Earlier the Patients Entering Into Prenatal Care, Higher the Cesarean Rates: Analysis of 17.035 Cases

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ABSTRACT

OBJECTIVE: To analyze whether the time the patients entering into prenatal care affects the route of delivery, maternal, and fetal outcomes.

STUDY DESIGN: The electronic medical files of 17,035 women who delivered at the same hospital between January 2008 and December 2014, were retrospectively reviewed. Pregnant women were distributed into one of 5 groups (No-prenatal-visit group, Only-pregestational-visit group, First-visit-prior-to-24-weeks-follow-up group, Early-third-trimester-follow-up group, Late-third-trimester-follow-up group) according to the time of their first pregnancy follow-up visit. The route of delivery, maternal anemia, and fetal outcomes were compared among the groups.

RESULTS: Pregnant women in the no-prenatal-visit group were younger and showed higher rates of vaginal delivery (56%), term deliveries (90.7%), and postpartum anemia. Those in the first-visit-prior-to-24-weeks group were older and showed higher rates of both primary and secondary cesarean (58%), and higher rates of term deliveries (93.6%) and lower postpartum anemia. Both the primary and secondary cesarean rates were higher in groups with frequent and early follow-up visits than in a no-prenatal-visit group and late-third-trimester-follow-up group (p<0.001).

CONCLUSION: The rates of cesarean deliveries were found to be increased prominently in pregnant women who began antenatal care early in pregnancy with frequent follow-ups.

Keywords: Cesarean delivery, Pregnancy, Prenatal care

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Introduction

Antenatal care aims to maximize the well-being of both the woman and her fetus through efficient and appropriate screening with preventive and therapeutic procedures. Various antenatal care programs or recommendations are in use in different countries. However, the quality and accessibility of antenatal care are not uniform even within the same country or city and among similar socioeconomic groups. Moreover, considerable differences in the demand for the service of antenatal care exist among pregnant women. Whereas the frequency of pregnancy follow-up visits was much higher than required among some women, few or no antenatal care despite the accessibility were observed among the others. Because of the incidence of maternal anemia, preterm labor, and low-birth-weight fetuses were reported to be high in pregnancies without antenatal care, every effort is directed toward maximum coverage of the pregnant population (1).

In most developed countries, various recommendations by medical societies on pregnancy follow-up are in routine clinical practice with remarkable variations by country or region. These recommendations include detailed information on the frequency of follow-up visits, schedules for examinations, and required test dates according to gestational week (2,3). In contrast, developing or underdeveloped countries lack such programs and consensus on follow-up protocols. Although the great effort was directed toward the development of recommendations by professional societies and the recommendations have been revised regularly for improvement, evidence supporting that a standard approach with consistency may improve outcome is lacking. On the other hand, medicolegal concerns frequently affect these recommendations; further-

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more, the protocols usually consider the financial cost, evidence-based scientific data, and medicolegal concerns.

Although pregnancy is known to be a physiological process, frequent and routine antenatal follow-up examinations, requests for a remarkable number of tests during follow-up visits, and a complex obstetric unit setup may reinforce the women's perceptions that childbirth involves risks and is an uncertain process, and that it potentially causes emotional fluctuations (fear, anxiety, etc.) in pregnant women (4). The aim of this study was to analyze whether the time the patients entering into prenatal care affects the route of delivery, maternal and fetal outcomes.

Material and Method

Setting

The study was performed retrospectively at a tertiary referral hospital in Ankara, Turkey. The medical electronic records of 17.035 deliveries of women who delivered at the same hospital within a span of 7 years (January 2008 and December 2014) were retrospectively reviewed in terms of the absence or presence and timing of the pregnant women entering into antenatal care. Maternal outcomes such as maternal anemia, route of delivery and fetal outcomes such as gestational age at birth, birth weight, and length of the fetus, Apgar scores, and stillbirth rates were evaluated. The gestational age was estimated by both sonographic biometric measurements of fetal femur length and by using last menstrual period date in women without a prenatal visit, as well as those who started their visit late in the 3rd trimester. The reason to evaluate outcomes based on the first presentation to prenatal care rather than the total number of prenatal visits was that most of the critical steps in pregnancy follow-up such as folic acid and iron supplementation, Down syndrome screening tests and sonographic fetal anomaly screening were all being performed during the first 24 weeks of gestation. Consent for using data was taken. The study was conducted in accordance with the Declaration of Helsinki. The study was approved by the institutional review board (No;2016/88-1).

