Factors Associated With Prescribed Antenatal Care Utilization: A Cross-Sectional Study in Eastern Rural China

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Abstract

With relatively sufficient antenatal health service supplies in eastern rural China, the utilization still needs to be improved. The objective of this study was to identify factors that correlate with antenatal care (ANC) utilization from the demand-side in Jiangsu, China. In a cross-sectional survey, a sample of 896 rural women who had a childbearing history in the previous 5 years answered ANC questions and formed the final analysis. Questionnaire was designed based on Andersen's behavioral model. The outcome variables included receiving times and items of prescribed ANC utilization, and the explanatory variables were organized into 3 hierarchical levels: predisposing, enabling, and need factors. Univariate analysis and multivariate logistic regression analysis were conducted. In the results of multivariate logistic regression, factors significantly associated with ANC examination times included income, odds ratio (OR) (95% confidence interval [CI]) = 2.90 (1.92-4.39); the distance from the nearest hospital, OR (95% CI) = 0.67 (0.47-0.95); chronic disease, OR (95% CI) = 1.77 (1.15-2.72); and parity, OR (95% CI) = 0.66 (0.46-0.95), while factors significantly associated with ANC examination items included education, OR (95% CI) = 8.02 (1.08-59.67); income, OR (95% CI) = 3.90 (1.72-8.85); female medical staff in towns and villages, OR (95% CI) = 2.64 (1.39-5.02); and parity, OR (95% CI) = 0.41 (0.23-0.75). In reducing inadequate ANC utilization in rural area, efforts should be made not only to target the rural women with lower income, lower educational level, and multi-parity, but also to further improve the accessibility of the primary medical facilities and female staff at the grassroots level.

Keywords

antenatal care, prenatal care, maternal health, rural population, cross-sectional studies, surveys and questionnaires, logistic regression, China

Introduction

Antenatal care (ANC) provides a platform for important health care functions, including health promotion, screening and diagnosis, and disease prevention.[1] It has been established that, by implementing timely and appropriate evidence-based practices, regular ANC plays critical role in protecting maternal health and promoting safety childbirth.[2-4] In addition, ANC proportion is the key indicator to measure the achievement of fourth and fifth Millennium Development Goals and involve tackling issues commonly associated with the Sustainable Development Goals.[5,6]

China's progress in maternal and child survival in the past 20 years has been impressive.[7] The advocating and promotion of maternal systemic management which include ANC has been a major driver, besides the increase in institutional delivery.[8,9] During the past decades, antenatal

examination rate increased rapidly for more than 25%.[10] However, it is still not satisfactory. Antenatal care utilization was distinguishing in women with various characteristics.

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Persistent regional disparities have been recognized and the proportion of ANC utilization in rural tends to be lower than in urban.[11]

Moreover, although the percentage of ANC examination (for at least 1 time) has kept pretty high, the percentage of prescribed ANC examination (for at least 5 times) which conforms to the Guideline for Maternal Health Care Service (GMHCC) of China is still low.[12] In 2009, National Health and Family Planning Commission of the People's Republic of China (NHFPC) proposed the rules for basic public health services (BPHS).[13] It also required all pregnant women to attend no less than 5 times of antenatal health services provided by formal medical institutions, and should increase number of tests for some extraordinary conditions.[14] In the GMHCC, the contents of prescribed antenatal examinations should mainly include physical examination, obstetric examination, and laboratory assistant examination.[12] But previous studies showed,[15,16] so far, that the utilization of ANC services was not optimistic in terms of the attending frequency, as well as the coverage of examination items.

Early studies have revealed some important factors associated with low ANC utilization in China from the service-supply side perspective. The inadequate uses were generally related to poor accessibility and quality of maternal health services.[17,18] However, in economically developed east China, both quantity and quality of maternal health service supplies were relatively better than in the central or western regions. Therefore, it is of worth to explore the factors associated with inadequate ANC uses from the demand-side rather than supply-side.

Using Andersen's model as a template, this study seeks to explore risk factors associated with inadequate ANC utilization among rural women in east coast China.

Methods

Data and Sampling

The data for this article were drawn from Health Services Survey (2013) in Jiangsu, China. It is the part of National Health Services Survey (NHSS) collected by the NHFPC. Jiangsu is located in the eastern coast of China and is one of the developed provinces with the highest grade point averages (GDPs). In 2013, 11 counties in rural areas of Jiangsu were covered in this survey. There were 5 counties in the south, 3 in the middle, and 3 in the north.

