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Factors Affecting the Adequacy of Prenatal Care Utilization Index in the First Level of Network System in Iran

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ABSTRACT

BACKGROUND AND OBJECTIVE: Prenatal care is an important strategy for achieving reproductive health. Despite the importance of maternity care in maternal health, some mothers are not adequately cared for. The aim of this study was to determine the factors affecting the Adequacy of Prenatal Care Utilization (APNCU) Index in the first level of network system in Iran.

METHODS: This cross-sectional study was conducted in six provinces of Iran in 2016. Mothers whose date of delivery was 2-6 months before the study were randomly selected. Data were collected using a researcher-made checklist and questionnaire containing 34 personal, family-related and environmental questions and 23 prenatal care-related questions based on health records and interviews with mothers and samples were divided into four groups according to the Adequacy of Prenatal Care Utilization index: 1: inadequate (less than 50% of expected care), 2: intermediate (50-79%), 3: adequate (80-109%), 4: adequate plus (110% and more), and the results were analyzed.

FINDINGS: Among 2655 studied mothers, the mean of total care during pregnancy was 6.43±1.7 times and according to the Adequacy of Prenatal Care Utilization index, 121 (4.6%) mothers had inadequate care, 603 (22.7%) mothers had intermediate, 1648 (62.1%) mothers had adequate and 283 (10.7%) mothers had adequate plus care. There was a significant relationship between the risk of maternal mortality in each province, urban population, prenatal care, time of first pregnancy care, maternal age, spouse's participation and education level, and adequacy of prenatal care ($p<0.05$).

CONCLUSION: This study showed that the adequacy of prenatal care, although influenced by social and personal factors, is at an appropriate level.

KEY WORDS: *Pregnancy, Prenatal Care, Adequacy of Care, Iran Network System.*

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Introduction

Prenatal care, which was emphasized as one of the strategies to achieve maternal health in the Millennium Development Goals is a systematic monitoring that includes examination and counseling on essential pregnancy issues, education and support for pregnant women and preparation of a continuous clinical and laboratory screening program to confirm lower risk of pregnancy or to prevent possible complications during pregnancy (1-2). Numerous studies have shown that although prenatal care plays an important role in ensuring, maintaining and promoting the health of mothers and infants, care is imperfect and is below the expected quantity in many health centers (3).

The number of prenatal treatments may vary slightly in different countries. The American College of Obstetricians and Gynecologists recommended a total of 16 visits for antenatal care (4). In Iran, according to the latest guidelines of the Ministry of Health and Medical Education, the expected number of visits for the care of pregnant women with low-risk pregnancies is as follows: once every 5 weeks during 6 to 30 weeks of pregnancy, once between 31-34 weeks of pregnancy, once between 35-37 weeks of pregnancy, once a week during 38-41 weeks of pregnancy and overall, 11 times is recommended; 8 sessions of care is emphasized according to the week of pregnancy (5). The World Health Organization recommends at least 4 visits during pregnancy for pregnant women without pregnancy complications (6).

Various methods are used to evaluate the usefulness and adequacy of prenatal care. One of the most commonly used methods is the Adequacy of Prenatal Care Utilization (APNCU) Index, which determines the adequacy of care by considering the time of starting the care and the appropriateness of its number (7). Studies conducted in different parts of the world show that the rate of benefiting from prenatal care varies in different areas and a significant percentage of mothers do not receive adequate care for various reasons (8).

In a study conducted in the US, 8.5% of women started first care in the first trimester, 49% in the second trimester, and 42.5% in the third trimester. In terms of the quantity of services received, 14.5% of mothers received inadequate care, 29.1% received intermediate care, 35.3% received adequate care and 21.1% received adequate plus (A+) care. In terms of factors affecting the time of beginning prenatal care, there was a significant relationship between the time of beginning prenatal care and the number of children (earlier beginning of first pregnancy care in women with fewer children), occupation of women and couples (earlier beginning of first prenatal care in working women and couples), but its relationship with age, marital status, mother's education was not significant (9). In a study conducted in Iran, the prenatal care was inadequate in 50.8% of mothers, intermediate in 16.1% of mothers, adequate in 27.7% of mothers and adequate plus in 5.4% of mothers. There was a significant relationship between adequacy of care and mother's education, age, education and employment status of spouse, unit and education of service provider (10).

