

Effect of flexible patterns of health education on enhancing the compliance of pregnant women from Tibet, China

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Abstract

Prenatal examination is a pivotal measure to prevent high-risk pregnancy and to ensure the safety of both mother and infant. However, pregnant women in Linzhi Prefecture in the Tibet Autonomous Region (TAR) often cannot obtain regular prenatal examinations due to limited accessibility of healthcare facilities, shortage of medical staff, and lack of medical equipment. Health education is an important approach to solve this ever-growing issue of pregnant women in rural Tibet.

To evaluate the efficacy of flexible methods of health education programs on improving compliance among pregnant women from Tibet, China.

In May to November of 2018, a total of 168 pregnant women receiving prenatal examination in a tertiary referral hospital in Linzhi Prefecture were recruited and randomly assigned to a control (n=85) and intervention group (n=83). All pregnant women were followed up until delivery. The pregnant women in the control group received regular prenatal examination and health education programs. Other than receiving routine prenatal care, participants of the interventional group also voluntarily joined the WeChat Social Messaging platform. Online resources posted by the maternity schools provided convenience and flexibility for the pregnant woman. The number of prenatal examinations was statistically significant between the 2 groups. The effect of flexible patterns of health education programs on improving the compliance of pregnant women in Tibet was assessed.

The number of prenatal examinations in the intervention group was 2.646 times, which was higher than that in the control group ($P < .01$). Multivariate analysis demonstrated that interventional measures and ethnicity were the influencing factors of the number of prenatal examinations for pregnant women in Linzhi after the adjustment of age, history of adverse pregnancy, education level, ethnicity, multiparity, gestational complications, and medical history. The number of prenatal examinations for the pregnant Tibetan women was 0.535 times lower compared with that of the pregnant Han women (95% CI: -0.089, 1.157, $P = .091$).

Flexible forms of health education during the antenatal period can effectively increase the compliance of pregnant women in Tibet.

Abbreviation: TAR = Tibet Autonomous Region.

Keywords: compliance, health education, pregnant woman, prenatal examination, Tibet

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JC and JH have contributed equally to this work.

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Paper context: Pregnant women in Tibet often cannot obtain regular prenatal examination due to poor health education. WeChat platform, online resources, and flexible patterns of health teaching were used to improve the health care situation for pregnant women in Tibetan. Extensive efforts should be made to persistently strengthen the health education and popularize health care knowledge during pregnancy, potentially enhancing the compliance of Tibetan pregnant women with prenatal examinations.

The authors have no conflicts of interest to disclose.

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1. Introduction

Antenatal care refers to the routine prenatal examinations in pregnant women, providing timely diagnosis and treatment of potential pregnancy abnormalities and to monitor intrauterine fetal conditions, which in combination is a pivotal measure to prevent a high-risk pregnancy and to ensure the wellbeing of mother and infant.^[1] Strict gestational care and necessary obstetric nursing are vital features to guarantee the safety of both mother and infant.^[2] Early antenatal care can provide the most effective screening and tests for congenital hereditary diseases and sexually transmitted diseases. In addition, it can also provide guidance for patients diagnosed with non-communicable diseases, by methods such as lifestyle changes in patients with diabetes mellitus.^[3] Prenatal examinations cannot thoroughly prevent the occurrence of gestational complications but has proven to reduce the impact of potential issues due to timely discovery of early manifestations and plays a vital role in lowering the mortality rate.^[4,5] Health education is an important approach to promote the patients' self-management and rehabilitation of certain diseases. Furthermore, basic health education can enable patients to detect some of the early clinical signs and symptoms of diseases and prevent potential complications. It is an essential part of prenatal care and an independent factor affecting the number of prenatal examinations.^[6–8] The establishment of an antenatal school for Tibetan women is an effective way to carry out health education programs during the prenatal period and is an essential step to promote maternal health care for women and their families. Moreover, this program can integrate medical services and health education.^[9,10] Antenatal schools provide a location for pregnant women and health caregivers to encourage the provision of care and support throughout pregnancy, encouraging safe motherhood programs.

