

BMJ Open What factors hinder ethnic minority women in rural China from getting antenatal care? A retrospective data analysis

Bo Liu,^{1,2} Duorui Shi,³ Wei Wang,⁴ Lei Nan,⁵ Bibo Yin,⁵ Chongyi Wei,⁶ Aga Emu,⁷ Haiqun Zhou,⁷ Wuha Wazha,⁸ Jianming Zhu,⁹ Shumei Wang,¹ Wei Ma¹

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BL and DS contributed equally.

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For numbered affiliations see end of article.

Correspondence to
Dr Wei Ma; weima@sdu.edu.cn

ABSTRACT

Background Mother-to-child transmission (MTCT) is one of the main transmission routes of HIV, and the probability of MTCT can be dramatically reduced with comprehensive interventions. In southwest and western regions in China, the level of development in rural areas is relatively backwards and retains some original features, which also increases the difficulty of controlling infectious diseases. The Liangshan Prefecture started the prevention of MTCT programme in 2009. However, the implementation of the programme is not ideal, and the coverage of HIV testing is still low. Many Yi (local major ethnicity) women did not take antenatal care (ANC) and just gave birth to their babies at home for a variety of reasons.

Methods Women with pregnancy history in the last 5 years were recruited from two townships based on cluster sampling. Face-to-face interviews were conducted to collect data. Descriptive analysis was performed to describe demographic characteristics, history of pregnancy and ANC uptake, knowledge of and attitudes towards ANC. Multivariable analysis was used to identify factors associated with uptake of ANC.

Results Among 538 women who completed the questionnaires, 77.9% knew that ANC was necessary during and after pregnancy. However, only 24.2% actually accessed ANC. Almost all women (94.6%) expressed their willingness to receive ANC for pregnancy but barriers towards actual uptake of ANC existed including shyness, lack of independence and unavoidable cost. Multivariate analysis showed that no experience of living outside of Zhaojue for more than 6 months, higher number of births, not knowing the necessity of ANC during pregnancy and not knowing the government's promotion policies for ANC were associated with lack of ANC uptake.

Conclusion Although ethnic minority women in rural Liangshan expressed strong intention to use ANC, actual uptake of ANC was low. Knowledge of ANC and HIV prevention for MTCT should be improved among this population, and efforts should be made to help them overcome barriers to accessing ANC.

INTRODUCTION

Background

HIV can be suppressed by combination antiretroviral therapy (ART) consisting of

Strengths and limitations of this study

- The subjects of this study were selected from health service provider, the recipient and the hub of them (the key figure in a family), which enriched the research perspective and made information acquisition and research results more comprehensive and objective.
- We only selected women of childbearing age who had pregnancy history in the last 5 years from two towns of Zhaojue, so maybe the findings are not generalisable to all the women of childbearing age in the rural area.
- Due to the mode of survey administration (interviewer-administered face to face), social desirability bias might be introduced.
- It may overestimate the uptake of antenatal care (ANC) because this study only focused on the uptake of ANC of the respondents within the whole 5 years and ignored whether they accepted ANC during the most recent pregnancy.
- Our HIV-related questions were not mother-to-child transmission or prevention for mother-to-child transmission specific, so future studies should consider HIV-related questions that are more relevant to the concerns and needs of pregnant women.

three or more antiretroviral drugs. Elimination of prevention for mother-to-child transmission (PMTCT) of HIV is now considered a realistic public health goal and an important component of a comprehensive HIV prevention package. There were approximately 36.9 million people living with HIV at the end of 2017 with 1.8 million people becoming newly infected in 2017 globally. Fifty-nine per cent of adults and 52% of children living with HIV were receiving lifelong ART in 2017.^{1 2}