As part of the NHSS, the sample was representative and chose using a multi-stage stratified cluster random sampling method. First, the counties were chosen randomly. Then, towns were drawn from each county, and then villages were drawn randomly from each town. Finally, the number of households drawn from each village was determined according to the proportion of the number of households.[19]

The investigators were doctors and nurses from local community institutions, as well as college students recruited from the local medical university. After informed consent was explained and accepted, all members of a household were interviewed individually at home by one of the investigators. Survey supervisors were professionals from the local county Centers for Disease Control and Prevention (CDC) and university, and they were responsible for the training of investigators and the quality control of investigations. Ethical approval was obtained from the Medical Faculty Ethics Committee of Nanjing Medical University (No. 316).

Based on the objectives of the study, the participants were women with childbearing history in the past 5 years in rural Jiangsu. Thus, 896 eligible women were included in this study.

Variables

The dependent variables included 2 dichotomous variables indicating ANC utilization. The GMHCC requires that each pregnant woman should receive at least 5 prenatal examinations during pregnancy. So the first dependent variable was whether receiving prescribed ANC examination times (receiving times ≥ 5 or <5). And basing on the ANC examination content specified by GMHCC (the prenatal examinations should cover the main 4 items: blood pressure measurement, blood test, urine test, and B ultrasonic examination), the second dependent variable was whether receiving prescribed ANC examination items (receiving items ≥ 4 or <4).

The behavioral model of health service utilization developed by Ronald M. Andersen is the most widely used theoretical framework for analyzing and predicting the use of health services.[20] According to Andersen's Health Services Utilization Model,[21] 3 dimensions of independent variables were taken into consideration: individuals' predisposing characteristics, enabling resources, and health service need. Age, marital status, educational level, and employment were used as indicators of individuals' predisposing characteristics. Indicators of enabling resources included income, the distance from the nearest hospital, availability of female medical staff in towns or villages, and social medical insurance. With or without chronic disease and parity were chosen as indicators to reflect need for health services. On the basis of the Andersen' model, the selection of independent variables was determined based on previous literature information and consultation with obstetrics experts.

Statistical Analysis

At first, chi-square tests were used for univariate analyses, and then, multivariate logistic analyses were used for the 2 dependent variables. The significance level in the analyses was set as .05 and enter method was selected in the multivariate logistic analyses. Double data entry was performed, and data analysis was performed using SPSS version 20.0 (IBM, New York City, New York).

Results

Characteristics of Study Population

A total of 896 rural women with childbearing history in the past 5 years were enrolled in this study. The average age of these women was 27.7 ± 3.6 years old. The average family income per person varied from 833 Yuan (US$124) to 175,000 Yuan (US$26,078) with a median of 16,000 Yuan (US$2,384). A total of 787 (87.8%) of women were married (Table 1).

ANC Services Utilization

This study only collected the ANC information of the latest childbirth. Distribution of the women's receiving ANC services times is shown in Table 1. Among the 896 respondents, 0.78% never used the ANC services, 19.4% used ANC services less than 5 times, and 79.8% used the services 5 times and above.

The distribution of the items is shown in Table 2. Among the 896 women, 93.5% received all 4 kinds of examination items, 6.0% had not received the blood test, 3.8% had not received blood pressure measurement, 4.5% had not received urine test, and 0.8% of the women had not received B ultrasonic examination (Table 2).

Factors Associated With Receiving Times of ANC Examinations

The results of univariate analyses showed (Table 3)—in terms of enabling resources—income, odds ratio (OR) (95% confidence interval [CI]) = 3.18 (2.12-4.75); the distance from the nearest hospital, OR (95% CI) = 0.63 (0.45-0.88); female medical staff in towns and villages, OR (95% CI) = 1.63 (1.03-2.60); and social medical insurance, OR (95% CI) = 0.85 (0.31-0.95), were significantly associated with times of ANC services utilization. In the aspect of need for health services, chronic disease, OR (95% CI) = 1.77 (1.18-2.66), was a significant impact factor, as well as parity, OR (95% CI) = 0.56 (0.40-0.79).

In the results of multivariate logistic regression, for enabling resources, income, OR (95% CI) = 2.90 (1.92-4.39), and the distance from the nearest hospital, OR (95% CI) = 0.67 (0.47-0.95), was significantly associated with ANC examination times. Among the variables of need for health services, chronic diseases, OR (95% CI) = 1.77 (1.15-2.72), and parity, OR (95% CI) = 0.66 (0.46-0.95), were significantly correlated with the number of ANC examinations. Predisposing characteristics had no significant correlation with examination times (Table 3). The Hosmer-Lemeshow (H-L) test showed good model degree of fit (*P* = .25).[22]

Factors Associated With Receiving Items of ANC Examinations

In the results of univariate analyses (Table 4), education, OR (95% CI) = 9.62 (1.32-70.12), was the only factor in the

Table 1. Characteristics of the Pregnant Women.