Tibet Autonomous Region is located in the southwest border of China. It has a scattered population, inconvenient transportation, and a relatively low education level amongst farmers and herdsmen. Pregnant women obtain maternal health care knowledge primarily from the elders, television, and the Internet. Prenatal examinations are mainly conducted in the township health centers with limited access to advanced technology, shortage of medical equipment and supplies, which can severely impact the accessibility to quality health care.^[11] The gravity of health care education has affected the number of pregnant women in Tibet from attending antenatal health education programs, which conversely results in neglect of primary maternal and fetal health. Some Chinese researchers have previously demonstrated that the self-care proficiency of pregnant women can be significantly enhanced through group messaging platforms and/ or online antenatal classes.^[9,12] WeChat is a novel communication tool, which can provide audio, video, text, picture with text, and other functions that compensate limitations of traditional text messages.

The application of WeChat in systematic health education for pregnant women in the remote areas has not been reported. In this study, WeChat was firstly applied in the joint education between the antenatal schools from the First Affiliated Hospital of Sun Yat-sen University in Guangzhou and a tertiary hospital in Linzhi, Tibet. The effect of distance education combined with useful health education of antenatal schools can improve the compliance of pregnant women in the Tibetan region.

2. Materials and methods

2.1. Study subjects

A total of 168 pregnant women who were registered for regular prenatal care in the obstetrics outpatient of a tertiary hospital in Linzhi from May to November 2018 voluntarily participated in this study. The registration number was determined by the expected date of delivery. Pregnant women with the odd final number of the registration number were assigned into the control group and their even number counterparts were allocated into the intervention group. In the control group, the pregnant women were aged (28.48 ± 4.68) (mean \pm s) years on average and received routine prenatal health education. The average age in the intervention group was (27.98 ± 4.67) years. The pregnant women in this group also received prenatal examinations, received online resources from the antenatal schools, and voluntarily joined the WeChat Social Messaging platform. They were required to attend ≥ 3 online courses organized by the antenatal school. The age, history of pregnancy and delivery, educational level, and complications did not significantly differ between 2 groups (all $P > .05$), whereas the distribution of ethnicity significantly differed between 2 groups ($P < .05$), as illustrated in Table 1.

2.2. Methods

2.2.1. Data collection. The data collection was completed face-to-face by a nurse from the Department of Obstetrics who was fluent in both Mandarin and Tibetan dialect. The data collected included maternal age, history of delivery, date of the last menstrual period, expected date of delivery, relative data of the spouse, etc. The archived data were classified and stored according to the month of the expected date of delivery for convenient access and preservation. All pregnant women who participated in the course provided by the antenatal school shared online resources and joined the social media exchange platform for pregnant women were registered and recorded. The data collected from each prenatal examination were input into a specific system, which delivered real-time recordings of the number of prenatal examination and gestational conditions.

Official permission and approvals were obtained from the study setting and the Ethical Committee of the Faculty of Nursing and the Department of Gynecology and Obstetrics from the First Affiliated Hospital of Sun Yat-sen University. Written consents were obtained from the study participants. Anonymity and complete confidentiality were established.

2.2.2. Education method. The prenatal examination which included abdominal examination, pelvic measurement, and vaginal examination in this study was conducted by 2 professional obstetricians. In the intervention group, the health education course instructors from the antenatal school were responsible for providing knowledge through WeChat social media platforms, including the WeChat platform for pregnant women was established by 2 course instructors from the antenatal school to share gestational knowledge from Monday to Friday on a weekly basis. Pregnant women could communicate with each other and ask questions related to pregnancy and delivery, and the instructors were responsible for answering questions and resolving their doubts. Instructors would regularly collect, analyze, and sort out the hot topics discussed on the WeChat platform. In addition, instructors sent out the course

Table 1
Comparison of baseline data between the control and intervention groups.