A comprehensive approach to PMTCT programmes is promoted by The WHO, which includes: (1) precluding new HIV infections among women of reproductive age; (2) avoiding accidental pregnancies

among HIV-infected women; (3) preventing HIV vertical transmission from an HIV-infected mother to her child; and (4) providing applicable treatment, care and support to HIV-infected mothers, their children and families.³ China has been starting on PMTCT since 2003 and achieved similar progress as other parts of the world.⁴ However, in some remote rural areas, especially regions resided by ethnic minority groups, PMTCT still faces significant challenges. For example, Liangshan Yi Autonomous Prefecture in Sichuan Province, which is situated on a major drug trafficking route of the Golden Triangle, is one of the areas that has the highest HIV infection rate in the past few years.^{5–9} A study reported that HIV prevalence was 4.4% among rural residents in two of the most affected counties in Liangshan prefecture in 2009, Butuo and Zhaojue.⁷ Furthermore, an early study conducted among HIV-positive pregnant women in the prefecture in 2004 found that 7.0% of their infants were tested HIV positive,⁹ which is significantly higher than the national average. Although overall rate of mother-to-child transmission (MTCT) dropped from 10.5% in 2008 to 5.5% in 2013 (unpublished data), MTCT of HIV is still a serious public health concern in this area due to lack of HIV testing, barriers to accessing treatment and care, and poverty and illiteracy among the population.

Antenatal care could provide opportunities to identify undiagnosed cases as well as conduct PMTCT among HIV-positive women. Liangshan Prefecture began to execute PMTCT programme at ANC clinics and hospitals since 2009. In addition to providing regular pregnancy-related check-ups, ANC also includes free HIV testing. However, coverage of PMTCT especially uptake of HIV testing remained low. One of the reasons for such low coverage was that about one-third of local women delivered their babies at home rather than in the hospitals.⁹ Furthermore, even fewer pregnant women accessed ANC before delivery. A study reported that 62% of pregnant women in the prefecture had fewer than five ANC visits during pregnancy, while 26.0% never used any ANC.¹⁰ Therefore, in order to improve the effectiveness of the PMTCT programme, access and uptake of ANC need to be improved substantially.

The study area, Zhaojue County, is an underdeveloped county with one of the highest HIV infection rates in Liangshan.⁷ In addition to the PMTCT programme, the China/UNICEF Conditional Cash Transfer project, which provides incentives for pregnant women to use ANC and deliver in hospitals, has also been implemented in Zhaojue. However, proportions of women who access ANC and have child delivery in hospitals are still below the average level in the prefecture. In order to encourage more women to access ANC and improve coverage, it is necessary to identify factors that may promote or hinder use of ANC among this vulnerable population.

Objectives

The objectives of this study were to describe knowledge, acceptability actual uptake of ANC and to identify factors

associated with lack of ANC attendance among women of childbearing age in Zhaojue County, Liangshan, China.

METHODS

Setting and participants

The survey was conducted in Zhaojue County of Liangshan Prefecture in December 2014. The county is located in east-central Liangshan, southwestern Sichuan Province, with an area of 2700 square kilometres and a population of 308 300. The main (97.9%) local population is the Yi, residing in 47 towns and 269 villages.¹¹

First, we purposively selected two townships that both have larger population and hospitals that provide ANC. Then we divided the villages within the two townships into two layers based on the distance between the villages and the township hospital. The average distance from the villages in the two layers to the township hospitals is 8 km and 15 km, respectively. One village close to the hospital and one far away from the hospital were randomly selected from each township. All eligible women in the selected four villages were invited to participate in the study. Inclusion criteria included: (1) female; (2) aged 49 years or under; (3) had a pregnancy history in the last 5 years; and (4) having resided in Zhaojue County for at least 6 months. The sample size is calculated by the equation $N = Z^2 P(1-P)/d^2$, and $Z = 1.96$, $d = 0.05$. The hospital delivery rate in Liangshan Yi Autonomous Region in 2013 was about 56%, so $p = 0.56$ and $N = 378$. As cluster sampling was conducted, in order to reduce sampling error, we increased the sample size by 50%. So, the sample size is 567.