Variable (n)	N/mean ± SD	%
Age (896)		
Average	27.7 ± 3.6	
≤27	499	55.7
>27	397	44.3
Marital status (896)		
Not married	109	12.2
Married	787	87.8
Education (896)		
Below high school	774	86.4
High school and above	112	13.6
Employment (896)		
Unemployed	139	15.5
Employed	757	84.5
Income (893)		
Average	17 077.6 ± 13 896.9	
≤16 000	548	61.4
>16 000	345	38.6
Chronic disease (896)		
Without	646	72.1
With	250	27.9
Parity (896)		
Primiparous	568	63.4
Multiparous	328	36.6
The distance from the nearest hospital (896)		
Less than 1 km	452	50.4
1 km or more	444	49.6
Female medical staff in towns and villages (896)		
Unavailable	110	12.3
Available	786	87.7
Social medical insurance (862)		
Without	124	14.4
With	738	85.6
Times of ANC services (896)		
Nonuse	7	0.8
<5 checks	174	19.4
≥5 checks	715	79.8
At least 4 major test items included in ANC (896)		
Yes	838	93.5
No	58	6.5

Note. The mean age was 27. Income indicates the annual per capital income, and 16 000 Yuan was a median of income. Chronic disease includes hypertension, diabetes, or any other chronic diseases diagnosed by a doctor. ANC = antenatal care.

Table 2. Distribution of Receiving Items of ANC Examinations.

Items	Received		Not received	
	n	%	n	%
Blood test	842	94.0	54	6.0
Blood pressure measurement	862	96.2	34	3.8
Urine test	856	95.5	40	4.5
B ultrasonic examination	889	99.2	7	0.8
Total 4 items	838	93.5	58	6.5

Note. ANC = antenatal care.

Table 3. Factors Associated With Times of ANC Examinations.

Variable (n)	Times of ANC services utilization, n (%)		ORu (95% CI)	ORm (95% CI)
	<5 times	≥5 times		
Individuals' predisposing characteristics				
Age (n = 889)				
≤27	98 (19.8)	397 (80.2)	I	I
>27	76 (19.3)	318 (80.7)	1.03 (0.74-1.4)	1.12 (0.78-1.60)
Marital status (n = 889)				
Not married	19 (17.6)	89 (82.4)	I	I
Married	155 (19.8)	626 (80.2)	0.86 (0.51-1.46)	1.02 (0.57-1.83)
Education (n = 889)				
Below high school	152 (19.8)	615 (80.2)	I	I
High school and above	22 (18.0)	100 (82.0)	1.12 (0.69-1.84)	1.05 (0.62-1.80)
Employment (n = 889)				
Unemployed	24 (17.4)	114 (82.6)	I	I
Employed	150 (20.0)	601 (80.0)	0.84 (0.52-1.36)	0.98 (0.58-1.68)
Enabling resources				
Income (n = 886)				
≤16 000 Yuan	140 (25.8)	402 (74.2)	I	I
>16 000 Yuan	34 (9.9)	310 (90.1)	3.18 (2.12-4.75)***	2.90 (1.92-4.39)***
The distance from the nearest hospital (n = 889)				
Less than 1 km	70 (15.9)	370 (84.1)	I	I
1 km or more	104 (23.2)	345 (76.8)	0.63 (0.45-0.88)**	0.67 (0.47-0.95)*
Female medical staff in towns and villages (n = 889)				
Unavailable	29 (27.1)	78 (72.9)	I	I
Available	145 (18.5)	637 (81.5)	1.63 (1.03-2.60)*	1.41 (0.87-2.30)
Social medical insurance (n = 855)				
Without	16 (12.9)	108 (87.1)	I	I
With	156 (21.3)	575 (78.7)	0.85 (0.31-0.95)*	0.68 (0.38-1.22)
Need for health services				
Chronic disease (n = 889)				
Without	140 (21.9)	500 (78.1)	I	I
With	34 (13.7)	215 (86.3)	1.77 (1.18-2.66)**	1.77 (1.15-2.72)**
Parity (n = 889)				
Primiparous	92 (16.2)	476 (83.8)	I	I
Multiparous	82 (25.5)	239 (74.5)	0.56 (0.40-0.79)***	0.66 (0.46-0.95)*

