for the frequency of material for non-pharmacological pain relief (grab bar, obstetrical 'horse-type' seat and Swiss ball), present in little more than half (53.8%) of services across the state. In addition, 100% of the maternity hospitals in the capital and the private ones had all the drugs surveyed. In maternity hospitals in the interior of the state and public,

Table 1

General characteristics of maternity hospitals. Piauí, 2018-2019.		
Characteristic	N	%
Location		
Capital	06	23.1
Countryside	20	76.9
Funding		
Public	23	88.5
Private	03	11.5
Number of deliveries/year		
<1000	05	19.2
1000 a 2999	17	65.4
≥ 3000	04	15.4
Adult ICU		
Yes	03	11.5
No	23	88.5
Neonatal ICU		
Yes	05	19.2
No	21	80.8
Clinical Laboratory		
Yes	19	73.1
No	07	26.9
Blood bank/transfusion agency		
Yes	12	46.2
No	14	53.8
Ambulance		
Yes	18	69.2
No	08	30.8

ICU = Intensive care unit.

magnesium sulfate (70% interior; 73.9% public), oxytocin (70% interior; 73.9% public), immunoglobulin D (65% countryside; 69.6% public) and surfactant (50% countryside; 56.5% public) were the least present drugs.

It was observed that adequacy varied according to the location and type of funding of the maternal healthcare facilities (Table 3). Higher percentages of human resources adequacy were observed in hospitals located in the capital (100% capital, 45% countryside; $p = 0.021$), as well as in private hospitals (100% private, 52.2% public; $p = 0.035$). A similar profile was found in the drugs domain, with higher percentages of adequacy in private maternity hospitals (100% private, 47.8% public; $p = 0.015$) and in those located in the state capital (100% capital; 40% countryside; $p = 0.001$). The physical infrastructure domain showed a higher percentage of adequacy in maternity hospitals in the countryside (40% in the countryside; 33.3% in the capital) and in public (39.1% public, 33.3% private), but with no significant difference. In turn, the percentage of global adequacy was 23.1% (data not shown in the table), being higher in maternity hospitals in the capital ($p = 0.034$) and private ($p = 0.031$).

Discussion

The data showed heterogeneity of the analyzed services, with global adequacy in only 23% of the evaluated services. In addition, deficiencies in human resources and drugs were observed, notably in public maternal healthcare facilities and in the countryside. Although the structure

Table 2

Availability of physical infrastructure, human resources, equipment and drugs in maternity hospitals, by location. Piauí, 2018-2019.										
Parameter	Capital		Countryside		Public		Private		All	
	n	%	n	%	n	%	n	%	n	%
Physical infrastructure										
Reception/welcoming room	6	100.0	20	100.0	23	100.0	3	100.0	26	100.0
Examination/Intake room	6	100.0	17	85.0	20	86.9	3	100.0	23	88.5
PPP Room	3	50.0	9	45.0	11	47.8	1	33.3	12	46.2
Walking area	5	83.3	15	75.0	17	73.9	3	100.0	20	76.9
Surgical delivery room/curetteage	6	100.0	17	85.0	20	86.9	3	100.0	23	88.5
Human resources										
24-hour obstetrician	6	100.0	16	80.0	19	82.6	3	100.0	22	84.6
24-hour pediatrician	6	100.0	13	65.0	16	69.6	3	100.0	19	73.1
24-hour anesthesiologist	6	100.0	10	50.0	13	56.5	3	100.0	16	61.5
24-hour nurse	6	100.0	19	95.0	22	95.7	3	100.0	25	96.2
Equipment										
Laryngoscope/adult orotracheal tube	6	100.0	19	95.0	22	95.7	3	100.0	25	96.2
Laryngoscope/neonatal orotracheal tube	6	100.0	17	85.0	20	86.9	3	100.0	23	88.5
Mechanical fan	6	100.0	19	95.0	22	95.7	3	100.0	25	96.2
Hand Resuscitator	6	100.0	20	100.0	23	100.0	3	100.0	26	100.0
Grab bar	4	66.7	10	50.0	13	56.5	1	33.3	14	53.8
Obstetrical 'horse-type' seat	4	66.7	10	50.0	13	56.5	1	33.3	14	53.8
Swiss ball	4	66.7	10	50.0	13	56.5	1	33.3	14	53.8
Drugs										
Magnesium sulfate	6	100.0	14	70.0	17	73.9	3	100.0	20	76.9
Misoprostol	6	100.0	14	70.0	17	73.9	3	100.0	20	76.9
Oxytocin	6	100.0	14	70.0	17	73.9	3	100.0	20	76.9
Antihypertensives	6	100.0	20	100.0	23	100.0	3	100.0	26	100.0
Uterine contractility inhibitors	6	100.0	16	100.0	19	82.6	3	100.0	22	84.6
Anti-D immunoglobulin	6	100.0	13	65.0	16	69.6	3	100.0	19	73.1
Antihemorrhagic	6	100.0	18	90.0	21	91.3	3	100.0	24	92.3
Antibiotics	6	100.0	20	100.0	23	100.0	3	100.0	26	100.0
Surfactant	6	100.0	10	50.0	13	56.5	3	100.0	16	61.5
Corticosteroids	6	100.0	20	100.0	23	100.0	3	100.0	26	100.0