Selection of groups

In this study, only those women who delivered at our hospital were included. 1.092 pregnant women who had visited our outpatient clinic for pregnancy follow-up but not delivered at our hospital were excluded. Severe fetal anomalies were also excluded among the non-viable fetuses and stillbirths. In total, 25.583 pregnancy-related visits (not cases) were recorded during the study period, with 17.035 women eligible for the analysis. All pregnant women included in the study were assigned to one of the following 5 groups according to the time of their first visit during pregnancy:

1. No-prenatal-visit group: Women who delivered at our hospital and whose medical records were not available at our hospital or any other institution. Did not have records either in pregnancy or before pregnancy.

2. Only-pregestational-visit group: Women who visited our outpatient clinic but were not admitted to either our or other hospitals until the time of delivery. There were medical records for before pregnancy.

3. First-visit-prior-to-24-weeks-follow-up group: Women with first pregnancy-related visit any time between the initiation of pregnancy until the end of the 24th gestational week.

4. *Early-third-trimester-follow-up group:* Women with their first pregnancy-related visit any time between >24 and ≤32 weeks of pregnancy.

5. *Late-third-trimester-follow-up group:* Women with their first pregnancy-related visit any time between >32weeks of pregnancy until delivery.

Statistical analyses

The data were analyzed and graphics were obtained using the commercially available software, Statistic Package for Social Sciences (IBM SPSS Statistics for Windows, Version 21.0 Armonk, NY: IBM Corp.) and Microsoft Excel 2015. XLSTAT (Version 2015.2.01.17315, trial version; Addinsoft SARL, Paris, France) was used for comparison of ratios. The relevance of the distribution of continuous variables such as age and birthweight was evaluated using the Shapiro-Wilk test. The continuous variables, age, and birth weight were expressed as median (interquartile range [IQR]), with the minimum and maximum values, and categorical variables such as the route of delivery were expressed as n (%). The continuous variables were analyzed using the Kruskal-Wallis test, and the categorical variables using the Pearson chi-square test. The primary cesarean section rates within groups were analyzed using K-ratio comparison. The Marascuilo procedure was used for dual rate comparisons. A p-value <0.05 was considered statistically significant.

Results

Participant characteristics

The median age of the women was 25.0 (IQR=9.0) years, within a range of 15 to 55 years. The rate of vaginal delivery and cesarean section was 48.1% and 51.9%, respectively. The rate of term delivery was 92.4% (Table I).

Table I: *Demographic findings*

	Statistics
Maternal age at delivery	
Median (IQR)	25.0 (9.0)
Min. - Max.	15.0-55.0
Route of delivery [n (%)]	
Vaginal	8,202 (48.1)
C/S	8,833 (51.9)
Gestational age at delivery [n (%)]	
Term	15,735 (92.4)
Preterm	1,022 (6.0)
Extreme Preterm	234 (1.3)
Nonviable	77 (0.3)

The numbers and percentages of cases within each group were as follows: 6.669 (39.2%) in the no-prenatal-visit group, 59 (0.3%) in the only-pregestational-visit group, 9.215 (54.1%) in the first-24-weeks-follow-up group, 808 (4.7%) in the early-third-trimester-follow-up group, and 284 (1.7%) in the late-third-trimester-follow-up group.

Associations

The distribution of maternal ages at delivery significantly differed among the groups (χ^2=121.528, p<0.001). Dual comparisons of the follow-up groups in terms of the maternal age at delivery showed that women in the no-prenatal-visit group were younger than those in the early- and late-third-trimester-follow-up groups and that women in the first-visit-prior-to-24-weeks group were older than those in the no-prenatal-visit group and late-third-trimester-follow-up group (Table II).

