

Research paper

Healthcare model based on personalised attention: impact on maternal mortality and health system quality

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ABSTRACT

Background Latin America's public healthcare model has traditionally offered health services on demand including provision for the most deprived inhabitants. However, this care model has not provided the expected improvement in health conditions or equity for the indigent population.

Aim To compare maternal health indicators between previous services and a new healthcare model based on personalised care and a named healthcare worker.

Methods Pregnant women in La Plata, Argentina were observed during two periods: a control period using a historical model and an intervention period where a new healthcare model was provided, each period lasting 12 months. Indicators of the quality of antenatal care services were measured, including mortality rate, number of pregnancy related consultations, vaccination coverage, gestational age at delivery, newborn weight, laboratory and scan monitoring, early pregnancy detection and type of delivery.

Results The number of patients undergoing antenatal surveillance increased almost five-fold during

the period of the new healthcare model. Also the rate of early detection of pregnancy, average number of health consultations and vaccination coverage were significantly higher with the new model compared with previous care. Maternal gestation at delivery increased from $37.4 \pm 3.8\%$ to $39.3 \pm 2.5\%$ weeks ($P < 0.001$) and neonatal weight increased from 3048 ± 612 g to 3301 ± 580 g ($P = 0.003$). There were no maternal deaths in the intervention group compared with seven deaths in the control group. Child mortality rate was 13.7 and 11.8 per 1000 for control and intervention groups respectively ($P = 0.039$).

Conclusions A named responsible health worker and personalised care helped contribute to improvements in quality of antenatal care in the health system.

Keywords: child mortality, health system, maternal health, named responsibility, primary care, quality

How this fits in with quality in primary care**What do we know?**

The model of public health care in South America has remained unchanged in the last three decades. Although health indicators have shown moderate improvement during that period, results obtained are far from optimal. Many programmes targeting the most vulnerable, especially mothers and children, have focused their efforts on providing greater inputs and resources to the health system. However, the results have been unsatisfactory in terms of hard outcomes such as maternal or child mortality rates.

What does this paper add?

A healthcare model based on personalised monitoring of patients and a named responsible health worker showed favourable effects on maternal indicators. The proposed change includes a shift of focus of health care from organisations to patients, providing dynamic care that follows individuals rather than forcing them to adapt to a static healthcare system.

Introduction

Among the factors that determine a community's health status, social factors and living conditions are often predominant.¹⁻⁶ Scientific and technical advances in medicine during the last century have not resulted in the expected improvements in population health or equity.⁷

Maternal and child health is perhaps one of the most sensitive indicators of health inequality. Differences are reflected in indicators of maternal or child morbidity or mortality.^{8,9} These indicators are also a barometer of health system quality and a measure of the effectiveness of health policies.^{10,11}

La Plata is the capital of Buenos Aires State with 650 000 inhabitants and 12 000 births annually, a number which has remained stable over the past decade.¹² Half the pregnancies are managed in the private health sector, and approximately 6000 are in uninsured people without specific health coverage.¹³ In the last decade, La Plata has become one of the jurisdictions with the highest maternal mortality in Buenos Aires State: 6.9 per 10 000 in 2006. This is hard to believe considering the extent of health services in the area. There are eight state hospitals and 45 municipal primary care health centres (PCHCs),¹⁴ providing many national, state and local programmes for pregnant women. Despite seemingly sufficient services and programmes for the population, outcomes are poor.¹⁵

In 2009 a new care model for maternal care, 'Healthy Mothers and Babies' (HM and B) was introduced by the La Plata municipal health secretary responsible for primary health care. Historically, pregnancy care was delivered free and on demand to uninsured people, either at municipal (first) or state (second) level. Although the primary healthcare system is often considered the best level of care for pregnancy, until 2009 there was a low rate of surveillance in primary care for pregnant women based on the number of births.

Maternal health data comes from the '*Programa Provincial Materno Infantil*' (Maternal and Child State Programme) which provides information to the Statistical Department of the State Ministry. This programme centralises data derived from all PCHCs about pregnancy care. The programme had historical information available up to 2006, so we used this year to compare groups since socioeconomic, demographic and health system conditions were similar between 2006 and 2009.¹⁵

The new HM and B healthcare model for pregnant women involved giving key members of primary health staff the responsibility to provide personalised antenatal care.¹⁶ The care organisation was selected by the pregnant woman based on her own experience or advice from relatives or friends. In order to evaluate this new model we undertook a prospective study comparing the new healthcare model with the previous model, using a historical control group.

Methodology

We undertook a prospective study based on the new healthcare model introduced in 2009. The results were compared with historical controls managed under the previous model of health care. We gathered information from 45 PCHCs and for each woman recruited we obtained information from regular registrations of labour and neonatal care provided by hospital services. The number of PCHCs and hospitals were the same both for 2006 and for 2009.

