CLINICAL ARTICLE

Factors associated with the use of prenatal corticosteroids in the management of preterm delivery in Chinese hospitals

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Xi Wang [a,b], Joshua P. Vogel [c,d], Chu-yun Kang [a,b], Yan-qiu Gao [a,b], Deng Ao [a,b], Ru-yan Pang [a,b], Yan Wang [a,b,*]

[a] Department of Child, Adolescent and Women's Health, Peking University, Beijing, China
[b] Key Laboratory of Reproductive Health, Ministry of Health, Beijing, China
[c] School of Population Health, University of Western Australia, Perth, WA, Australia
[d] Department of Reproductive Health and Research, World Health Organization, Geneva, Switzerland

ABSTRACT

Objective: To assess the prevalence of the use of prenatal corticosteroids (PCS) in the management of preterm delivery and the factors associated with PCS administration. Methods: A secondary analysis was performed of a cross-sectional study conducted in 21 Chinese healthcare facilities between November 2010 and January 2011. The medical records of women who delivered preterm were reviewed. Associations between PCS administration and individual and organizational-level factors were determined. Results: The study population comprised 659 women who delivered at 20 facilities. PCS were given to 158 (68.1%) of 232 women delivering after 27–34 weeks of pregnancy and 119 (27.9%) of 427 delivering after 35–36 weeks. Teenaged girls were less likely to receive PCS after 27–34 weeks than were women aged 20–35 years (odds ratio [OR] 0.22; 95% confidence interval [CI] 0.07–0.70). Among women who delivered after 35–36 weeks, the odds of receiving PCS were lower in urban hospitals than in periurban or rural hospitals (OR 0.04; 95% CI 0.00–0.44), and there was significant hospital-level variance with regard to the administration of PCS ($P < 0.05$). Conclusion: Generally, PCS were underprescribed to women at risk of preterm delivery and many women received the treatment after 35–36 weeks of pregnancy, when it might not have been effective.

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1. Introduction

Preterm birth is one of the principal causes of perinatal mortality and morbidity [1]. Complications of preterm birth account for 35% of the 3.1 million neonatal deaths that occur annually worldwide. In China, 7.1% of deliveries are premature, and the number of preterm deliveries was shown to be the second highest of 184 countries [2].

Prevention of preterm births is challenging; an increasing amount of attention has been paid to attempts to improve the health and survival of preterm neonates. The administration of prenatal corticosteroids (PCS) to mothers at high risk of preterm delivery to hasten the maturation of fetal lung tissue has been shown to be a beneficial prenatal intervention. A Cochrane review of preterm neonates [3] demonstrated that PCS at 26–34 weeks' of pregnancy significantly reduces the risks of respiratory distress syndrome, cerebral hemorrhage, and neonatal mortality.

Despite the well-established evidence of the benefits of PCS, the Bellagio Child Survival Study Group estimated that, on average, only 5% of the target population of mothers at high risk of preterm birth in the 42 countries with 90% of worldwide child deaths in 2000 received PCS [4]. The prevalence of the use of PCS in the management of preterm deliveries in China has not been assessed. Furthermore, the clinical practice patterns of Chinese obstetricians managing women at risk of preterm delivery have not been reported, and hence, whether there are any inequalities or barriers to the administration of PCS in the country has not been determined. Understanding the factors associated with PCS administration could help to increase the use of this effective intervention among women at risk of preterm delivery in China. The aim of the present study was to assess the prevalence of the use of PCS in Chinese hospitals, using data from the WHO Multicountry Survey on Maternal and Newborn Health (WHOMCS), and to investigate the sociodemographic and healthcare-facility factors associated with PCS administration.

2. Materials and methods

The present study was a secondary analysis of the China database in WHOMCS; a detailed description of the methods has been reported elsewhere [5]. Briefly, WHOMCS was a cross-sectional, facility-based study conducted in 29 countries between May 1, 2010 and December

* Corresponding author at: Department of Child, Adolescent and Women's Health, School of Public Health, Peking University, 38 Xueyuan Road, Beijing 100191, China. Tel.: +86 10 82801621; fax: +86 10 62023133.
E-mail address: wangyan@bjmu.edu.cn (Y. Wang).

31, 2011. The project was approved by the WHO Ethical Review Committee and relevant national and subnational ethical boards. It was not necessary to obtain informed consent because data were abstracted from medical records and personal information about the participants remained anonymous.

In China, a stratified, multistage cluster sampling strategy was used to select a sample of 21 healthcare facilities in two randomly selected provinces (Yunnan Province and Zhejiang Province) and Beijing. Healthcare facilities were only eligible for inclusion in the study if they conducted at least 1000 deliveries per year and were able to perform cesarean deliveries. All women delivering in the participating facilities or who experienced a severe complication of pregnancy and delivery (including ectopic pregnancy and abortion) between November 1, 2010, and January 31, 2011, were included.

Trained medical staff abstracted data from the medical records of the study population, including sociodemographic characteristics, obstetric history, medical complications, perinatal outcomes, and interventions received. The healthcare professional(s) responsible for obstetric services were surveyed at each participating hospital to collect facility-level data, such as size, level, and capacity.