The distribution of the route of delivery within groups is presented in table 2 and significantly differed among the groups (χ^2=109.331, p<0.001). According to the detailed chi-square analyses, the rate of vaginal delivery was significantly higher, in descending order, in the no-prenatal-visit group, early-third-trimester-follow-up group, and late-third-trimester-follow-up group, as compared to the rates in the other groups. Significant differences were also found among the groups in regard to primary cesarean rates (χ^2=339.298, p <0.001). In dual comparisons, the rates of primary cesarean were the highest in the first-visit-prior-to-24-weeks group and the lowest in the no-prenatal-visit group (Table II).

The rate of term deliveries (at least 89.8%) was similar among the groups. The rate of stillbirth was high in the no-prenatal-visit group (30 cases) and in the first-visit-prior-to-24-weeks group (33 cases) as compared to the rate in the other groups. Statistical analyses could not be performed for nonviable deliveries because of the uneven distribution. When nonviable deliveries were excluded, the fetal age (gestational weeks) at delivery was found to significantly differ among the groups (χ^2 = 89.954, p<0.001). The rate of term deliveries was high, in descending order, in the no-prenatal-visit group, early-third-trimester-follow-up group, and late-third-trimester-follow-up group, as compared to the rates in the other groups (Table II).

The medians of birthweight, fetal length, Apgar scores, and postpartum maternal hemoglobin (Hb) levels were presented in table III. Except for the Apgar scores (p>0.05), the values of all the parameters significantly differed among the follow-up groups (p<0.05). The dual comparisons showed that the birth weights were higher in the no-prenatal-visit-group than in the first-visit-prior-to-24-weeks group and in the early-third-trimester-follow-up group; in the first-visit-prior-to-24-weeks group than in the early-third-trimester-follow-up group; and in the early-third-trimester-follow-up group than in the late-third-trimester-follow-up group. Other dual comparisons for birth weights yielded insignificant results (p>0.05). The fetal length was found to be greater in the first-visit-prior-to-24-weeks group than in the early-third-trimester-follow-up group (p=0.009); the difference between the other groups was insignificant. The postpartum Hb levels were significantly higher in the first-visit-prior-to-24-weeks group than in the no-prenatal-visit group (p=0.043). The difference in the Hb levels between the other groups was insignificant (Table IV).

Table II: *The distribution of maternal age at delivery, route of delivery, primary cesarean rates, fetal age at delivery, and stillbirths in regard to follow-up groups*

	No follow-up group n (%)	Only pregestational visit group n (%)	First 24 weeks group n (%)	Early third-trimester group n (%)	Late third-trimester group n (%)
Maternal age at delivery (years)[1,2,3]					
Median (IQR)	25.0 (8.0)[1,3]	25.0 (7.0)	26.0 (8.0)[1,2]	25.0 (9.0)[3]	25.0 (8.0)[2]
Min. - Max.	15.0 - 48.0	17.0-37.0	15.0-55.0	15.0-44.0	17.0-40.0
Route of delivery[4,5]					
Vaginal	3.733 (56.0)	32 (54.2)	3.841 (41.7)	435 (53.8)	161 (56.7)
Cesarean	2.936 (44.0)	27 (45.8)	5.374 (58.3)	373 (46.2)	123 (43.3)
Primary cesarean	2.206 (33.1)	21 (35.6)	4.039 (43.8)	284 (35.3)	96 (33.8)
Fetal age at delivery (weeks)					
Term	6.049 (90.7)	53 (89.8)	8.625 (93.6)	731 (90.5)	277 (97.5)
Preterm	443 (6.6)	4 (6.8)	498 (5.4)	71 (8.8)	6 (2.1)
Extreme preterm	144 (2.2)	2 (3.4)	81 (0.9)	6 (0.7)	1 (0.4)
Nonviable	33 (0.5)	0 (0.0)	11 (0.1)	0 (0.0)	0 (0.0)
Still birth[6]					
Absent	6.619 (99.5)	59 (100.0)	9.174 (99.6)	806 (99.8)	282 (99.3)
Present	30 (0.5)	0 (0.0)	33 (0.4)	2 (0.2)	2 (0.7)