The study included women living in the district of La Plata, Buenos Aires, Argentina recruited during pregnancy by PCHCs (from day of pregnancy detected until delivery) in 2006 and 2009. Women were included if they lived in La Plata County for at least four weeks during the year of study, even if they were not native to the city. Women were excluded if they did

not live in the city during the period of the study, or if they were from other districts, provinces or countries and stayed in La Plata for less than one month, since this was considered the minimum period in which a positive intervention could affect the chosen maternal indicators.

The intervention group included patients in whom pregnancy was detected during the period 1 January to 31 December 2009 and who fulfilled the inclusion criteria. The control group included patients during pregnancy who were managed using the old healthcare model from 1 January to 31 December 2006, which was the latest period with official state data.

The following indicators were used:

- health coverage: total number of pregnant women during the year
- health surveillance: average number of consultations for pregnancy care¹⁷
- average number of laboratory tests performed
- early pregnancy detection: ratio of pregnancies detected before (a) 14 weeks (b) 16 weeks or (c) 20 weeks to total number of pregnancies during the year
- average number of scans during pregnancy
- rate of tetanus vaccination: ratio of number of pregnant women with complete vaccinations (verified at delivery) to total number of pregnant women during the year
- preventive treatment with folic acid: ratio of number of patients that completed folic acid prophylaxis to total number of pregnant women during the year
- average weight of newborns: weight of newborns from mothers belonging to the group of study to total of pregnant women during the year
- percentage of newborn with low birth weight (weighing less than 2500 grams)
- type of labour termination (percentage of patients that had finished the pregnancy period either by delivery or by caesarean section)
- vaginal delivery: Caesarean section ratio
- maternal deaths associated with pregnancy or childbirth.

We calculated means and standard deviations for continuous variables and proportions for categorical variables. To analyse the differences between means we used a *t* test for matched groups; while for the rates a *Z* score was calculated. For this analysis SPSS version 15 for Windows was used. A *P* value <0.05 was considered for significant difference.

Benefits included in both healthcare models

Pregnancy consultations (three to five consultations during pregnancy is considered optimal), minimum of one laboratory study of screening, one follow up (including blood count, sedimentation rate, blood glucose, factor group, indirect Coombs test and determination of Rhesus status), liver screening, urinalysis and glucose tolerance test.

Model of care for intervention group

On confirmation of pregnancy women chose a health team that would be responsible for monitoring health during pregnancy, or else a team from the nearest PCHC to the patients' home was assigned. Mothers were then admitted under a programme called, 'Healthy Mothers and Babies' (HM and B) in which one member of staff in the primary care obstetric team was responsible for establishing a direct and personal relationship with the mother, ensuring access to the health system and providing her with all antenatal care.

The designated responsible staff member inputted data on the antenatal health care provided into special software designed for the programme. Data were submitted weekly and if a programmed consultation was not done, the responsible staff member was notified and a home visit conducted. Every pregnant woman received free prophylaxis or treatment with folate and also iron if needed.

Results

Analysis of data from the historical control period showed that during 2006, 1569 pregnant women were included in the public health programme; 69.3% did not complete their full number of antenatal consultations by the end of their pregnancy; 71.1% bypassed PCHC care to access the hospital service directly and 80.4% of the mothers did not know who was responsible for their health care during pregnancy.¹⁴ In the old healthcare model, pregnant women accessed the health system on demand when they attended the PCHC, and otherwise they were not provided care until the time of their delivery in the state hospital.¹⁸

During the intervention period (2009), 6668 patients were included in the HM and B intervention programme and results of the programme are shown in Table 1. Among the 6668 pregnant women followed during 2009, maternal illness was detected in 2901 (44.9%). The most frequent conditions were anaemia (in 33.0%) or genitourinary tract infection (10.4% of women). During 2006, anaemia occurred in 41.5% of

Table 1 Maternal and child health indicators comparing intervention (2009) and historical controls (2006)

Variable	2006	2009	P value
Total number of pregnant women	1569	6668	<0.00001
Age of pregnant women	26.74 yrs (SD 7.09)	27.43 yrs (SD 6.21)	*NS
Pregnancy in patients <18 years	26.51%	18.47%	*NS
Early detection of pregnancy			
<14 weeks	31.21%	43.72%	0.04
<16 weeks	44.11%	60.35%	0.01
<20 weeks	69.34%	71.12%	*NS
Average number of consultations for pregnancy care	3.04±13.32	3.93±4.78	0.03
Average number of consultations in high-risk pregnancy	4.23±2.47	6.78±2.09	<0.001
Percentage of patients with antenatal consultations during the third trimester	67.9%	98.8%	<0.001
Nutritional status of mother			
Underweight	14.4%	8.9%	0.01
Normal weight	54.2%	60.8%	*NS
Overweight	21.9%	26.5%	*NS
Obesity	9.5%	3.9%	0.02
Tetanus vaccination coverage (at time of delivery)	60.8%	100%	0.001
Total number of births	876	3307	<0.001
Vaginal delivery: caesarean section ratio	2.5:1	2.9:1	*NS
Gestational age (in weeks) at delivery	37.4±3.8	39.3±2.5	<0.001
Newborn weight at birth (in grams)	3048 (SD 612)	3301 (SD 580)	0.03
Percentage of newborns with low weight at birth	30.85%	6.88%	<0.001
Death of mothers under programme	7 (9**)	0 (7**)	0.001
Rate of maternal mortality in the region	6.9	3.16	<0.001
Child mortality (× 1000) (in first year of life)	13.7	11.8	0.039