Study instrument and data collection

A structured questionnaire was developed by local health experts based on literature review, formative research and pilot test. The information collected included: (1) demographic and household characteristics of participants, including age, income, education, ethnicity, occupation, marital status, age of the participant's husband and family size; (2) history of pregnancy, including number of pregnancies, number of births, and whether participants accessed ANC during their pregnancies; (3) whether they know ANC is necessary, ANC is free, where to get ANC and what ANC includes; (4) willingness to utilise ANC measured by a series of yes/no questions, facilitators of and barriers to accessing ANC; and (5) whether they have heard of AIDS and knew someone who was HIV positive.

Interviewers were five local women who were proficient in both Yi (local language) and Mandarin. They were trained by School of Public Health, Shandong University before investigation to ensure study protocol was followed. On account of the general low educational level of some respondents, oral informed consent was obtained from each of them before the face-to-face interview. For respondents who do not know how to write their own names, the investigator signed on their

behalf with their consent. This study is a cross-sectional study that does not involve clinical trials. In consideration of that most of the respondents are illiterate, the ethics committee approved this procedure. The trained investigators directly inquired about the participants and explained to them the thoughts involved in the questions. After confirming that the participants understood the questions, interviewers filled out the questionnaire according to interviewees' answers. Investigators conduct investigations at the village committee, using the 'Prenatal Health Survey Form for Women of Childbearing Age' to conduct investigations. Some respondents may not be present, so researchers need to go to their home for face-to-face investigation until we collect enough data.

Data management and statistical analysis

All the data were double entered with Epidata 3.1, and discrepancies were checked against the raw data. Data analysis was performed with SPSS V.21.0. Descriptive analysis was used to describe demographic characteristics, history of pregnancies and ANC-related variables. To identify independent correlates of ANC uptake, univariate analysis was first conducted through χ^2 tests comparing characteristics of women who accessed ANC during their pregnancy versus those who did not. Variables with p values <0.05 in the univariate analysis were eligible for entry into the multivariable logistic regression model, where adjusted OR and 95% CI were calculated accordingly.

Patient and public involvement

No patients were involved in the development of the research question nor the design of the study. The Zhaojue County Maternal and Child Health Hospital has processed the research results into science knowledge and informed local villagers through several publicity in 2018. In this process, the staff informed the villagers that both men and women should pay attention to antenatal care, and the government will bear most of the costs.

RESULTS

Demographic characteristics

A total of 547 women with pregnancy history in the past 5 years (1 January 2010~31 December 2014) were approached and 538 valid questionnaires were collected, with a response rate of 98.4%. The mean age of participants was 35.6 years, and 7.0% of them were less than 25 years of age. Most participants (86.2%) were illiterate. Almost half (45.1%) had 4–5 family members, while 87 (16.4%) had 1–3 and family members. More than half (56.2%) had 3–4 births. Women in the ≤ 25 -year-old group had the highest proportion of antenatal care at 48.6%. The proportion of participants in the 25–35 age group and the 35–45 age group who participated in antenatal care was 28.6% and 17.5%,

respectively. For the >45 -year-old group, only 9.2% ever took ANC. In the age group with spouse ≤ 25 years, the participation rate of ANC was 44.4%. With the increase of the spouse age group, the participation rate decreased, which was 30.6%, 20.3%, 11.1%. The higher the level of education, the higher the percentage of prenatal examinations. The percentage of women who attended primary and junior high school examinations (35.3% and 33.3%) was significantly higher than the 22.2% who did not attend school. Among women of childbearing age who have lived for more than half a year outside of Zhaojue, the proportion of people who have had antenatal care is 63.9%, which is significantly higher than that of women who have not lived outside of Zhaojue (23.1%). A percentage of 34.5% of women with three or fewer family members ever took ANC, and the proportion of people who too ANC for 4–5 and ≥ 6 was 26.3% and 18%, respectively. In addition, women who give fewer births have a higher rate of participation in prenatal care. Among those with 0–2 births, 33.7% have received ANC, but in those with 4–5 births and 6 or more, this proportion is only 24.3% and 4.4% (table 1).