[1,2,3] χ^2 : 121.528, p<0.001 (maternal age at delivery across groups), [4] χ^2 =109.331, p<0.001 (vaginal versus cesarean), [5] χ^2=339.298, p<0.001 (vaginal, primary and secondary cesarean), [6] No statistical analyses could be performed because of insufficient number of cases in each group

Table III: *Fetal outcomes and maternal postpartum hemoglobin levels*

	No follow-up group	Only pregestational visit group	First 24 weeks group	Early third-trimester group	Late third-trimester group
Birthweight (g)[1]					
Median (IQR)	3.150.0 (645.0)	3.210.0 (550.0)	3.205.0 (580.0)	3.130.0 (560.0)	3.210.0 (545.0)
Min - Max	230.0-6.450.0	520.0-4.510.0	240.0-4.950.0	700.0-5.000.0	2000.0-4.400.0
Fetal length(cm)[2]					
Median (IQR)	49.0 (3.0)	49.0 (2.0)	49.0 (2.0)	49.0 (2.0)	49.0 (2.0)
Min-Max	17.0-59.0	26.0-54.0	20.0-57.0	35.0-55.0	25.0-54.0
Apgar 1st min.					
Median (IQR)	9.0 (0.0)	9.0 (0.0)	9.0 (0.0)	9.0 (0.0)	9.0 (0.0)
Min-Max	0.0-10.0	1.0-9.0	0.0-10.0	0.0-10.0	0.0-10.0
Apgar 5th min.					
Median (IQR)	10.0 (0.0)	10.0 (0.0)	10.0 (0.0)	10.0 (0.0)	10.0 (0.0)
Min-Max	0.0-10.0	1.0-10.0	0.0-10.0	0.0-10.0	0.0-10.0
Postpartum Hb (mg/dL)[3]					
Median (IQR)	12.60 (1.63)	13.17 (1.08)	12.71 (1.59)	12.64 (1.59)	12.74 (1.66)
Min-Max	6.72-16.10	9.84-14.68	7.29-16.00	8.80-15.70	7.47-14.80

[1] $\chi^2 = 92.332$, $p<0.00;1$, [2] $\chi^2 = 16.911$, $p=0.002$, [3] $\chi^2 = 14.263$, $p=0.007$

Table IV: *Pairwise comparisons*

	No follow-up /First 24 weeks follow-up	No follow-up /Late third-trimester follow-up	First 24 weeks follow-up / Early third-trimester follow-up	Early third-trimester follow-up / Late third-trimester follow-up
	p	*p*	*p*	*p*
Birth weight	<0.001	0.004	0.002	0.027
Fetal length	ns	ns	0.009	ns
Postpartum Hb	0.043	ns	ns	ns

ns: Non-significant

Discussion

Several documented evidence of antenatal care programs is available in national and/or the Ministry of Health guidelines recommending "minimum package of services" for antenatal care facilities. World Health Organization (WHO) recommends a minimum of 4 antenatal care visits in otherwise normally progressing pregnancies, ideally starting at 16 weeks, between 24 and 28 weeks, 32 weeks and 36 weeks, with each visit that includes care services appropriate for the stage of pregnancy. The main goals of WHO antenatal care visits are the identification of pre-existing health conditions, early detection of complications arising during pregnancy, health promotion and disease prevention, birth preparedness, and complication planning (5). Additional background and recommended components of antenatal care were defined in USAID/Population Council (2006) (6), USAID/CORE Group (2004) (7), USAID (2009) (8), and Mailman School of Public Health (2007) (6-9).

