

Adequate and Ever Use of Prenatal Care in Fars Province 2000-2010

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Abstract

Background: Prenatal care consists of a series of clinical visits and services offered to pregnant women throughout the ante-partum period. Despite advances in the extent of prenatal care use in Iran, some women still avoid using these services. It is, therefore, very important to investigate the prevalence of prenatal care use, and to identify the factors associated with it. This study analyzes prenatal care use in Fars Province between 2000 and 2010, identifying the associations between women's demographic and socio-economic characteristics and prenatal care use.

Methods: The study is quantitative and based on secondary data drawn from IDHS 2000 and MIDHS 2010. The sample consisted of 765 individuals from Fars Province. The data were weighted to reflect the characteristics of the rural-urban population. Statistical analyses were carried out using SPSS-18. In the inferential analysis, bivariate and multivariate logistic regressions were applied.

Results: It was indicated that both the quantity and quality of prenatal care increased during 2000–2010. Obstetricians and gynecologists became the primary reference point for women accessing healthcare during this period. Our study indicates that, in the final analytical model, the educational attainment (OR=1.32, P=0.035), urban place of residence (OR=10.49, P=0.003), sanitary and health status of households (OR=5.04, P<0.001), and knowledge of family planning (OR=1.14, P<0.001) were significantly related to the use of prenatal care.

Conclusion: Women who do not have access to prenatal care are mainly from families with low socio-economic status. Thus socially vulnerable groups receive deficient prenatal care, indicating the need for government investment and planning in a comprehensive insurance system.

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Introduction

The International Conference on Population and Development (ICPD1994) found out that meeting the reproductive needs of women and men is a critical part of human and social development.¹ From the broader perspective of the life cycle approach, reproductive health is considered a crucial factor when building a platform to promote social and gender equity.

Among the indicators of reproductive health,

prenatal care plays an important role. Prenatal care consists of a series of clinical visits and services that ideally begin before conception and extend throughout the ante-partum period.²⁻⁴ This care package has the potential to reduce the incidence of prenatal morbidity by treating medical conditions, identifying and reducing potential risks, and helping women address behavioral factors that may contribute to poor outcomes.^{5,6}

According to the existing literature in this field,

almost one-quarter of infant deaths and nearly all maternal deaths are due to inadequate healthcare during pregnancy and the immediate postpartum period.⁷ Inadequate prenatal care has been associated with prematurity, low birth weight and fetal death.⁸⁻¹⁰

Studies have reported that women with inadequate or no prenatal care are less likely to adhere to recommendations for continuity of care after birth.^{11,12} Access to prenatal care serves as a proxy for access to healthcare in general, predicting increased use of qualified care for children and childhood immunizations.¹³⁻¹⁵

In Iran, the availability of different healthcare services, such as primary healthcare and a maternity care package that includes antenatal care, delivery in a safe environment, and obstetric care are generally assumed to be significant factors in reducing health risks.¹⁶

In addition to the importance of adequate prenatal care, the timing of maternal support is also a significant issue. Delaying prenatal care means that many significant fetal developments are unmonitored, and opportunities to influence the outcome are missed. Prenatal care is more likely to be effective if women begin receiving care in the first trimester of pregnancy and continue to receive care throughout pregnancy, according to accepted standards of periodicity.⁹

The adequacy of care is assessed using a range of different criteria. While the World Health Organization (WHO) recommends a minimum of four prenatal care visits,¹⁷ the American College of Obstetricians and Gynecologists (ACOG) recommends 11–14 visits as an adequate number of visits.⁷ The Society of Obstetricians and Gynecologists of Canada (SOGC) recommends that women receive PNC visits every 4–6 weeks in early pregnancy, every 2–3 weeks after 30 weeks' gestation, and every 1–2 weeks after 36 weeks' gestation.⁹ However, the Iranian Ministry of Health and Medical Education considers PNC to be adequate if there are “at least six visits,” to trained providers of health, using the Iran Demographic and Health Survey (IDHS) criteria. This criteria of “at least six visits” was adopted by Turkey.¹⁸

Since the use of prenatal care has not been examined in Fars Province using national and provincial data, this study aimed to investigate Prenatal Care (PNC) at the provincial level. This study aimed to determine the rate of prenatal care use in Fars Province between 2000 and 2010, identify the proportion of the population that receive prenatal care from different outlets and health personnel, and determine the association between women's demographic and socio-economic characteristics and prenatal care use.