Table 3

Adequacy of physical infrastructure, human resources, equipment and drugs in maternity hospitals, according to location and funding. Piauí, 2018-2019.										
Parameter	Capital		Countryside		P	Public		Private		P
	n	%	n	%		n	%	n	%	
Physical infrastructure										
Appropriate	2	33.3	8	40.0	0.073	9	39.1	1	33.3	0.068
Partially appropriate	4	66.7	11	55.0		13	56.5	2	66.7	
Inappropriate	0	-	1	5.0		1	4.4	0	-	
Human resources										
Appropriate	6	100.0	9	45.0	0.021*	12	52.2	3	100.0	0.035*
Partially appropriate	0	-	8	40.0		8	34.8	0	-	
Inappropriate	0	-	3	15.0		3	13.0	0	-	
Equipment										
Appropriate	4	66.7	10	50.0	0.063	13	56.5	1	33.3	0.078
Partially appropriate	2	33.3	8	40.0		8	34.8	2	66.7	
Inappropriate	0	-	2	10.0		2	8.7	0	-	
Drugs										
Appropriate	6	100.0	8	40.0	0.001*	11	47.8	3	100.0	0.015*
Partially appropriate	0	-	7	35.0		7	30.4	0	-	
Inappropriate	0	-	5	25.0		5	21.8	0	-	
Global adequacy										
Appropriate	2	33.3	4	20.0	0.034*	5	21.8	1	33.3	0.031*
Partially appropriate	3	50.0	8	40.0		9	39.1	2	66.7	
Inappropriate	1	16.7	8	40.0		9	39.1	0	-	

* p<0.05.

of obstetric care services does not assure that the process is adequate, these results suggest possible compromise, even in low-risk obstetric care in the state.

The higher frequency of neonatal ICUs (19.2%) than of adult ICUs (11.5%) suggests that maternity hospitals are more prepared to care for newborns at risk than for pregnant and postpartum women. It is noteworthy that 1/3 (30.8%) of the institutions without an adult ICU also did not have an ambulance for the transfer of high-risk pregnant or postpartum women to another agreed establishment, as recommended by Ordinance nº 1.020/2013.¹⁷ In addition, only 1 maternity hospital located in the capital had an adult ICU that exclusively treated obstetric cases, concentrating pregnant women who needed intensive care from the interior of the state. Although ICU admission for obstetric patients is less common in developed countries, this scenario is reversed in locations where hypertensive diseases, bleeding conditions and abortion complications are still the most prevalent causes of near miss and maternal death,¹⁸ as is the case from Piauí.¹⁹

It is also noteworthy that only 46.2% of the evaluated maternal healthcare facilities had a transfusion agency in operation. Data from a national survey that evaluated the structure of maternity hospitals between 2011 and 2012 show that 62.2% of the services in the North and Northeast regions had a transfusion agency.¹¹ RDC 36/2008 regulates that every obstetric and neonatal care service must guarantee access to full-time hemotherapy care, having at least one transfusion agency/blood bank on its premises when performing more than 60 monthly transfusions.⁸ Considering the high proportion of cesarean sections in Piauí¹⁴ and, in addition, the fact that hemorrhages are the second leading cause of maternal deaths in the state,²⁰ it is worrying to note that this support is not immediately available in most institutions that provide childbirth care.

All the institutions evaluated had a reception/welcoming room, however, the PPP Room was the least present item in the physical infrastructure of the maternity hospitals. Although its absence does not exclude the possibility of adequate obstetric care, this room is closely linked to the humanization of childbirth and the concepts of autonomy, privacy and dignity of the parturient. There is evidence that the birth environment influences birth outcomes, positively affecting the duration of labor and pain intensity²¹ – the hypothesis is that the release of oxytocin will be modified if the physical space is perceived as stressful.²² Considering that national standards advocate an obstetric environment with more comfort and privacy, the data from this study show that healthcare services have difficulty in meeting the criteria for a PPP Room established by RDC 36/2008.⁸