History, knowledge of and attitude towards ANC

Almost all participants (94.6%) reported that they were willing to use ANC during pregnancy. However, just under a quarter (24.2%) had ever received it. The majority (77.9%) thought ANC was necessary during and after pregnancy, 84.5% thought it was necessary to give birth in hospitals and 83% also knew that ANC and delivery in hospitals were free. However, almost half (45.2%) did not know what ANC included. Almost all of the participants (97.4%) heard of AIDS and more than half (54.7%) knew someone who was HIV infected. Compared with those who ever used ANC, participants who did not were significantly more likely not to have known that ANC was necessary during pregnancy (27.5% vs 5.4%, $p<0.001$), not to have known delivery should be in hospital (17.8% vs 8.4%, $p<0.05$), not to have known ANC and delivery in hospitals are all free (19.4% vs 9.3%, $p<0.005$) and not to have known government encourages ANC (39.1% vs 24%, $p<0.005$) (table 2).

Independent correlates of lack of ANC uptake

In multivariable analysis, women who did not know that ANC during pregnancy was necessary (OR=4.056, 95% CI 3.021 to 14.706) and those who did not know about government's support policy of ANC (OR=2.033, 95% CI 1.292 to 3.195) were less likely to use ANC. Women who never lived outside of Zhaojue for more than 6 months (OR=5.882, 95% CI 2.874 to 12.048) and those who had five or more deliveries (OR=10.989, 95% CI 3.311 to 37.037) were more likely to have not used ANC (table 3).

Table 1 Differences in demographic characteristics between participants who used ANC versus those who did not

	Ever took ANC			P value
	No	Yes	Total	
Age (years)				<0.001
≤25	19 (51.4)	18 (48.6)	37 (7.0)	
26–35	165 (71.4)	66 (28.6)	231 (43.8)	
36–45	160 (82.5)	34 (17.5)	194 (36.8)	
>45	59 (90.8)	6 (9.2)	65 (12.3)	
Husband's age (years)				<0.001
≤25	15 (55.6)	12 (44.4)	27 (5.7)	
26–35	143 (69.4)	63 (30.6)	206 (43.2)	
36–45	137 (79.7)	35 (20.3)	172 (36.1)	
>45	64 (88.9)	8 (11.1)	72 (15.1)	
Education				0.04
Never attended school	360 (77.8)	103 (22.2)	463 (86.2)	
Primary	44 (64.7)	24 (35.3)	68 (12.7)	
Secondary or higher	4 (66.7)	2 (33.3)	6 (1.1)	
Lived out of Zhaojue more than half a year ever				<0.001
Yes	13 (36.1)	23 (63.9)	36 (7.5)	
No	342 (76.9)	103 (23.1)	445 (92.5)	
Household income in the last year (RMB)				0.744
≤1500	93 (44.1)	118 (55.9)	211 (44.1)	
1501–3000	145 (72.5)	55 (27.5)	200 (39.8)	
3001–4500	39 (76.5)	12 (23.5)	51 (10.1)	
≥4500	101 (77.1)	30 (22.9)	131 (26)	
Family members				0.008
≤3	57 (65.5)	30 (34.5)	87 (16.4)	
4–5	177 (73.8)	63 (26.3)	240 (45.1)	
≥6	168 (82.0)	37 (18.0)	205 (38.5)	
Number of delivery				<0.001
0–2	106 (66.3)	54 (33.7)	160 (30.8)	
3–4	221 (75.7)	71 (24.3)	292 (56.2)	
≥5	65 (95.6)	3 (4.4)	68 (13.1)	

ANC, antenatal care.

Facilitators and needs assessment of ANC

When asked about who can influence their decisions of accessing ANC, almost half reported Village Women Federation (47.9%), followed by husbands (43.8%) and parents-in-law (34.7%). The most cited reasons for not using ANC were shyness (33.3%), incapability of going without company (27.3%) and cultural custom (15.2%). In terms of facilitators of ANC, the most popular responses were reimbursement of transportation (73.8%), improved education of ANC among women (64.2%) and linking ANC to issuance of birth certificates (51.9%). About a third of participants (30.9%) thought 50 RMB (about US\$8) for ANC was acceptable and 23.3% thought 100 RMB was acceptable; however, 22.1% was unwilling to pay (table 4).