Due to the lack of a national study in recent years regarding the factors affecting the quantity of prenatal care and also the importance of prenatal care in providing, maintaining and promoting maternal and fetal health and the new policy of the Government of the Islamic Republic of Iran in promoting and expanding childbearing, which makes increasing the quantity and quality of prenatal care services more and more necessary, this study was conducted to investigate the factors affecting the Adequacy of Prenatal Care Utilization Index at the first level of the network system (public sector) in Iran and recognition of possible differences in the referral pattern of pregnant mothers.

Methods

After obtaining permission from the ethics committee of Ahvaz Jundishapur University of Medical Sciences with the code AJUMS.REC.1393.119 and obtaining informed consent from participants, this cross-sectional study was performed on married women of reproductive age (10-49 years). According to a national study examining the trend of maternal mortality in Iran during 2007-2012 and dividing the provinces into three groups of low risk, medium risk, and high risk in terms of maternal death (11), six provinces were randomly selected, which included provinces Chaharmahal Bakhtiari, Hamedan, West Azerbaijan, Khorasan Razavi, Golestan, and Hormozgan. In each selected province, according to the estimated sample size and prediction of at least 383 mothers, 24 urban and rural health centers in the public sector of Iran were randomly selected in proportion to the geographical distribution of the population. In selected health centers, the health records of pregnant mothers who gave birth from two to six months before the time of the study (with a history of any number of previous deliveries) and were covered by selected

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health centers with at least one visit during recent pregnancies were examined. In addition to reviewing the health records of selected mothers, a face-to-face interview was conducted by inviting mothers to the health center.

One part of the data was collected using a checklist based on health records, which included the type of geographical area based on maternal mortality rate, place of residence (urban/rural), urban population of the surveyed cities, age, education and occupation of the mother, age, education and occupation of spouse, pre-pregnancy care, number of pregnancies, abortion, stillbirth, time of first prenatal care, number of prenatal care and maternal body mass index based on the health records of the selected mothers.

The second part of the data was collected using a researcher-made questionnaire, which included 11 questions related to men's participation in prenatal care, and was collected through interviews with selected mothers. The validity of the questionnaire was confirmed by asking the opinions of seven people, including two experts working in the maternal health department of the Ministry of Health, two gynecologists, three midwives working in health centers, and its reliability was calculated by Cronbach's test to be 89%.

The inclusion criteria included mothers who were covered by a selected health care center during their recent pregnancy had at least one history of care during their recent pregnancy and the mother's delivery was performed between two and six months before the study. Mothers without health records and without history of prenatal care, and mother who gave birth within less than 2 months and more than 6 months were excluded from the study.

Quantity of prenatal care was assessed using the Adequacy of Prenatal Care Utilization Index, which divides total prenatal care into four groups: 1: inadequate (less than 50% of expected care), 2: intermediate (50-79%), 3: adequate (80-109%), 4: adequate plus (110% and more). According to the latest instructions of the Ministry of Health and Medical Education of Iran, which suggests 8 times of prenatal care according to the week of pregnancy (7), samples were divided into four groups: 1: inadequate (less than 4 times of care), 2: intermediate (between 4 to 5 times of care), 3: adequate (between 6 to 8 times of care), 4: adequate plus (more than 8 times of care). To score the answer to closed-ended questions related to individual, family and environmental variables with coding, and open-ended questions such as age, number of pregnancies in the same way (quantitative discrete) and questions related to male participation on a 5-point Likert scale (very low, Low, medium, high and very high) scored 1 to 5 respectively and entered Excel. Data were analyzed by ANOVA test for quantitative variables, Chi-Square test for nominal quality variables and Stepwise Backward Logistic Regression Model test for categorized variables in SPSS 23 software. $p<0.05$ was considered significant.

Results

In this study, 2655 mothers were examined, among which 846 mothers (31.9%) from low-risk provinces, 829 mothers (31.2%) from medium-risk provinces and 980 mothers (36.9%) were from high-risk provinces. The mean time of starting prenatal care for all mothers was 10.1±4.6 weeks of gestation and for low-risk, moderate-risk and high-risk provinces were 10.1±4.3 and 9.7±4.3, and 10.4±4.5 weeks of gestation, respectively. There was a significant relationship between the mean time of starting prenatal care and provinces with different risks of maternal death ($p<0.001$).

