

PRENACEL: Development and Evaluation of an M-Health Strategy to Improve Prenatal Care in Brazil

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Abstract—The quality of prenatal care is key to reduce maternal morbidity and mortality. Communication between the health service and users can stimulate prevention and care. M-health has been an important and low cost strategy to health education. The PRENACEL programme (prenatal in the cell phone) was developed. It consists of a programme of information via SMS from the 20th week of pregnancy up to 12th week after delivery. Messages were about prenatal care, birth, contraception and breastfeeding. Communication of the pregnant woman asking questions about their health was possible. The objective of this study was to evaluate the implementation of PRENACEL as a useful complement to the standard prenatal care. Twenty health clinics were selected and randomized by cluster, 10 as the intervention group and 10 as the control group. In the intervention group, women and their partner were invited to participate. The control group received the standard prenatal care. All women were interviewed in the immediate post-partum and in the 12th and 24th week post-partum. Most women were married, had more than 8 years of schooling and visit the clinic more than 6 times during prenatal care. The intervention group presented lowest percentage of higher economic participants (5.6%), less single mothers and no drug user. It also presented more prenatal care visits than the control group and it was less likely to present Severe Acute Maternal Mortality when compared to control group as well as higher percentage of partners (75.4%) was present at the birth compared to control group. Although the study is still being carried out, preliminary data are showing positive results of the compliance of women to prenatal care.

Keywords—Cellphone, health technology, prenatal care, prevention.

I. INTRODUCTION

THE quality of prenatal care is a key to improve maternal and perinatal health [1]. The low quality of women's health care during prenatal, birth delivery and postpartum is a factor that contributes to the maternal e perinatal mortality in Brazil [2].

Morbidities and mortality developed during pregnancy are associated with low quality of care as it is the case of Severe Acute Maternal Morbidity (SAMM) defined as severe complications of pregnancy, birth or post-partum occurring until 42 days after birth [3]. Some factors such as age, caesarean section, previous abortion or miscarriages as well as

low compliance to prenatal care are pointed out as associated to the development of SAMM and maternal mortality [4].

Maternal Mortality rates in Brazil in 1990 was 143,2 deaths by 100,000 living born and the Millennium Development goal was to reduce in 2015 to 35 deaths by 100,000 living born [5], [6] However, in 2013, the country reached 58.1 maternal deaths by 100,000 living born, a reduction of 59% [7].

Besides maternal mortality rates being not compatible with Brazilian development there is also a high incidence of congenital syphilis in Brazil [8] and other indicators point out to low the quality of care during pregnancy: 75% of Brazilian women had no access to educational groups during prenatal care, 64% had no guarantee of having an companion during birth delivery, as stated by low, 95% had the birth in lithotomy and a vaginal birth with excessive manipulation, oxytocin use or episiotomy [9], [10]. In addition to this picture there is a high dissatisfaction of women with birth assistance since one in four revealed that suffered abuse or violence during the hospitalization for the birth delivery [11].

The quality of health care is a multidimensional concept including among other factors, the use of effective health initiatives, sufficient health infrastructure and appropriate attitudes from health professional [12]. Taking in consideration the characteristics of prenatal assistance in the public health system in Brazil (short and superficial medical consultations) the task of improving maternal and perinatal outcomes and produce satisfaction among pregnant women can be considered a challenge [13], [14]. Another challenge is to overcome the situation of powerless and the lack of information of the users of health system since many do not know their rights. This contributes to the low demand for interventions and the improvement of quality of care.

To establish a communication channel between the health service and its users can stimulate the compliance to the prenatal program, increase the demand for preventive and therapeutic actions, provide information, dissipate doubts, receive complaints and have positive impact in women's mental health. Furthermore, prenatal is an important moment to orientate about breastfeeding, to discuss family planning and contraceptive use, especially due the fact that increasing the interval among pregnancies can protect women's and child health [15], [16].