Variable	Total (n, %)	Intervention group (n = 83)	Control group (n = 85)	Statistics	P-value
Age					
Median (quartile Q1, Q3), y	28.00 (25, 32)	28.00 (24, 32)	28.00 (25, 31)	-0.455	.649*
History of adverse pregnancy					
No	164 (97.6%)	82 (98.8%)	82 (96.5%)	0.976	.621†
Yes	4 (2.4%)	1 (1.2%)	3 (3.5%)		
Educational level					
Illiteracy	26 (15.5%)	12 (14.5%)	14 (16.5%)	3.000	.392
Primary school	33 (19.6%)	19 (22.9%)	14 (16.5%)		
Junior school/Secondary school	29 (17.3%)	17 (20.5%)	12 (14.1%)		
University/College	80 (47.6%)	35 (20.8%)	45 (52.9%)		
Ethnicity					
Tibetan	128 (76.2%)	65 (78.3%)	63 (74.1%)	7.200	.027
Han	22 (13.1%)	14 (16.9%)	8 (9.4%)		
Moinba/Lhoba/Hui	17 (10.7%)	4 (4.8%)	14 (16.5%)		
Multipara					
No	104 (61.9%)	52 (62.7%)	52 (61.2%)	0.039	.844
Yes	64 (38.1%)	31 (37.3%)	33 (38.3%)		
Complications					
No	122 (72.6%)	63 (75.9%)	59 (69.4%)	0.890	.346
Yes	46 (27.4%)	20 (24.1%)	26 (30.6%)		
History					
No	163 (97.0%)	82 (98.8%)	81 (95.3%)	1.783	.191†
Yes	5 (3.0%)	1 (1.2%)	4 (4.7%)		

* Non-parametric test; Wilcoxon rank sum test.

† Fisher exact test.

schedules and notifications of the antenatal school programs through the WeChat platform to enable the parents to make full preparation for the classes to be thought. After following the WeChat public account and filling out basic personal information, pregnant women were able to access the short-video courses pre-recorded by the antenatal school. The videos and infographics were supplemented with Chinese subtitles to naturally assist and lowered the burden for women of lower education background. There were in total of 362 animated videos, averaging about 5 minutes each. After every video, there was a short quiz which assessed the participant's comprehension of the video context. The online platform could automatically screen out suitable videos for pregnant women according to their medical history, personal history, and possible worries throughout the gestational period. The antenatal school sent out individualized prenatal care information and scheduled morning reminders on the day of prenatal examination. Traditional classroom courses were delivered once every 2 weeks. The course contents were determined by 2 instructors based upon participant's questionnaires distributed prior to class. According to the survey report and the health care information taught during different gestational stages, spouses, and other guardians were encouraged to participate in the course. A participant-led discussion was held after every class and the instructors would provide additional detailed explanations of the hot topics discussed on the WeChat platform of the antenatal school. Commonly raised topics include prenatal supplements, nutrition, exercise, sexual intercourse, and antenatal examination scheduling. Both a native Tibetan nurse and medical specialist of obstetrics and gynecology were recruited in this study to set up a perinatal health care card. During regular prenatal check-ups, information such as maternal weight, fundal height, lab tests was collected. In addition, this newly established antenatal school

abrogated the communication barrier between concerned pregnant woman and their medical specialist.

2.3. Statistical analysis

Epidata 3.0 software was utilized to establish the database. SPSS 20.0 statistical software (SPSS Inc., Chicago, IL) was used for statistical analysis.

3. Results

3.1. Comparison of the number of prenatal examinations between 2 groups

The number of prenatal examinations in the intervention group was 4.46 ± 1.63 , significantly higher compared with 1.81 ± 1.06 in the control group (95% CI: 2.229, 3.064), as demonstrated in Table 2.

3.2. Analysis of influencing factors of the number of prenatal examinations

Univariate analysis demonstrated that the number of prenatal examinations in the intervention group was 2.646 (95% CI: 2.229, 3.064) more than that in the control group. The number of prenatal examinations for pregnant women with junior school or equivalent education was 1.028 (95%: 0.017, 2.039) more than that for illiterate counterparts. The number of prenatal examinations for Tibetan pregnant women was 0.878 (95%: 0.017, 1.738) less than that for Han pregnant women.