Data and Method

This is a quantitative study based on secondary data drawn from IDHS 2000 and MIDHS 2010. These two surveys were carried out to provide rigorous data on health and population at the national and provincial levels, in order to assess a range of social indicators and their influences on health, especially on the situation of children and women in Iran. (For more information refer to Rashidian et al. 2014).¹⁹ Provincial data related to Fars Province were extracted from the country data, allowing us to examine the extent to which prenatal care use is related to women's socio-demographic characteristics. The IDHS sample for Fars Province included 4000 households, while the MIDHS sample included 1790 households. The final sample included 765 individuals (313 from urban and 453 from rural areas) which represented all women of childbearing age who were pregnant in the last two years before surveys and were living in various districts of Fars Province. These data were weighted to reflect the rural-urban population of the province. The study's inclusion criteria were age (between 15 and 45) and an experience of pregnancy during the two years preceding the survey.

Variables

The data for this study included questions about socio-demographic variables (age, educational attainment, and employment status), fertility histories (parity, number of pregnancies, abortions, stillbirths), and prenatal care variables (prenatal care use, frequency of care visits, start of prenatal care). The dependent variable (prenatal care use) was measured using the women's experience of use. The prenatal visit was defined as a meeting with a health specialist or support provided by a health outlet (obstetrician, gynecologist, midwife, public health center, private health center or clinic, rural health home, or village midwife). The amount of prenatal care was assessed using every experience of prenatal care use. Furthermore, the timing of care was determined based on the stage (week) of pregnancy at which prenatal care first began. Women's use of prenatal care was recorded in two categories. If a woman had at least one prenatal visit, she was categorized as “having prenatal care;” if she did not, she was considered to have had “no prenatal care.” If the woman had at least six prenatal visits, she was categorized as “having adequate prenatal care;” if she did not, she was considered to have had “none adequate prenatal care.”

Statistical Analysis

The statistical analysis includes both descriptive and inferential analyses. Statistical analyses were carried out using SPSS-18. The descriptive analysis provided detailed characteristics of the sample. Both

bivariate and multivariate analyses were conducted using variables in the inferential analysis of the study. In the bivariate analysis, as the dependent variable was dichotomous, a logistic regression analysis was applied to determine the relationships between the dependent and independent variables. The multivariate analysis used multiple logistic regression to determine the total effect of explanatory variables on determining the odds of prenatal care use and assessing the importance of each variable in explaining the dependent variable. The alpha level (α) for rejection of null-hypotheses was set at 0.05 ($P < 0.05$).

Results

Table 1 presents the distribution of characteristics of prenatal care use across the country as a whole and in Fars Province between 2000 and 2010. Prenatal care use, measured on the basis of at least one visit at any time during pregnancy, was 93.1 and 91.3 in Iran and Fars Province respectively in 2000. In 2010, it reached 96.9 for the country as a whole and 93.3 for Fars Province. Prenatal care use, based on at least six visits during pregnancy, was 74.6 and 81.4 in Iran and Fars Province respectively in 2000. In 2010, it reached 83.2 for the country as a whole and 84.3 for Fars Province. In terms of the personnel from whom women received care, the study showed that community health workers (Behvars) were the main caregivers, with 49.4% of women having visited Behvarz in community health houses in 2000. This figure almost entirely belongs to rural areas because Behvarzes work in rural areas. The second largest group, at 39.5%, were the health experts, based mainly in urban health centers in a way that figure for urban areas was 67.6%. Obstetricians and gynecologists were consulted by 37.8% of the women. The 2010 results in Fars Province differed significantly from these national figures ($T=5.24$, $P < 0.001$). In Fars, 68.7% of women visited obstetricians and gynecologists, while 39.6% consulted Behvarz. The corresponding figure for rural areas was 82.7%. Interestingly, in 2010, 38.9 percent of women relied on midwives for their care and counseling. These differences are also evidenced in national data and rural urban areas (Table 1).