* NS: non-significant value ($P>0.05$)

** Overall deaths in mothers in La Plata but not included in the 'control' or 'intervention' groups (because they attended private services or hospitals outside the programme)

pregnant women; data for genitourinary infections were not available.

There were no deaths among the 6668 pregnant women in the HM and B programme during 2009. In the same year, seven maternal deaths occurred, four cases in the private health sector and three cases in mothers who chose to attend hospital using the old

model of health care. During 2006, there were six maternal deaths (and another three maternal deaths in the private health system). The child mortality rate fell from 13.7 per 1000 in 2006 (13.2 in 2007 and 13.1 in 2008) to 11.8 per 1000 in 2009. In absolute terms, there were 159 child deaths in 2006, 155 in 2007 and 158 in 2008. This figure dropped to 142 cases in 2009.

Discussion

Maternal and child mortality rates are indicators that reflect the level of development and health of a country.¹⁹ There are clear differences in these indicators between the developed and non-developed countries of America.²⁰ The exception in Latin America is Cuba, where rates are comparable to North America or Europe.²¹ Many authors agree that the main reasons for Cuba's success is their model of health care, based on primary care, prevention and timely care.²¹ However, there is little conclusive evidence regarding which of these aspects is responsible for those benefits and that health impact.²²

The limitations of our method of using a historical control period included possible baseline differences in the groups, secular trends, external influences and maturation effects.²³ Since 2005, potential confounding influences²⁴ such as other area-wide interventions, health system reorganisations and socio-economic conditions remained broadly unchanged.¹⁵ No other national policy or socio-economic changes that were likely to have affected the changes seen between the control and intervention periods occurred during this period.

There was an increase from 1569 to 6668 pregnant women using the new antenatal care system which itself demonstrates improvement in the organisation of care. Other important changes seen were earlier detection of pregnancy which led to earlier management of pregnancy, an increase in surveillance of high-risk patients (crucial for avoiding fetal and newborns deaths) and greater vaccination rates.

This programme did not have a significant impact on the vaginal delivery/caesarean section ratio which is often affected by other economic factors and legal issues.²⁵ Maternal deaths declined from seven in 2006 to zero in 2009, and although this might not have been directly attributable, the programme may have contributed to these results.

In the old healthcare model in Buenos Aires, only 13% of patients needing a prompt health consultation received one; since they do not perceive themselves to be ill they do not demand attention from the health system.¹⁸ Although in La Plata there were eight hospitals and 45 PCHCs (first level health centres), this huge resource was unable to provide adequate antenatal care during 2006, since only 20% of women had the minimum number of consultations for pregnancy care. By changing the model of health care to assign named responsibility of health workers to patients, the same local health system and resources were able to improve maternal health and reduce maternal mortality.

The HM and B programme focused health system resources (whether they belonged to national, state or local authorities) towards the user, providing care before patients demanded health services. By providing regular contact for patients with the health worker through a programmed visit to a PCHC, a phone call or home visit, the loyalty of the pregnant woman to her named worker was assured for the entire pregnancy and postpartum period. The numbers of pregnant women recruited and followed up during the intervention year were fivefold greater than in the control period. Also, the intervention group number exceeded the numbers of potential users of the public system, which meant that some pregnant women who usually attended the private sector, with health insurance cover to do so, opted for the HM and B programme, providing further evidence to support the benefits of a model based on personalised care and named responsibility.^{16,23}

Many health projects focusing on maternal health have been developed in Latin America and Argentina (e.g. 'Mother and Child', with national funding developed in the 1970s until today and 'Plan *Nacer*/Birth', funded by the World Bank since 2004). All of them, however, have been focused on the provision of inputs and resources to primary care without so far achieving the desired results. Until now, maternal mortality has remained a stable indicator during the last decade in La Plata, Buenos Aires State and Argentina as a whole. Future research should incorporate other social and economic factors likely to be associated with the development of better maternal and newborn care.

In our view, it is not a matter of providing more resources or offering new services. The main problem arises in the model of care. When patient consultations are spontaneous, sporadic and chaotic, and responsibility for care is diluted among staff, little commitment is obtained. It is necessary to engage health workers and patients in the objectives and goals expected. This work serves to demonstrate that a system of named responsibility and personalised attention contributes to improvements in health.

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ETHICAL APPROVAL

The study was an evaluation and therefore did not require ethical approval.

PEER REVIEW

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CONFLICTS OF INTEREST

None.

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