It has been shown that short message (SMS) disseminated via mobile phone have a positive effect on the health, particularly in the prevention and management of chronic conditions [17]-[23]. This new research and innovation field known as m-Health (mobile health) is considered promising

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	Intervention Group		Control Group	p-value (AIT)	p-value (APP)
	Total ¹ (n=770)	PRENACEL ² (n=116)	(n=440)		
Missing values	19	0	8		
Marital Status					
<i>Living with a partner</i>	609 (81.2%)	103 (88.8%)	345 (80%)	0.6835	0.0417
<i>Not living with a partner</i>	141 (18.8%)	13 (11.2%)	86 (20%)		
Missing values	20	0	9		
Schooling (years)					
< 4	29 (3.9%)	1 (0.9%)	14 (3.3%)	0.3027	0.1786
5-9	289 (38.9%)	41 (35.3%)	145 (34.1%)		
10-12	384 (51.7%)	63 (54.3%)	244 (57.4%)		
> 12	41 (5.5%)	11 (9.5%)	22 (5.2%)		
Missing values	27	0	15		
Paid work					
<i>Yes</i>	387 (53.1%)	56 (48.7%)	213 (52.3%)	0.8525	0.5267
<i>No</i>	342 (46.9%)	59 (51.3%)	194 (47.7%)		
Missing values	40	1	33		
Social Class					
A/B1-B2	64 (10.1%)	6 (5.6%)	51 (14.7%)	0.0002	0.0219
C1- C2	359 (56.8%)	70 (65.4%)	222 (64.2%)		
D-E	209 (33.1%)	31 (29%)	73 (21.1%)		
Missing values	138	9	94		
Colour					
<i>White</i>	281 (37.4%)	44 (37.9%)	177 (41.3%)	0.6643	0.7461
<i>Mulattos</i>	372 (49.5%)	60 (51.7%)	201 (46.9%)		
<i>Black</i>	88 (11.7%)	11 (9.5%)	46 (10.7%)		
<i>Asian</i>	8 (1.1%)	0 (0%)	3 (0.7%)		
<i>Native</i>	2 (0.3%)	1 (0.9%)	2 (0.5%)		
Missing values	19	0	11		
Previous Pregnancies					
0	241 (32.3%)	37 (31.9%)	146 (34.4%)	0.6246	0.9267
1	244 (32.7%)	37 (31.9%)	124 (29.2%)		
2	118 (15.8%)	19 (16.4%)	66 (15.6%)		
3 or more	143 (19.2%)	23 (19.8%)	88 (20.8%)		
Missing values	24	0	16		
Previous Births					
0	287 (38.5%)	45 (38.8%)	170 (40.1%)	0.4902	0.3707
1	241 (32.3%)	37 (31.9%)	130 (30.7%)		
2	128 (17.2%)	23 (19.8%)	63 (14.9%)		
3 or more	90 (12.1%)	11 (9.5%)	61 (14.4%)		
Previous Abortions					
0	619 (83%)	525 (83.3%)	94 (81%)	0.539	1
1 or more	127 (17%)	105 (16.7%)	22 (19%)		
Family Planning					
<i>Wanted pregnancy</i>	302 (43.1%)	58 (51.8%)	160 (41.7%)	0.6848	0.0734
<i>Unwanted pregnancy</i>	398 (56.9%)	54 (48.2%)	224 (58.3%)		
Missing values	70	4	56		
Pregnancy Risk					
<i>Low risk</i>	475 (67.6%)	77 (67%)	279 (71.5%)	0.1966	0.4063
<i>High risk</i>	228 (32.4%)	38 (33%)	111 (28.5%)		
Missing values	67	1	50		
Prenatal Care*					
yes	686 (89.1%)	112 (96.6%)	373 (84.8%)	0.0361	0.0013
no	84 (10.9%)	4 (3.4%)	67 (15.2%)		
Behaviour factors					
<i>Smoking</i>	89 (12.6%)	12 (10.3%)	59 (15.1%)	0.2807	0.2539
<i>Alcohol</i>	140 (19.8%)	14 (12.1%)	66 (16.9%)	0.273	0.2699
<i>Drug use</i>	14 (2%)	0 (0%)	17 (4.3%)	0.0345	0.017
Missing values	62	0	49		

¹ Includes all women from the cluster intervention

² Includes only women who received PRENACEL

* At least six visits to the clinic during prenatal care

TABLE II
SAMM AMONG WOMEN PARTICIPATING OF PRENACEL STUDY, 2015-16

	Intervention Group		Control Group	p-value	p-value
	Standard PNC (n=659)	PRENACEL (n=116)	(n=443)		
SAMM					
Yes	59 (9%)	3 (2.6%)	36 (8.1%)	0.632	0.037
No	600 (91.0%)	113 (97.4%)	407 (91.9%)		

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