In the sample, 765 individuals were women (aged 15–49) who had experienced pregnancy during the

two years preceding the survey. The average age of these participants was 26.89 ± 6.0 . The percentages of women in various age groups resembled the age specific fertility rate pattern, as the highest frequency belonged to the 20–24 age group (31%). The second category involved women aged 25–29 (28.4%), followed by women aged 30–34 (22.3%) and 15–19 (8.3%). In terms of education, diploma level and high school educated women were the largest group (34.5%), followed by primary school educated women (27.9%). Women with intermediate school (guidance school) education constituted 15.2% of the sample. The percentage of mothers with 2–3 children was 41.7%; women with only 1 child made up 32.2% of the respondents. In terms of family structure, 80.7% of the participants lived in nuclear families, as compared with 16.4% in the extended families, and 1.7% in dissolved families. The information collected from this sample is illustrated in Table 2.

Table 2: Socio-demographic characteristics of the sample

		Frequency
Age	Mean	26.89
	SD	6.01
Age groups	15-19	63 (8.28%)
	20-24	236 (31.01%)
	25-29	216 (28.38%)
	30-34	170 (22.34%)
	35-39	48 (6.31%)
	40-44	24 (3.15%)
Education	45-49	4 (0.53%)
	Illiterate	92 (12.07%)
	Primary school and lower	213 (27.95%)
	Intermediate School	116 (15.22%)
	High school	263 (34.51%)
Parity	College/University degree	78 (10.24%)
	1	245 (32.24%)
	2-3	317 (41.71%)
	4-5	124 (16.32%)
Family Structure	6+	74 (9.74%)
	Nuclear	615 (81.67%)
	Extended	125 (16.60%)
	Dissolved	13 (1.73%)

Table 3 presents a bivariate analysis of the factors related to prenatal care use. The events are “using care”

Table 1: Prenatal Care Utilization in Iran and Fars Province in 2000 and 2010

		Ever Use (all cares)	Adequate Use (six visits)	Obstetrics & gynecologist	Midwife	Health Expert	Behvarz (Rural Health Worker)	Village midwife*	Local Midwife**
Total Country	2000	93.1	74.6	43.3	14	42.9	34.2	0.4	0.8
	2010	96.9	81.4	58.9	53.9	25.4	28.5	0.7	1.2
Fars Province	2000	92.1	83.2	37.8	9.1	39.5	49.4	0.7	0.3
	2010	93.3	84.3	68.7	38.9	36.5	39.6	0.0	1.5

*Village Midwife: Midwives who are native and have past 6 month of formal education in areas of maternal and delivery health; **Local Midwife: Traditional midwives who are native and have no formal education in health matters

Table 3: Bivariate Logistic Regression for prenatal care Utilization

Variables	Ever Use of Prenatal Care				Adequate Use of Prenatal Care			
	Odds Ratio	95% CI for Odds Ratio		P value	Odds Ratio	95% CI for Odds Ratio		P value
		Lower	Upper			Lower	Upper	
Age	0.846	0.79	0.90	P<0.001	0.929	0.90	0.96	P<0.001
Education	1.82	1.30	2.58	P<0.001	1.15	1.05	1.25	P=0.001
Household Health Index	2.89	1.78	4.71	P<0.001	1.58	1.26	1.97	P<0.001
Economic Status	2.26	1.51	3.39	P<0.001	1.57	1.30	1.90	P<0.001
Age at Marriage	1.38	1.01	1.89	P=0.015	1.08	0.97	1.20	P=0.160
Parity	0.30	0.20	0.45	P<0.001	0.542	0.45	0.65	P<0.001
Family Planning Knowledge	1.30	1.20	1.38	P<0.001	1.13	1.07	1.19	P<0.001
Settlement	1.091	0.52	2.27	P=0.817	1.037	0.70	1.52	P=0.851
Experience of Abortion	4.66	0.86	24.90	P=0.073	1.53	0.89	2.64	P=0.121
Family Structure (Nuclear)	1.06	0.42	2.68	P=0.903	1.30	0.82	2.06	P=0.259
Employment (Employed)	3.04	0.57	16.35	P=0.196	2.26	1.10	4.68	P=0.027

or “not using care” as a dichotomous first dependent variable and at least six visits compared to less than six visits as the second dichotomous dependent variable. For this reason, a logistic regression was used. In the bivariate analysis, variables were analyzed one by one. As indicated in Table 3, a reverse significant relationship was found between age (OR=0.846, P<0.001) and parity (OR=0.30, P<0.001) in relation to prenatal care. In the bivariate analysis, education, household health index, household economic index, age at marriage, and knowledge of family planning were all positively and significantly related to prenatal care use. No significant relationship was found between settlement, experience of abortion, family structure, and employment with the use of prenatal care. When adequate use of care was defined as dependent variable, the results were the same except age at marriage that was not significant while employment showed a positive relationship.