91% of mothers started first care during the fourth month and 9% after the fourth month. In high-risk provinces, 88.1% of care was started in the first four months and 11.9% after the fourth month. There was a significant relationship between the time of starting care and provinces with different risks of maternal death ($p<0.001$). 81.9% of mothers were covered with prenatal care in the first trimester, 16.6% in the second trimester and 1.5% in the third trimester of pregnancy. The above index was 78%, 20.1% and 1.9% in high-risk provinces, respectively. There was a significant relationship between the time of starting prenatal care in different trimesters of pregnancy and provinces with different risks of maternal death ($p=0.003$).

The mean total number of visits during pregnancy was 6.43±1.7 times and based on low-risk, moderate-risk and high-risk provinces was 6.87±1.7, 6.51±1.5, 6.05±1.7 times, respectively. Based on ANOVA test, there was a significant relationship between the number of visits and provinces with different risks of maternal death ($p<0.001$). According to the Adequacy of Prenatal Care Utilization Index, 121 people (4.6%) had inadequate care (less than 4 visits), 603 people (22.7%) had intermediate care (4-5 visits), 1648 people (62.1%) had adequate care (6-8 visits) and 283 people (10.7%) had adequate plus care (more than 8 visits) (Table 1). There was no significant relationship between the

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Adequacy of Prenatal Care Utilization Index and abortion history, stillbirth history, and maternal BMI. In data analysis in the form of two-variable analysis, of all 10 variables that had a significant relationship with the Adequacy of Prenatal Care Utilization Index, the significance of a number of variables was confirmed in two-way multivariate analysis of variance (two-way MANOVA) and Backward LR (Table 2). In the multivariate analysis of variance (MANOVA), with 12 stages of the test, finally 8 variables were confirmed as effective factors in the Adequacy of Prenatal Care Utilization Index.

Table 1. Relationship between demographic and social factors and the Adequacy of Prenatal Care Utilization Index in Iran

Adequacy of care Variable name	Inadequate care Number(%)	Intermediate care Number(%)	Adequate care Number(%)	Adequate plus care Number(%)	Total Number(%)	p-value
Geographical areas based on maternal mortality rate						
Low risk	31(3.7)	150(17.7)	535(63.2)	130(15.4)	846(100)	
Medium risk	25(3.0)	153(18.5)	578(69.7)	73(8.8)	829(100)	<0.001
High risk	65(6.6)	300(30.6)	535(54.6)	80(8.2)	980(100)	
Residence area						
Urban	102(7.3)	371(26.7)	812(58.4)	105(7.6)	1390(100)	<0.001
Rural	19(1.5)	232(18.3)	836(66.1)	178(14.1)	1265(100)	
Age of mothers						
Under 20 years	7(4.0)	31(17.8)	103(59.2)	32(19.0)	173(100)	
20-35 years	105(4.6)	506(22.7)	1389(62.3)	229(10.3)	2229(100)	0.008
Over 35 years	9(3.9)	61(26.5)	143(62.2)	17(7.4)	230(100)	
Mothers' education						
Illiterate and elementary	18(3.1)	137(21.6)	375(63.7)	69(11.7)	589(100)	
Middle School	31(3.7)	109(19.3)	366(64.9)	68(12.1)	564(100)	<0.001
High school diploma	45(4.3)	249(23.6)	642(60.9)	118(11.2)	1054(100)	
University education	33(8.8)	97(25.9)	221(58.9)	24(6.4)	375(100)	
Spouse's education						
Illiterate and elementary	16(3.1)	107(30.8)	337(65.6)	54(10.5)	541(100)	
Middle School	34(4.3)	174(21.9)	508(63.8)	80(10.1)	796(100)	0.034
High school diploma	43(4.5)	217(22.7)	586(61.2)	112(11.7)	112(100)	
University education	26(8.2)	81(25.5)	181(56.9)	30(9.4)	318(100)	
Number of previous pregnancies						
0	40(4.6)	168(19.2)	557(63.8)	108(12.4)	873(100)	
1	50(5.5)	208(22.8)	570(62.5)	84(9.2)	912(100)	0.011
2	14(2.7)	135(25.6)	324(61.6)	55(10.4)	528(100)	
3 or more	17(5.1)	90(27.0)	191(57.4)	35(10.5)	333(100)	
Number of pre-pregnancy care						
Without care	99(7.9)	368(29.4)	683(54.6)	101(8.1)	1251(100)	
Once	18(1.5)	198(16.4)	838(69.6)	152(12.7)	1207(100)	<0.001
Twice or more	4(2.0)	37(18.8)	127(64.5)	29(14.7)	197(100)	
Population of the city of residence						
Under 20 thousand people	9(2.3)	65(14.4)	267(67.3)	56(14.1)	397(100)	
20-50 thousand people	17(7.3)	81(34.8)	124(53.2)	11(4.7)	233(100)	<0.001
50-100 thousand people	17(6.9)	75(30.5)	144(58.5)	10(4.1)	246(100)	
Over 100 thousand people	59(11.5)	150(29.2)	277(53.9)	28(5.4)	514(100)	
Men's participation in pregnancy						
Low and medium	18(3.7)	124(25.7)	305(63.1)	36(7.5)	483(100)	0.008
High	86(4.5)	403(21.0)	1199(62.4)	233(12.1)	1921(100)	
first time hemoglobin						
Less than 11 mg/dL	21(9.5)	72(32.7)	115(52.3)	12(5.5)	220(100)	<0.001
11 mg/dL and more	88(3.7)	515(21.7)	1506(63.3)	269(11.3)	2378(100)	