Note. After exclusion of missing data for all covariates in multivariate analysis, n = 852 (95.1%). ANC = antenatal care; ORu = the odds ratio of univariate logistic regression analysis; CI = confidence interval; ORm = the odds ratio of multivariate logistic regression analysis.
*P < .05. **P < .01. ***P < .001.

predisposing characteristics associated with items of ANC examination. All of enabling factors were significantly associated with examination items, including income, OR (95% CI) = 4.85 (2.17-10.82); the distance from the nearest hospital, OR (95% CI) = 0.51 (0.29-0.90); female medical staff in towns and villages, OR (95% CI) = 3.32 (1.81-6.08); and social medical insurance, OR (95% CI) = 0.31 (0.10-1.00). In terms of the need for health services, parity, OR (95% CI) = 0.30 (0.17-0.53), was the significant impact factor.

The results of multivariate model showed that education, OR (95% CI) = 8.02 (1.08-59.67); income, OR (95% CI) = 3.90 (1.72-8.85); female medical staff in towns and villages, OR (95% CI) = 2.64 (1.39-5.02); and parity, OR (95% CI) = 0.41

(0.23-0.75), had significant correlation with the examination items. The Hosmer-Lemeshow (H-L) test showed good model degree of fit (P = .94; Table 4).

Discussion

The survey results showed that most women received antenatal health services during pregnancy in the sampling area. However, there were still 20% who failed to receive adequate ANC examinations which should be 5 times and above according to GMHCC. In view of the coverage of the examination items, over 90% of the pregnant women received all 4 major items. Among the 4 items, B-ultrasound examination

Table 4. Factors Associated With Items of ANC Examinations.

Variable (n)	Covered the main 4 kinds of items, n (%)		ORu (95% CI)	ORm (95% CI)
	Yes	No		
Individuals' predisposing characteristics				
Age (n = 896)				
≤27	467 (93.6)	32 (6.4)	1	1
>27	371 (93.5)	26 (6.5)	0.98 (0.57-1.67)	1.16 (0.65-2.09)
Marital status (n = 896)				
Not married	104 (95.4)	5 (4.6)	1	1
Married	734 (93.3)	53 (6.7)	0.67 (0.26-1.70)	0.70 (0.25-1.97)
Education (n = 896)				
Below high school	717 (92.6)	57 (7.4)	1	1
High school and above	121 (99.2)	1 (0.8)	9.62 (1.32-70.12)**	8.02 (1.08-59.67)*
Employment (n = 896)				
Unemployed	132 (95.0)	7(5.0)	1	1
Employed	706 (93.3)	51 (6.7)	0.73 (0.33-1.65)	0.83 (0.32-2.15)
Enabling resources				
Income (n = 893)				
≤16 000 Yuan	498 (90.9)	50 (9.1)	1	1
>16 000 Yuan	338 (98.0)	7 (2.0)	4.85 (2.17-10.82)***	3.90 (1.72-8.85)***
The distance from the nearest hospital (n = 896)				
Less than 1 km	424 (95.5)	20 (4.5)	1	1
1 km or more	414 (91.6)	38 (8.4)	0.51 (0.29-0.90)*	0.56 (0.31-1.00)
Female medical staff in towns and villages (n = 896)				
Unavailable	93 (84.5)	17 (15.5)	1	1
Available	745 (94.8)	41 (5.2)	3.32 (1.81-6.08)***	2.64 (1.39-5.02)**
Social medical insurance (n = 862)				
Without	121 (97.6)	3 (2.4)	1	1
With	683 (92.5)	55 (7.5)	0.31 (0.10-1.00)*	0.48 (0.14-1.64)
Need for health services				
Chronic disease (n = 896)				
Without	601 (93.0)	45 (7.0)	1	1
With	237 (94.8)	13 (5.2)	1.37 (0.72-2.58)	1.26 (0.64-2.49)
Parity (n = 896)				
Primiparous	547 (96.3)	21 (3.7)	1	1
Multiparous	291 (88.7)	37 (11.3)	0.30 (0.17-0.53)***	0.41 (0.23-0.75)**

Note. After exclusion of missing data for all covariates in multivariate analysis, n = 859 (95.9%). ANC = antenatal care; ORu = the odds ratio of univariate logistic regression analysis; CI = confidence interval; ORm = the odds ratio of multivariate logistic regression analysis.
*$P < .05$. **$P < .01$. ***$P < .001$.

was with the highest participation rate, while blood test was with the lowest one. Based on the Anderson's Health Service Model, this study investigated the influencing factors associated with the ANC service utilization in eastern rural China from the perspective of demand-side. This study revealed education was the only influencing factor in predisposing characteristics and it was associated with the items of ANC examination. Women with higher educational level more likely received at least 4 kinds of ANC examination items. In terms of enabling factors, income was associated with times of ANC utilization. It was also the influencing factor associated with examination items. Women with higher per capita household income more likely received adequate ANC

services both for times and items. Besides income, longer distance from the nearest hospital was a risk factor for the ANC utilization times, and female staff in towns and villages was the protective factor for test items. In the aspect of need for health services, being multiparous was the risk factor associated with both times and items of ANC service utilization. In addition, women with chronic diseases more likely received ANC services 5 times or more than others.