Table 4 shows the results of the multivariate analysis on the association between predictors and

prenatal care use. As shown in the model, urban women were more likely to use care (OR=10.49, P=0.035). Women with higher index of households sanitary health (OR=5.4, P<0.001), women who had more knowledge of family planning (OR=1.28, P<0.001), and those with higher levels of education (OR=1.32, P=0.035) were significantly more likely to use prenatal care. Age, household economic index, age at marriage, parity, employment, family structure, and experience of abortion were not found to be significant. The Hosmer-Lemeshow Test for Logistic Regression (Chi-square: 7.15, P=0.520) indicated a good fit with the model. The Nagelkerke R square of the model showed that the model was able to explain 57% of the variance of the dependent variable.

Regarding the dependent variable of at least six visits, household health index (OR=1.64, P=0.003) urban settlement (OR=2.81, P<0.001) experience of abortion (OR=1.94, P=0.031) economic status (OR=1.35, P=0.021), and parity (OR=0.549, P=0.001) showed significant relationships. The

Table 4: Multivariate Logistic Regression for prenatal care Utilization

Variables	Ever Use of Prenatal Care				Adequate Use of Prenatal Care			
	Odds Ratio	95% CI for Odds Ratio		P value	Odds Ratio	95% CI for Odds Ratio		P value
		Lower	Upper			Lower	Upper	
Household Health Index	5.04	1.90	13.32	P<0.001	1.64	1.37	2.13	P=0.003
Family Planning Knowledge	1.28	1.14	1.47	P<0.001	1.07	0.99	1.14	P=0.097
Settlement (urban)	10.49	1.63	49.31	P=0.003	2.81	1.57	5.01	P<0.001
Education	1.32	1.02	1.68	P=0.035	1.05	0.96	1.15	P=0.305
Experience of Abortion	1.78	0.74	2.65	P=0.384	1.94	1.06	3.56	P=0.031
Family Structure (Nuclear)	1.45	0.36	5.85	P=0.598	1.62	0.97	2.70	P=0.062
Employment (Employed)	1.38	0.19	10.05	P=0.748	2.08	0.96	4.48	P=0.061
Age	0.92	0.79	1.07	P=0.288	1.01	0.94	1.07	P=0.922
Economic Status	0.794	0.39	1.58	P=0.514	1.35	1.05	1.75	P=0.021
Age at Marriage	1.01	0.65	1.56	P=0.961	0.91	0.78	1.05	P=0.21
Parity	0.54	0.23	1.27	P=0.157	0.55	0.38	0.79	P=0.001
Hosmer and Lemeshow Test: Chi-square=7.15, P=0.520				Hosmer and Lemeshow Test: Chi-square=4.04, P=0.854				
Cox & Snell R Square=0.143, Nagelkerke R Square=0.569				Cox & Snell R Square=0.091, Nagelkerke R Square=0.154				

Hosmer-Lemeshow Test for Logistic Regression (Chi-square: 4.04, $P=0.854$) showed that the model's goodness of fit was acceptable. The Nagelkerke R square of the model indicated that the model explained 15% of the variance of the dependent variable.

Table 5 presents a bivariate analysis of the factors related to the use of prenatal care in terms of residence. In the analyses, a reverse significant relationship was found between age ($OR=0.80$, $P<0.001$ and $OR=0.87$, $P<0.001$) and parity ($OR=0.190$, $P<0.001$ and $OR=0.382$, $P<0.001$) in both urban and rural areas, respectively. Education ($OR=2.35$, $P<0.001$ in urban and $OR=1.6$, $P=0.019$ in rural areas), the household health index ($OR=12.93$, $P<0.001$ in urban and $OR=4.67$, $P<0.001$ in rural areas), the economic status ($OR=2.24$, $P=0.003$ in urban and $OR=2.92$, $P<0.001$ in rural areas), and knowledge of family planning ($OR=1.28$, $P<0.001$ in urban and $OR=1.20$, $P<0.001$ in rural areas) were all positively and significantly related to the use of prenatal care regardless of their residence. Only age at marriage showed a significant relationship in urban areas ($OR=1.94$, $P=0.01$). No significant relationship was found among experience of abortion, family structure, and the use of prenatal care.