DISCUSSION

In this study, we investigated knowledge about, acceptance and uptake of ANC among women of childbearing age in an ethnic minority area of China. We also explored factors associated with lack of ANC uptake among these ethnic minority women. We found that majority of participants knew that ANC was free and that it was necessary to use antenatal care during pregnancy, and most of them were willing to use ANC. However, less than a quarter had ever accessed ANC, which is much lower than reported by previous studies. In 1998, The National Health Service Surveys reported that 81% of women used ANC, meanwhile, 76% women in rural areas accessed ANC during 1998–2000.^{12 13} There were a few possible reasons for the low uptake of ANC found in our study. First, the study

Table 2 Differences in knowledge of ANC, HIV and PMTCT between participants who used ANC versus those who did not

	Ever took ANC			P value
	No	Yes	Total	
Knowing ANC is necessary for pregnant				<0.001
Yes	290 (72.5)	123 (94.6)	413 (77.9)	
No	110 (27.5)	7 (5.4)	117 (22.1)	
Thinking delivery should be in hospital				0.037
Yes	332 (82.2)	119 (91.5)	451 (84.5)	
No	72 (17.8)	11 (8.4)	83 (15.5)	
Knowing ANC and delivery in hospitals are all free				0.004
Yes	328 (80.6)	117 (90.7)	445 (83)	
No	79 (19.4)	12 (9.3)	91 (17)	
Knowing what ANC includes				0.436
Yes	225 (55.1)	70 (53.8)	295 (54.8)	
No	183 (44.9)	60 (46.2)	243 (45.2)	
Knowing government encourages ANC				0.003
Yes	235 (60.9)	98 (76)	333 (64.7)	
No	151 (39.1)	31 (24)	182 (35.3)	
Having ever heard AIDS				1
Yes	397 (97.3)	127 (97.7)	524 (97.4)	
No	11 (2.7)	3 (2.3)	14 (2.6)	
Knowing HIV-infected person				0.219
Yes	225 (55.7)	66 (51.6)	291 (54.7)	
No	179 (44.4)	62 (48.4)	241 (45.3)	

ANC, antenatal care; PMTCT, prevention for mother-to-child transmission.

area is undeveloped, many women do not know about the government's policy and they worry about the spending as well as transportation issues. Second, many women in this area are illiterate and non-independent (they said they were not able to go without company). In addition, the cultural custom of not talking about pregnancy and just delivering at home also hinder those pregnant women from taking ANC. Third, the strong intention to use ANC reflected current attitudes among participants, while the actual uptake of ANC covered many previous pregnancies. In recent years, due to the implementation of the PMTCT programme in the area, the proportion of Yi women who delivered in hospitals had increased substantially. However, local governments only started to encourage and support ANC access a couple of years before the current survey. There were some informational and educational materials of ANC being distributed, but most women in the rural areas of Zhaojue were illiterate.

We found that women who understand the need for ANC during pregnancy or who understand the government's support policies for ANC are more likely to have received ANC. We also found that having had five or more deliveries was negatively associated history of taking ANC. Women with more pregnancies tended not to take ANC for two possible reasons: (1) these women were older and

less educated, thus their knowledge of ANC was relatively poor and they may have no ability to communicate with healthcare professionals. (2) They might think that they had successfully experiences of delivering babies therefore it is no need to care about ANC. The results of our study were similar to studies in other developing countries. For example, in the systematic review by Simkhada *et al*, factors associated with the utilisation of ANC were: education level of pregnant women and their spouses, health service accessibility, cost, family income and so on. They also found that the attitude towards pregnancy could impact the utilisation of ANC, and there was an inverse correlate between the previous pregnancy and the utilisation of ANC.¹⁴ Some studies conducted in China also had similar findings. For example, Liu and Ceng conducted studies individually in 2007 and 2010, and they found factors associated with the intention and uptake for pregnant women to take ANC could be summarised into three categories: (1) demographic characteristics of pregnant women and their spouses such as low education level, older age and low economic level; (2) number of children; and (3) policies such as birth control leading the worry about being punished even forced abortion.^{15 16}