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Table 2. Individual, family and social factors affecting the Adequacy of Prenatal Care Utilization Index

Impact rate / Effective factors	OR Exp (B)	95% CI	p-value
Urban population of the city of residence (less than 50 thousand people/ 50 thousand and more*)	1.892	1.374-2.606	<0.001
Age of mothers (under 30 years/ 30 years and above*)	1.394	1.019-1.901	0.032
Spouse education (illiterate until the end of middle school/ high school and university*)	1.316	0.968-1.689	0.080
History of pre-pregnancy care (did not have/ had*)	0.441	0.313-0.623	<0.001
The time of starting the first prenatal care (in the first four months of pregnancy/ after the first four months of pregnancy*)	3.850	2.416-6.134	<0.001
Men's participation in prenatal care (low, medium/ high*)	0.648	0.454-0.925	0.017
First time maternal hemoglobin in pregnancy (less than 11 mg/dL/ 11 and more*)	0.423	0.260-0.689	<0.001
Provincial risk of maternal mortality (low-risk and medium-risk provinces/ high-risk provinces*)	2.322	1.692-3.185	<0.001
Constant	2.148		0.003

*Reference group

Discussion

The results of the present study showed that the majority of mothers who were covered by health units during pregnancy received adequate care and the prenatal care in more than 80% of mothers began in the first trimester of pregnancy. We can compare the above findings with the study of Hawley et al. in the United States, in which the rate of adequate maternal care was about one-third and less than 10% of prenatal care began in the first trimester of pregnancy (9), and a study by Reis et al. that showed adequate care for women aged 15-45 in Brazil in 26% of cases (12), indicating a much better situation in Iran.

One of the reasons why the time of starting prenatal care and quantity of care in Iran is more appropriate may be related to the fact that prenatal care is free in the public sector of Iran, and mothers can receive pregnancy services from the nearest health unit in their place of residence. In addition to free services, the personnel of health units in the public sector of Iran, especially in rural areas, have a duty to check the reproductive status of women in the covered area and in case of pregnancy, to file and follow up and provide timely care.

One of the findings of this study was the significant difference in the frequency and time of care in provinces with different risks of maternal death in Iran; the frequency and time of care in high-risk provinces was lower and started later compared to other provinces. According to the results of several studies, insufficient frequency of prenatal care can be associated with high risk of severe pregnancy complications and maternal death (13) and delays in starting prenatal care may lead to missed opportunities to diagnose gestational hypertension, gestational diabetes or sexually transmitted diseases (14, 15). Perhaps part of the reason for the high number of maternal deaths in high-risk provinces of Iran is due to inadequate care and late start of care. Initiation of first care in this study compared to a study conducted in the United States, in which 77.1% of mothers started their first prenatal care in the first trimester, 16.7% in the second trimester and 4.6% in the third trimester and 1.6% did not receive any care (8), indicates a better situation in Iran, and one of the reasons may be related to the expansion and efficiency of the health care network in Iran.