When adequate use of prenatal care was considered, the results were slightly different. Table 6 indicates that the results are almost the same for urban

and rural areas. The main differences were related to education and experience of abortion. Education showed a significant association in rural areas ($OR=1.27$, $P=0.001$) and experience of abortion was significant in urban areas ($OR=4.25$, $P=0.020$). The variables including household health index, family planning knowledge, age, economic status and parity indicated a significant relationship with dependent variable in both urban and rural areas.

Discussion

As previously stated, prenatal care is important for the detection of adverse pregnancy-related outcomes and is vital for healthy prenatal outcomes in both mothers and infants.²⁰ Prenatal visits provide more opportunities for preventive care and health promotion in pregnant women, especially for those with high risk pregnancies. The prenatal period represents a window of opportunity to engage with and educate women about the importance of maternal healthcare.²¹

The data used in the study are from large scale study of DHS, so the generalizability of findings is assured. Caution must be taken that data are only related to Fars province. The results of this study indicated that the rate of prenatal care use has increased during the decade 2000–2010. During this time span, there have been advances in prenatal care use. In addition to an

Table 5: Bivariate Regression Logistic for Ever Use of Prenatal Care Utilization in Urban and Rural Areas

Variables	Urban			Rural				
	Odds Ratio	95% CI for Odds Ratio	P value	Odds Ratio	95% CI for Odds Ratio	P value		
Household Health Index	12.93	4.04	41.39	$P<0.001$	4.67	2.60	8.41	$P<0.001$
Family Planning Knowledge	1.28	1.17	1.37	$P<0.001$	1.33	1.20	1.44	$P<0.001$
Education	2.35	1.54	3.58	$P<0.001$	1.6	1.08	2.37	$P=0.019$
Experience of Abortion	2.01	0.58	10.34	$P=0.190$	2.6	0.48	14.94	$P=0.260$
Family Structure (Nuclear)	2.12	0.75	5.45	$P=0.112$	2.45	0.88	6.85	$P=0.088$
Employment (Employed)	1.03	0.94	1.12	$P=0.874$	1.88	0.336	10.54	$P=0.471$
Age	0.80	0.73	0.88	$P<0.001$	0.87	0.81	0.94	$P<0.001$
Economic Status	2.24	1.31	3.82	$P=0.003$	2.92	1.76	4.84	$P<0.001$
Age at Marriage	1.94	1.16	3.22	$P=0.010$	1.12	0.85	1.54	$P=0.449$
Parity	0.19	0.10	0.36	$P<0.001$	0.38	0.25	0.58	$P<0.001$

Table 6: Bivariate Regression Logistic for Adequate use of Prenatal Care in Urban and Rural Areas

Variables	Urban			Rural				
	Odds Ratio	95% CI for Odds Ratio	P value	Odds Ratio	95% CI for Odds Ratio	P value		
Household Health Index	2.068	1.27	3.36	$P=0.003$	2.37	1.64	3.42	$P<0.001$
Family Planning Knowledge	1.15	1.07	1.23	$P=0.001$	1.11	1.02	1.21	$P=0.021$
Education	1.10	0.96	1.25	$P=0.144$	1.27	1.10	1.48	$P=0.001$
Experience of Abortion	4.25	1.25	14.46	$P=0.020$	0.99	0.53	1.86	$P=0.988$
Family Structure (Nuclear)	1.06	0.51	2.17	$P=0.87$	1.52	0.83	2.77	$P=0.172$
Employment (Employed)	2.32	0.67	8.06	$P=0.183$	2.23	0.91	5.42	$P=0.077$
Age	0.90	0.86	0.94	$P<0.001$	0.95	0.91	0.98	$P=0.014$
Economic Status	2.02	1.42	2.85	$P<0.001$	1.56	1.21	2.02	$P=0.001$
Age at Marriage	1.05	0.90	1.22	$P=0.528$	1.12	0.95	1.30	$P=0.173$
Parity (No. Children)	0.48	0.35	0.65	$P<0.001$	0.57	0.46	0.72	$P<0.001$

increased frequency of visits, the quality of visits has also improved. In the year 2000, at the beginning of the decade, most women visited Behvarz (community health workers) in health houses, while at the end of the decade (2010), most visits were to obstetricians and gynecologists. In fact, obstetricians and gynecologists were the primary healthcare providers used by women in our survey, followed by Behvarz and health care workers in urban health centers.