Some previous studies have reported that pregnant women with lower cognitive levels may receive less maternal health care.[23,24] Our findings also showed that educational level affected ANC services utilization. Therefore, it is necessary to conduct in-depth health education for pregnant women,

especially those with low educational level, to raise their awareness of the importance of the ANC. In particular, more education contents should focus on what the essential examination items are, what the benefits of these items are, and what time each examination item should be conducted during pregnancy.

This study found that, even in developed coastal areas of China, the ANC utilization rate was lower among rural women in lower income families. In these areas, there was still the phenomenon that low economic conditions negatively impacted maternal health service uses. Some previous studies reported that the government alleviated the financial burden and improved the utilization rates of medical services by implementing the New Rural Cooperative Medical Scheme (NCMS, the medical insurance widely covered in rural China).[25,26] However, there was also the view that the NCMS played a limited role in promoting ANC uses.[27] This was mainly because the outpatient expenditures such as antenatal examinations were almost out-of-pocket fees, and could not be reimbursed by NCMS like the expenditures of inpatient services.[28]

The results disclosed that the availability of female medical staff in rural primary health care facilities had an impact on the participation rate of ANC. The willingness was low for some rural women to accept the medical examinations provided by male staff due to conceptual or cultural conflict.[29,30] It is recommended that, if possible, female staff was requisite to be arranged into the primary health care institutions. In addition, it is necessary to perform some targeted health education to reduce the negative impact of cultural concept. This study also found that the long distance from the nearest hospital increased the inadequate ANC uses. At present, according to the principle of hierarchical diagnosis and treatment planning in China, some of the specific implementations of ANC services (especially during early pregnancy and mid-pregnancy) are mostly provided in community health institutions.[31] Generally, pregnant women should attach community clinics on their own initiative to consult and follow regular examination arrangements. However, the inconvenience for the long distance from medical institutions might affect women's ANC services seeking behaviors.[32] The above 2 factors including female staff and distance from the nearest hospital are both in terms of the accessibility of medical services. One is for the distribution of health workforce and another is for the setting of health institutions. These findings prompted that health policy makers should proceed adjusting the reasonable allocation of health resources, whether human resources or institutions.

Parity was the important factor reported in the previous literature.[33] In this study, the results revealed that multiparous mothers were less likely to use ANC than primiparous mothers. An early study found ANC was paid more attention at the first birth than at the subsequent births.[34] A number of multiparous women may believe they have enough experiences, knowledge, and skills of childbirth. When undergoing

the second child, they will not concern the ANC as much as the first time. China is actively reforming the population policy, and the "second baby policy" may be due to a rapid rising of multi-parity. So the potential risk factors of rising multi-parity may bring new challenges to maternal health care services. In addition, women with chronic diseases had more ANC uses than others. This might be because women with chronic diseases usually worry whether the diseases would have some bad effects on pregnancy or delivery. This leads these women to participate in more examinations than others. What's more, given the disease histories of pregnant women, doctors would suggest them to take antenatal examinations more carefully and frequently.

There are several limitations to this study. First, the NHSS in China was not specifically designed for aim of the current study. Hence, other related factors, which also might possibly influence ANC utilization, were not included in our study. This may affect the comprehensiveness of the explanation. Second, as this is a retrospective study, memory bias may have occurred. Third, this study was based on partial national data. Due to the disparity in economic development and maternal health conditions in different countries and regions, the results of this study should be extrapolated carefully.

Conclusions

Despite the expressive improvements in adequate ANC use, inequalities in services utilization still persist. The determinants found in this study have useful implications for both maternal health care providers and decision makers. Being poor, having a low educational level, and multi-parity are important barriers against receiving adequate ANC services. The accessibility of medical services provided by female staff in the rural primary medical institutions should be further valued.

Author Contributions

Y.H., Y.T., and G.H. designed the study, performed the final statistical analyses, and prepared the first version of manuscript. K.Y., X.X., and L.X. critically reviewed, commented, and revised the manuscript. B.L. and C.N. participated in the data analysis. All authors were responsible and approved the final manuscript.

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