Differently from what was observed in a study conducted in Sergipe between 2015 and 2016, where there were pediatricians in a 24-hour on-duty regime in all maternity hospitals,²³ the results of the study in Piauí show that, in 35% of the countryside institutions and 30.4% of the public

ones, this qualified health professional was not available full time. More importantly, the absence of an anesthesiologist was noted in 50% of the hospitals in the countryside and 43.5% of the public ones. Even in services that provide care to low-risk pregnant women, the absence of a member from the multiprofessional team (obstetrician, pediatrician/neonatologist, anesthesiologist) can result in fewer vacancies for parturient women and in the search for more than one hospital, making access and delivery outcome more difficult. Although this was not evaluated in this study, when deliveries occur in hospitals without safe care for pregnant women and critically ill newborns, there is a higher probability of maternal and neonatal death.⁹

Equipment for maternal and neonatal resuscitation was available in almost all services, with a lower percentage for orotracheal tube and neonatal laryngoscope in inland cities and public maternity hospitals. This data is similar to that found in maternal healthcare facilities in Sergipe (where all had material for resuscitation of the newborn),²³ however it differs from that observed in the national study, where there was no availability of equipment for maternal and neonatal resuscitation in 71% and 68% of public hospitals, respectively.¹¹ Although some hospitals had material for neonatal resuscitation, for example, they did not have a full-time pediatrician and/or ambulance to transport the newborn, compromising the quality of care for critically ill neonates. There was a 64.1% drop in the mortality of infants under 5 years of age in Piauí between 1990 and 2015, but the state still has the fourth highest rate of mortality from prematurity in the country and intrapartum asphyxia is the second leading cause of newborn death.²⁴ Part of these numbers may be explained by the deficient structure in neonatal resuscitation in the evaluated services.

It seems paradoxical that, on the one hand, maternity hospitals in Piauí are better equipped to deal with the emergency of women and newborns even in low-complexity facilities and, on the other hand, the presence of material that helps non-pharmacological pain control is infrequent, available in little more than half of the maternity hospitals in Piauí. Although officially recommended, this type of resource is still not routine in most services, usually due to the lack of knowledge of health professionals involved with childbirth care.²⁵ Except for the installation of equipment for immersion baths, they are low cost and considered safe for the pregnant woman and the fetus. By reinforcing the autonomy and active participation of the parturient, there is evidence that non-pharmacological methods determine greater satisfaction for women and shorter labor time.²⁶

When considering the presence of essential drugs at the time of evaluation, it is noteworthy that 25% of public and rural hospitals were considered inadequate. Although this may be a one-off finding, the absence of magnesium sulfate and oxytocin in the services is worrisome, since there is a

consensus that these are the drugs of choice for the prevention and treatment of eclampsia and postpartum hemorrhage, respectively.^{2,3} In Brazil, most cases of near miss and maternal death are more associated with the delay in transporting the woman to more complex hospitals and with the delay in offering adequate treatment in the health services.²⁷ Even considering that maternal death does not occur due to a single factor, the lack of essential drugs may help understand why hypertensive diseases and postpartum hemorrhage are the main causes of maternal death in Piauí.²⁰

The present study has limitations. The services responsible for approximately 90% of hospital births in the state were evaluated, and the parameters analyzed may have been underestimated. It is possible that hospitals with a small volume of annual deliveries and, therefore, of smaller size, have a more inadequate structure. In addition, the execution of the process in childbirth care was not evaluated; nevertheless, it is known that the adequate structure of the services is associated with favorable outcomes for the woman and the newborn.^{6,28} Finally, the verification of the human resources domain was predominantly based on the manager's response and complemented by observation directly from the point record researchers, when available.

This is the first hospital-based study that evaluated the structure of childbirth care in Piauí and, although it does not provide information on processes and outcomes, it presents a preliminary overview of the quality of maternal healthcare facilities in the state. As in the rest of the country, there is almost universality of hospital-based births in the state; however, maternal and perinatal indicators are still a matter of concern. Partially, this can be explained by the deficient structure evidenced by the present study, notably in public maternity hospitals and in the interior of the state. The identification of poorly equipped facilities without specialized professionals points to the need for changes in the hospital structure, especially in the areas of human resources and drugs. Given that the quality of care plays a central role in improving the health of the population, the data point to the need for immediate interventions to structure and organize hospitals in Piauí in order to offer greater equity in the care of pregnant women and newborns.

Acknowledgments

We thank the National Council for Scientific and Technological Development (CNPq) for the financial support.

Authors' contribution

Madeiro A and Rufino AC contributed to the study design, data analysis and interpretation, and manuscript writing. Nunes MDS, Martins VML, Barbosa CM, Sousa

AMC and Acaqui RF collaborated in the study design, data interpretation and relevant critical review of the manuscript's intellectual content. All authors approved the final version and are responsible for all aspects of the work, ensuring its accuracy and integrity.

The authors declare no conflicts of interest.

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Received on July 20, 2020

Final version presented on December 6, 2021

Approved on January 2, 2022