In the bivariate model, education or maternal schooling was one of the most significant variables. The odds of prenatal care use increased with increasing education (OR=1.80). This result confirms the findings of several other studies in which education played an important role in healthcare utilization.²¹⁻²³ Education increases the opportunity for social mobility, which, in turn, sharpens the likelihood that people will be in the path of innovative behaviors.²⁴ The significance of education was crucial in our study because the educational level of Iranian women has continually increased over the recent years; this pattern of improvement may result in more and better use of healthcare, especially in the area of prenatal care.

Maternal age is another variable that shows a significant association with prenatal care utilization in the bivariate model: in this case, a reverse association. In other words, the higher the age of the respondents, the lower the probability of their accessing prenatal care. In general, women more than 35 years old were identified as low-level users of care,^{21,23} highlighting the need for different strategies to target specific age groups.

Maternal parity was identified as a factor associated with prenatal care use. There was a higher rate of use among multiparous women (OR=0.31). This reflects the results of several other studies.²⁵⁻²⁷ The lower rates of prenatal care use by women who had more children could reflect the fact that such women might believe they had enough knowledge and experience already, and considered prenatal care relatively unimportant.²² This explanation may also help to explain the association between age and care use, as older women may have more experience of pregnancy and childbearing.

Another important variable that indicated a positive association was knowledge of family planning. Family planning and prenatal care were two related aspects of reproductive health. For this reason, having knowledge of family planning could be a proxy for understanding other aspects of reproductive health, including the importance of prenatal care. In addition, women with more knowledge of family planning were more likely to enjoy higher levels of education and a higher socio-economic status.

Economic status, employment and the sanitary status of households could be related to socio-economic

situation of the household. As indicated in these results, the economic status and sanitation and health index of households were significantly related to prenatal care (OR=2.26, and OR=2.89, respectively). Although this study was not able to assess the exact economic status of individual households, since the survey did not ask about family income, these indices may provide some information about the impact of household financial standing. As indicated, these two variables had the strongest relationship with the dependent variable. The association between low economic and health status and low education with less care use showed that more socially vulnerable groups received deficient prenatal care, indicating the presence of an “inverse healthcare law” according to which those individuals who need healthcare the most are the ones who have the least access to it.⁷

Conclusion

The prenatal period is a window of opportunity to educate women about the importance of maternal healthcare. Prenatal care coverage was practically universal although when the adequate care is considered, the deficiencies are more obvious. Nonetheless, there was a reduction in the rate of inadequate utilization in the period under the study.

Structural elements in terms of society and household as economic status and health index played an important role both in rural and urban areas. Efforts to improve care for the population should be focused on education and empowerment of families and households. Women who do not have access to prenatal care are mainly from families with low socio-economic status, indicating the need for government investment and planning in a comprehensive insurance system.

The study did not model other key elements of effective prenatal care, such as timing of the first visit and use of vitamin and iron supplements; therefore, other studies to examine the quality and content of care are recommended.

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Conflict of Interest: None declared.

References

- 1 UNFPA. Program of Action; adopted at International Conference on Population and Development, Cairo, 1994.
- 2 Shoff C, Chen VY-J, Yang T-C. When homogeneity meets heterogeneity: the geographically weighted regression with spatial lag approach to prenatal care