The variables with statistical significance ($P < .05$ by univariate analysis) and imbalance baseline variables were included for stepwise multivariate analysis, suggesting that

Table 2
Comparison of the number of prenatal examinations between the control and intervention groups.

Variable	Total (mean/median)	Intervention group (n=83)	Control group (n=85)	Statistics	P-value
Number of prenatal examinations ($\bar{x} \pm s$, y)	3.12 \pm 1.90	4.46 \pm 1.63	1.81 \pm 1.06	9.351	<.001
Number of prenatal examinations Median (quartile Q1, Q3), y	3.00 (1.00, 4.50)	4.00 (3.00, 6.00)	1.00 (1.00, 2.00)	12.46	<.001*

* Non-parametric test; Wilcoxon rank sum test.

intervention measure and educational level were the influencing factors of the number of prenatal examinations for pregnant women ($R^2=0.499$). The number of prenatal examinations in the intervention group was 2.665 (95% CI: 2.242, 3.089) more compared with that in the control group. Compared with Han pregnant women, Tibetan pregnant women, and those of other ethnic groups received fewer prenatal examinations by 0.535 on average (95% CI: -0.087, 1.157) ($P=.091$). No statistical significance was found in other variables as shown in Table 3.

4. Discussion

The main findings of this study demonstrate that compliance to health care during pregnancy in Tibetan areas is significantly improved after effective flexible health education. The number of prenatal examinations in the intervention group was 2.665 (95% CI: 2.242, 3.089) more than that in the control group. The inconvenient transportation system in Tibet has made it difficult for pregnant women to attend the classes in the antenatal schools. The online antenatal health education programs and the WeChat platform play a pivotal role in coordinating the work of the antenatal schools and ultimately provides a convenient channel for pregnant women and their families to educate themselves at home. They can freely access online classes without the restriction of time and location. Despite limitations in sample collection of participants from a similar education background as a starting point, our sample composed of 15.5% uneducated Tibetan women. In order to make the highly comprehensive and relevant content more

accessible, our instructors and research design team developed multimodality tools to abate the difficulty of common Chinese character comprehension in women of low educational level. However, this study did not evaluate the difference in justifying the lack of compliance in women of different education levels. The online antenatal school sends individualized prenatal care information and provides reminders of prenatal examination. WeChat platform can not only facilitate the communication amongst pregnant women and their instructors but also enable them to receive important course information delivered by the antenatal schools. Instructors of the antenatal school releases the course content and schedule in advance to facilitate pregnant women to choose suitable courses according to their individual situations and requirements. Instructors can also monitor the class progress of the pregnant women according to their check-in data. Persistent, effective, and comprehensive cooperation is conducive to the work implementation of antenatal schools and to enhance the enthusiasm and compliance of pregnant women with prenatal examinations.

Univariate analysis demonstrates that the number of prenatal examinations for pregnant women who received junior school and equivalent education was 1.028 (95% CI: 0.017, 2.039) more than that for those who received primary school education or below. The number of prenatal examinations for Tibetan pregnant women was 0.878 (95% CI: 0.017, 1.738) less than that for Han pregnant women. However, multivariate analysis reveals that ethnicity does not statistically influence our results but could be caused by possible interaction among other influencing factors. In addition, a majority of the population in this survey are Tibetan pregnant women, and the sample is unevenly

Table 3
Analysis of influencing factors of the number of prenatal examinations in pregnant women.