This study showed that prenatal care has an effective role in increasing pregnancy visits and adequacy of care. According to the latest instructions of the Ministry of Health, Treatment and Medical Education of Iran (5), the first level health units are obliged to compile a health record for women of reproductive age who intend to become pregnant in the future and control the weight once a year, blood pressure and other vital signs, and provide the necessary training to prepare covered women for a safe and low-risk pregnancy. Therefore, the positive role of prenatal care in increasing the adequacy of prenatal care utilization can both confirm the role of health units in preparing mothers and can increase women's interest and readiness to pay attention to the issues of the prenatal period and prevention of possible complications.

This study showed that the rate of adequate and adequate plus in rural areas was significantly higher than urban areas. In a study conducted by Uddin et al. in the United States and also in a study conducted in one of the cities of Iran, the rate of care in rural areas was reported to be higher than in cities (16, 17). In the study

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of Afulani in Ghana, however, the level of care in urban areas was significantly higher than in rural areas (18). The higher quantity of care in rural areas of Iran can be due to several reasons. One of the reasons is the lower rate of migration or population displacement in rural areas, which always provides a useful opportunity for adequate prenatal care. In the study by Debessai et al., which reported inadequate care in Canadian pregnant women to be 18.9%, migration was one of the factors that increased the chances of inadequate care (19). Other reasons include the fact that a large percentage of health unit personnel in rural areas of Iran are social workers who are native and have a greater knowledge of the population and women's reproductive behaviors. The level of literacy, which was inversely related to pregnancy adequacy in this study, could be one of the reasons for higher care in rural areas with lower literacy levels.

This study showed that in addition to the amount of care in urban areas being less than rural areas, the amount of care significantly decreases as the population increases in urban areas. Therefore, the level of care in Iran's metropolises is probably at the lowest level, which can be attributed to the higher rate of migration and population movement in larger cities, higher level of women's literacy, inadequate control and follow-up of health personnel due to less knowledge of the demographic characteristics. However, due to the possibility of using communication technology applications, it is necessary to control the establishment of active follow-up for adequate prenatal care in urban centers.

One of the findings of this study is the relationship between mothers' age and the Adequacy of Prenatal Care Utilization Index, which is consistent with the study of Zahedi et al. in Iran (20). In a study conducted in the United States, the rate of prenatal care was higher in women aged 15-20 years compared to other age groups (15). But in the study of Say et al., it was shown that young maternal age and low education are among the socio-demographic risk factors of inadequate prenatal care in low- and middle-income countries (21). Younger mothers are also more excited because of their first pregnancy experience and insufficient familiarity with the issues that may be a little scary and worrying, and on the other hand, they may have more enthusiasm. Overall, they are more motivated to receive preventive services. Therefore, as mothers age and experience more pregnancies, become less motivated for prenatal care probably due to both becoming more familiar with pregnancy issues and reduction of fears and anxieties. This study showed that mothers who had inadequate participation from their husbands during pregnancy received about one-third less care. The findings of the present study and those of other researchers could support the study of Aguiar et al., according to which encouraging men to participate in prenatal care is an important first step in building men's commitment to maternal and infant health (22). Given the positive role of men in improving prenatal and postpartum care outcomes, the World Health Organization emphasizes men's participation as an important strategy in achieving third millennium development goals such as women's empowerment, gender equality, and maternal health (23).

This study showed that the adequacy of prenatal care, although appropriate in Iran, is different in different regions and is lower in provinces with a high risk of maternal mortality. Some demographic and social variables affect the adequacy of pregnancy care in Iran. Therefore, it is suggested that more effective interventions be implemented in proportion to the effective factors, especially in high-risk areas and large cities, as well as for women with higher risks, in order to improve the Adequacy of Prenatal Care Utilization Index. One of the limitations of the present study was that some mothers, in addition to having access to public sector services in Iran, received private sector care and those services were not considered. In the mothers' interview, because at least 2 months to a maximum of 6 months had passed since the end of the pregnancy, some mothers may not have been ready enough to answer a number of questions.

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