- utilization. *Geospatial health*. 2014;8(2):557.
- 3 Alexander GR, Kogan MD, Nabukera S. Racial differences in prenatal care use in the United States: Are disparities decreasing? *American Journal of Public Health*. 2002;92(12):1970-5.
 - 4 Daniels P, Noe GF, Mayberry R. Barriers to prenatal care among Black women of low socioeconomic status. *American Journal of Health Behavior*. 2006;30(2):188-98.
 - 5 Heaman MI, Newburn-Cook CV, Green CG, Elliott LJ, Helewa ME. Inadequate prenatal care and its association with adverse pregnancy outcomes: a comparison of indices. *BMC Pregnancy and Childbirth*. 2008;8(1):1.
 - 6 Health UDo, Services H. *Healthy People 2010. Maternal, Infant, and Child Health. Chapter 16. Vol. II, 2nd.* 2003.
 - 7 Bernardes ACF, da Silva RA, Coimbra LC, de Britto MTSS, de Sousa Queiroz RC, Batista RFL, et al. Inadequate prenatal care utilization and associated factors in São Luís, Brazil. *BMC pregnancy and childbirth*. 2014;14(1):1.
 - 8 Knight E, Morris M, Heaman M. A descriptive study of women presenting to an obstetric triage unit with no prenatal care. *Journal of Obstetrics and Gynaecology Canada*. 2014;36(3):216-22.
 - 9 Heaman MI, Green CG, Newburn-Cook CV, Elliott LJ, Helewa ME. Social inequalities in use of prenatal care in Manitoba. *Journal of Obstetrics and Gynaecology Canada*. 2007;29(10):806-16.
 - 10 Bryant AS, Worjolah A, Caughey AB, Washington AE. Racial/ethnic disparities in obstetric outcomes and care: prevalence and determinants. *American journal of obstetrics and gynecology*. 2010;202(4):335-43.
 - 11 DiBari JN, Yu SM, Chao SM, Lu MC. Use of postpartum care: predictors and barriers. *Journal of pregnancy*. 2014 Feb 20;2014.
 - 12 York R, Tulman L, Brown K. Postnatal care in low-income urban African American women: relationship to level of prenatal care sought. *Journal of Perinatology*. 2000;20(1).
 - 13 Epstein B, Grant T, Schiff M, Kasehagen L. Does rural residence affect access to prenatal care in Oregon? *The Journal of Rural Health*. 2009;25(2):150-7.
 - 14 Alexy B, Nichols B, Heverly MA, Garzon L. Prenatal factors and birth outcomes in the public health service: a rural/urban comparison. *Research in nursing & health*. 1997;20(1):61-70.
 - 15 Harper MA, Byington RP, Espeland MA, Naughton M, Meyer R, Lane K. Pregnancy-Related Death and Health Care Services. *Obstetrics & Gynecology*. 2003;102(2):273-8.
 - 16 Piran P. *Socio-cultural Factors & Reproductive health: The Case of Rural Communities. Center for Women's Participation Tehran, Iran 2004.*
 - 17 World Health Organization. *WHO recommended interventions for improving maternal and newborn health: integrated management of pregnancy and childbirth.* 2007.
 - 18 Ciceklioglu M, Soyer MT, Öcek ZA. Factors associated with the utilization and content of prenatal care in a western urban district of Turkey. *International Journal for Quality in Health Care*. 2005;17(6):533-9.
 - 19 Rashidian A, Karimi-Shahanjari A, Khosravi A, Elahi E, Beheshtian M, Shakibazadeh E, Khabiri R, Arab M, Zakeri MR. Iran's Multiple Indicator Demographic and Health Survey (IrMIDHS-2010): Study protocol. *International journal of preventive medicine*. 2014;5(5).
 - 20 Chong S, Nelson M, Byun R, Harris L, Eastwood J, Jalaludin B. Geospatial analyses to identify clusters of adverse antenatal factors for targeted interventions. *International journal of health geographics*. 2013;12(1):1.
 - 21 Ozor M, Omuemu V. Awareness and Practice of Prenatal and Obstetric Care among Mothers in Ekpoma, Edo-Nigeria. *Medicine Journal*. 2014;1(2):21.
 - 22 Domingues RMSM, Leal MdC, Hartz ZMdA, Dias MAB, Vettore MV. Access to and utilization of prenatal care services in the Unified Health System of the city of Rio de Janeiro, Brazil. *Revista Brasileira de Epidemiologia*. 2013;16(4):953-65.
 - 23 Fekrat M, Kashanian M, Saberi Z. Evaluation of the effective factors in irregular prenatal care. *Razi Journal of Medical Sciences*. 2004;11(42):605-10.
 - 24 Weeks J. *Population: An introduction to concepts and issues: Nelson Education; 2011.*
 - 25 Hueston WJ, Geesey ME, Diaz V. Prenatal care initiation among pregnant teens in the United States: an analysis over 25 years. *Journal of Adolescent Health*. 2008;42(3):243-8.
 - 26 Coimbra L, Figueiredo F, Silva A, Barbieri M, Bettiol H, Caldas A, et al. Inadequate utilization of prenatal care in two Brazilian birth cohorts. *Brazilian Journal of Medical and Biological Research*. 2007;40(9):1195-202.
 - 27 Bassani DG, Surkan PJ, Olinto MTA. Inadequate use of prenatal services among Brazilian women: the role of maternal characteristics. *International perspectives on sexual and reproductive health*. 2009:15-20.