Surprisingly, we found that having ever heard of AIDS and knowing someone who was HIV-infected were not

Table 3 Multivariable analysis of independent correlates associated with having not used ANC

	Having not used ANC	
	OR	95% CI
Age (years)		
≤25	1	
26–35	4.464	(1.170 to 4.785)
36–45	4.464	(2.119 to 9.346)
>45	9.346	(3.236 to 27.027)
Husband's age (years)		
≤25	1	
26–35	1.815	(0.804 to 4.098)
36–45	3.135	(1.346 to 7.299)
>45	6.410	(2.227 to 18.519)
Education		
Secondary or higher school	1	
Primary or lower	2.748	(1.967 to 3.165)
Lived out of Zhaojue more than half a year ever		
Yes	1	
No	5.882	(2.874 to 12.048)
Number of deliveries		
0–2	1	
3–4	1.585	(1.038 to 2.421)
≥5	10.989	(3.311 to 37.037)
Is ANC for pregnancy necessary?		
Yes	1	
No	4.056	(3.021 to 14.706)
Is giving birth in hospitals necessary?		
Yes	1	
No	2.151	(0.884 to 5.235)
Knowing ANC and delivery in hospitals are all free		
Yes	1	
No	2.347	(1.235 to 4.464)
Knowing government encourages ANC		
Yes	1	
No	2.033	(1.292 to 3.195)
Family size		
1–3	1	
≥4	2.062	(1.290 to 3.745)

ANC, antenatal care.

associated with uptake of ANC. A possible reason is that women might not be aware of HIV testing services provided by ANC or that HIV was not one of the top health concerns during their pregnancy, and knowledge of HIV and perceived threat of HIV were not sufficient to motivate them to get themselves tested during ANC.

Table 4 Facilitators and needs assessment of ANC among participants

Items	Frequency (%)
People who affect the decision of ANC	
Spouse	232 (43.8)
Parents-in-law	184 (34.7)
Parents	31 (5.8)
Family	5 (0.9)
Village doctor	105 (19.8)
Village Women Federation	254 (47.9)
Others	108 (20.4)
No idea	10 (1.9)
Refuse to answer	2 (0.4)
People who support to use ANC	
Spouse	287 (53.9)
Parents-in-law	253 (47.6)
Parents	122 (22.9)
Family	7 (1.3)
Village doctor	236 (44.4)
Village Women Federation	382 (71.8)
Others	27 (5.1)
No idea	6 (1.1)
People who oppose to use ANC	
Spouse	9 (1.9)
Parents-in-law	10 (2.1)
Village doctor	18 (3.8)
Village Women Federation	25 (5.2)
Others	427 (89)
No idea	12 (2.5)
Refuse to answer	8 (1.7)
Reasons for objecting to using ANC	
Cultural custom	5 (15.2)
Incapability of going for ANC without company	9 (27.3)
Shyness	11 (33.3)
Cost of transportation	2 (6.1)
Others	10 (30.3)
Refuse to answer	5 (15.2)
How to promote the usage of ANC	
Carrying out health education to women	340 (64.2)
Carrying out health education to spouses	100 (18.9)
Getting reimbursement for transportation	391 (73.8)
Issuing birth certificate based on ANC	275 (51.9)
Others	27 (5.1)
No idea	24 (4.5)
Money willing to pay for ANC	

Continued

Table 4 Continued

Items	Frequency (%)
Unwilling to pay anything	110 (22.1)
<50	154 (30.9)
<100	118 (23.7)
<200	99 (19.9)
<500	15 (3.0)
≥500	1 (0.2)
Favourable accompanying person taking ANC	
Husband	162 (39.2)
Mother or mother-in-law	82 (19.9)
Family	16 (3.9)
Women's association of village	140 (33.9)
Village doctor	1 (0.2)
Others	12 (2.9)

ANC, antenatal care.