Variable	Single factor analysis		Multivariate analysis		
	β	95% CI	β_{adjust}	95% CI	$\beta_{\text{standardized}}$
Intervention (vs control)	2.646	(2.229, 3.064)***	2.665	(2.242, 3.089)***	0.702
Age	-0.052	(-0.114, 0.010)			
History of adverse pregnancy and delivery (vs no)	-0.890	(-2.794, 1.013)			
Educational level					
Primary school (vs illiteracy)	0.300	(-0.682, 1.281)			
Junior school/Secondary school (vs illiteracy)	1.028	(0.017, 2.039)*			
University (vs illiteracy)	0.319	(-0.526, 1.164)			
Ethnicity					
Tibetan (vs Han)	-0.878	(-1.738, -0.017)*	-0.535	(-1.157, 0.087)	-0.120
Moinba/ Lhoba/Hui (vs Han)	-1.131	(-2.317, 0.054)	-0.027	(-0.899, 0.844)	-0.004
Multipara (vs no)	0.413	(-0.182, 1.009)			
Complications (vs no)	-0.014	(-0.667, 0.638)			
History (vs no)	-1.153	(-2.856, 0.550)			

Multivariate regression analysis: $R^2=0.499$.

* <.05.

*** <.001.

distributed. In subsequent studies, the sample size should be enlarged, and multifactorial factors which could affect number of prenatal examinations for pregnant women should be comprehensively considered.

5. Conclusion

After efficacious health education, the health care compliance for pregnant women in Tibetan areas has been significantly improved. This educational intervention can present as an exemplary proposition to be applied in clinical practice. Comprehensive and flexible health education contributes to sharing high-quality medical resources, enabling pregnant women in Tibet to receive health education from tertiary referral hospitals. Lack of adequate health care knowledge during pregnancy is the main influencing factor of the optimizing health care throughout the gestation period. Extensive efforts should be made to persistently strengthen the health education and popularize health care knowledge during pregnancy, eventually enhancing the compliance of Tibetan pregnant women with prenatal examination.

Author contributions

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References

- [1] Kuo K, Zhu TY, Raidoo S, et al. Partnering with public schools: a resident driven reproductive health education initiative. *J Pediatr Adolesc Gynecol* 2014;27:20–4.
- [2] Chen DJ, Yu Lin. Reduce the incidence of stillbirth by prevention and pay attention to the etiological management. *Chin J Prac Gynecol Obstetr* 2018;34:1318–21.
- [3] Early antenatal care visit: a systematic analysis of regional and global levels and trends of coverage from 1990 to 2013. *Lancet Glob Health* 2017;5:e977–83.
- [4] Jauniaux E, Bhide A. Prenatal ultrasound diagnosis and outcome of placenta previa accreta after cesarean delivery: a systematic review and meta-analysis. *Am J Obstet Gynecol* 2017;217:27–36.
- [5] Liem S, Schuit E, Hegeman M, et al. Cervical pessaries for prevention of preterm birth in women with a multiple pregnancy (ProTWIN): a multicenter, open-label randomized controlled trial. *Lancet* 2013;382:1341–9.
- [6] Huang Y, Shallcross D, Pi L, et al. Ethnicity and maternal and child health outcomes and service coverage in western China: a systematic review and meta-analysis. *Lancet Glob Health* 2018;6:e39–56.
- [7] Fan X, Zhou Z, Dang S, et al. Exploring status and determinants of prenatal and postnatal visits in western China: in the background of the new health system reform. *BMC Public Health* 2017;18:39.
- [8] Han LJ, Zhao CY, Tu Q. Research progress on the health education mode for hypertension. *Chin J Med Nurs* 2013;19:3022–3.
- [9] Xie RH, Tan H, Taljaard M, et al. The impact of a maternal education program through text messaging in rural China: cluster randomized controlled trial. *JMIR Mhealth Uhealth* 2018;6:e11213.
- [10] Leng XL, Zhao F. The investigation and analysis of pregnant woman need for health education. *Med Soc* 2008;21:17.
- [11] Li Q, Yan H, Wang QL, et al. Study on maternal health care status to agricultural and nomadic counties in Tibet Autonomous Region of China. *Chin J Epidermiol* 2006;27:9–11.
- [12] Sayakhot P, Carolan-Olah M. Internet use by pregnant women seeking pregnancy-related information: a systematic review. *BMC Pregnancy Childbirth* 2016;16:65.