All women who delivered preterm neonates with a gestational age of between 22 and 36 weeks were included in the secondary analysis. Women who delivered on arrival at the healthcare facility or within the first 3 hours of admission were excluded from the secondary analysis, because PCS were not a treatment option for these women.

The binary outcome variable for the present analysis was whether or not a woman received a PCS. Any obstetric interventions performed during the study period, including administration of PCS, were performed according to the local standard practice at the participating facilities.

Associations between the administration of PCS and the characteristics of the individual women (maternal age, parity, pre-eclampsia or eclampsia, years of education, and multiple pregnancy) and the organizational characteristics of the healthcare facilities (province, location, level of facility, teaching hospital, and maternal exclusive hospital) were examined. Parity was defined as the number of previous births, excluding the current delivery. A multiple pregnancy was defined as two or more neonates delivered in the current delivery. The level of the facility was defined by official regulations on hospital management developed by the Ministry of Health of China: primary hospitals are typically township hospitals; secondary hospitals are affiliated with a medium-sized city, county, or district; and tertiary hospitals are comprehensive hospitals in cities. Maternity hospitals were defined as a hospital that only provides maternal healthcare services, including obstetrics and gynecology.

Preterm deliveries were stratified according to gestational age. Gestational age was recorded in completed weeks and was defined as the best obstetric estimate of gestational age at delivery. Given that the minimum gestation in the study population was 27 weeks, preterm deliveries were divided into two groups: 27–34 weeks' gestation and 35–36 weeks' gestation.

Univariate and multivariable methods were used to determine the factors associated with the administration of PCS. Owing to the multistage cluster sampling strategy, the data had a hierarchical structure because women were nested in hospitals. Therefore, a two-level (individual and organizational) logistic regression method was used in the multivariable analysis. First, a null model (model 1) was constructed without any explanatory variables. Next, individual and organizational characteristics were added as predictor variables in model 2. The hospital-level variance summarized the between-hospital differences conditional on what variables were specified in the fixed part of the model. Wald tests for the hospital-level variances were carried out to explore whether there was a hospital effect in PCS administration.

Statistical analyses were performed using SPSS version 19.0 (IBM, Armonk, NY, USA) and MLwiN 2.02 software (University of Bristol, Bristol, UK). $P < 0.05$ was considered statistically significant.

Table 1
Characteristics of the study population.[a]

	No. of women (n = 659)
Maternal age, y	
<20	34 (5.2)
20–35	562 (85.3)
≥36	62 (9.4)
Missing	1 (0.2)
Parity	
0	424 (64.3)
1–2	228 (34.6)
≥3	6 (0.9)
Missing	1 (0.2)
Schooling, y	
<8	104 (15.8)
8–12	356 (54.0)
>12	198 (30.0)
Missing	1 (0.2)
Gestation, wk	
27–34	232 (35.2)
35–36	427 (64.8)
Pre-eclampsia or eclampsia	
Yes	82 (12.4)
No	577 (87.6)
Multiple pregnancy	
Yes	52 (7.9)
No	607 (92.1)
Province	
Beijing	165 (25.0)
Zhejiang	385 (58.4)
Yunnan	109 (16.5)
Location	
Urban	624 (94.7)
Periurban or rural	35 (5.3)
Teaching hospital	
Yes	577 (87.6)
No	82 (12.4)
Level of facility	
Primary or secondary	191 (29.0)
Tertiary	391 (59.3)
Other	77 (11.7)
Maternity hospital	
Yes	300 (45.5)
No	359 (54.5)

[a] Values are given as number (percentage).

Table 2
Administration of PCS per hospital at 27–34 weeks or at 35–36 weeks of pregnancy.[a]

Hospital code	27–34 weeks		35–36 weeks	
	No. of deliveries	No. of women given PCS	No. of deliveries	No. of women given PCS
11	11	9 (81.8)	30	0
12	26	10 (38.5)	26	1 (3.8)
13	0	0	2	2 (100.0)
14	4	4 (100.0)	12	2 (16.7)
15	8	7 (87.5)	13	3 (23.1)
16	3	1 (33.3)	9	1 (11.1)
17	4	4 (100.0)	17	15 (88.2)
21	75	56 (74.7)	90	22 (24.4)
22	3	1 (33.3)	10	9 (90.0)
23	30	22 (73.3)	47	6 (12.8)
24	27	18 (66.7)	58	25 (43.1)
25	0	0	17	3 (17.6)
26	1	1 (100.0)	6	2 (33.3)
27	2	1 (50.0)	19	1 (5.3)
31	10	6 (60.0)	14	7 (50.0)
33	2	2 (100.0)	4	1 (25.0)
34	10	9 (90.0)	17	5 (29.4)
35	14	6 (42.9)	23	2 (8.7)
36	0	0	10	9 (90.0)
37	2	1 (50.0)	3	3 (100.0)
Total	232	158 (68.1)	427	119 (27.9)

Abbreviation: PCS, prenatal corticosteroids.
[a] Values are given as number or number (percentage).