Findings from our study suggest that future efforts to increase uptake of ANC and improve PMTCT should focus on the following aspects: (1) improve knowledge of ANC among pregnant women, especially among those with low education or illiterate. For example, instead of text-based educational materials, picture-based materials should be distributed. In addition, mini-dramas or plays demonstrating the importance and benefits of ANC could be conducted at community events; (2) improve accessibility of ANC, which may involve infrastructure construction, provision of user-friendly services and so on. In this study, many participants did not know places where ANC is offered, and there were also many participants halted because of the long distance and cost in journey. Therefore, making ANC more accessible is urgent. A good service attitude is another approach to attract pregnant women since one who had good experiences with ANC could put other women in motion;. (3) mobilise community and family members to encourage ANC during and after pregnancy. Women in poor rural area are more likely to be lack of independence. In other words, they are not used to make decisions towards something important. So, the call of community and support of family would give them courage and belief to overcome the psychological barriers. It would make a big difference if their family members and the community encourage them to accept ANC during pregnancy. (4) HIV screening should continue to be offered at ANC clinics in order to prevent mother-to-child transmission of HIV. The knowledge of the effectiveness and benefits of PMTCT should be improved among women and among their families and other community members.

Although there are important discoveries revealed in this study, there are also limitations. First, the findings may not be generalisable to all the women of childbearing age in the rural area because we only selected women

of childbearing age who had pregnancy history in the last 5 years from two towns. Second, due to the mode of survey administration (interviewer-administered face to face), social desirability bias might be introduced. Third, we only focused on the uptake of ANC of the respondents within the whole 5 years and ignored whether they accepted ANC during the most recent pregnancy, so it may overestimate the uptake of ANC. Last, our HIV-related questions were not MTCT or PMCT specific, so future studies should consider HIV-related questions which are more relevant to the concerns and needs of pregnant women.

As a result, the Zhaojue County Maternal and Child Health Hospital gave a publicity to the villagers, therefore, targeted measures were taken to encourage the villagers to conduct ANC.

CONCLUSIONS

In summary, although the actual uptake of antenatal care among women of childbearing age in this rural minority area is lower than other areas, women in the region have strong intention to ANC. No experience of living outside, higher number of births, not knowing the necessity of ANC during pregnancy and not knowing the government's promotion policies for ANC were associated with lack of ANC uptake. ANC targeting PMTCT in China may need to be more comprehensive and incorporate the cultural, logistic and needs of the population in order to effectively affect this population's utilisation of ANC.

Author affiliations

- ¹Department of Epidemiology, Shandong University School of Public Health, Jinan, China
²School of Health Care Management, Shandong University, Jinan, China
³School of Public Health and Primary Care, The Chinese University of Hong Kong, Hong Kong, China
⁴Department of TB Control and Prevention, Zhejiang Provincial Center for Disease Control and Prevention, Hangzhou, China
⁵Department of AIDS Control and Prevention, Liangshan Prefecture Center for Disease Control and Prevention, Xichang, China
⁶Department of Epidemiology and Biostatistics & Global Health Sciences, University of California, San Francisco, California, USA
⁷Zhaojue Maternal and Child Care Service Centre, Zhaojue, China
⁸Zhaojue Zhuhe Central Hospital, Zhaojue, China
⁹Zhaojue Abingluogu Central Hospital, Zhaojue, China

Contributors BL, LN, CW and WM conceived and designed the study. BL, DS and WeW trained interviewers. BY, AE, HZ, WuW and JZ assisted respondents to fill out the questionnaire. BL and DS analysed the data. BL, DS and SW contribute to writing the manuscript. CW and WM critically revised the paper. All authors read and approved the final manuscript.

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Competing interests None declared.

Patient consent for publication Not required.

Ethics approval The study protocol was approved by the Ethical Review Committees of the WHO (RPC587) and Shandong University School of Public Health

(20130602). Study procedures, voluntary nature of participation, participants' right to withdraw and autonomy of the participants were explained and oral informed consent was obtained from all participants.

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Data availability statement The data used to support the findings of this study are available from the corresponding author upon request.

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