Remarkable differences exist among different cultural groups and societies in terms of pregnancy follow-up and birth. Besides many factors such as the background of the local health system and the coverage of the social security system, the autonomy and decision-making process of pregnant women should also be considered. The most vital part of the autonomy of pregnant women is the appropriate information provided by health professionals regarding the choices for pregnant women. In the last century, a change in trend from the traditional midwife-assisted delivery at home to professional medical follow-up up to delivery in hospitals was observed. However, a new trend of planned home delivery has been on the rise, especially in North Europe. The outcomes and safety of planned home deliveries have been reported to be on par with the outcomes of hospital deliveries (10). Although the statistical data for the pregnant population of our country is lacking, we have observed a trend of very high rates of hospital deliveries, as against planned home deliveries, even among pregnant women with no or few antenatal visits. Despite these high rates of hospital deliveries, we observed a remarkable rate of no-antenatal-care in our study population.

The present study has several limitations, especially in the selection of the groups. First, the selection bias was toward pregnant women with no follow-up, irrespective of whether some of the women with no follow-up in our hospital visited other medical centers. However, this bias was minimized because of the software package used in our outpatient clinic included the question of whether pregnant women underwent any follow-up examination in other hospitals. Other limitations were the lack of information regarding whether the pregnancy was planned or unplanned and the sociodemographic characteristics of the pregnant women. Because previous studies have found that the extent of emotional fluctuations (anxiety and fear of birth) was less in the case of planned pregnancies, emotional fluctuations are closely related to the preparedness of a woman for childbirth (11).

The only blood test results evaluated in this study were complete blood count to determine postpartum anemia. However, results of several blood tests such as those for thyroid functions, screening for gestational diabetes, and serological examinations for Toxoplasma, Cytomegalovirus, Rubella, and Herpes infections, screening for Down syndrome, urinalysis, and sonographic fetal anomaly screening were not evaluated in the study. Moreover, the data were not evaluated for most preventive and early-detection components of antenatal care, such as vaccination, nutrition counseling, micronutrient supplements, early detection of diabetes, or preeclampsia. Anyway, this study did not aim to evaluate the impact of these factors on the fetal outcomes in the follow-up groups.

Because of the rate of cesarean section has been increasing seriously in Turkey, several programs and measures have been held by the Ministry of Health to promote vaginal delivery. However, there was no change in the antenatal care process or policy during the 7-year study period that might possibly affect the outcomes. The steepest increase in cesarean rates was observed between 2008 and 2009 in our hospital database, with rates of 40.6%, 50.1%, 56.0%, 53.0%, 52.4%, 53.0%, 52.0%, and 52.8% in years 2008 to 2015, respectively. The rate was the highest in women who underwent early and frequent follow-up examinations, and this rate was the lowest in women with no-prenatal-care. The higher rates of term deliveries, higher birth weights and lower primary cesarean rates in the no-prenatal-care group were unexpected findings in our study. These results do not clearly show whether entering prenatal care at an early gestational period reinforced the women's perception that childbirth involves risk, or whether the need for frequent and early antenatal follow-up examinations were related to the women's anxiety and fear of childbirth. Moreover, we can speculate that these findings may be related to the significantly different maternal age distribution across groups, which we think is also a confounder as it relates to pregnancy outcomes. The preterm birth rate was less than 8% in our study population. The reason for the low preterm birth rate may be related to the low-risk nature of our population. Because the prenatal care requirements differ between low and high-risk groups, we would observe better outcomes with earlier onset of antenatal care if our study population were of the high-risk group.

The postpartum Hb levels were significantly higher in the first-visit-prior-to-24-weeks group than in the no-prenatal-visit group; the difference between the other groups was insignificant. This finding may be attributed to the prescription of iron supplementation early in pregnancy follow-up. Because no significant differences in the Hb levels were found between the other follow-up groups, we can speculate that the start of iron supplementation during the third trimester was also effective for the prevention of postpartum anemia. Oral iron supplementation, even in the absence of professional antenatal care, is vital for the prevention of postpartum anemia.

Because of the health insurance coverage is widespread in our country, especially the reason for no-antenatal-care should be elucidated. Although the aim of this study was not to find out the reasons for no or very limited and late-onset antenatal care, some reasons could be speculated such as the anxiety and fear of the screening tests and probable invasive procedures such as amniocentesis and the common belief that the decision of the cesarean section is liberally taken with inappropriate indications.

The development of individualized national and/or regional antenatal care programs is mandatory for broad coverage of target populations. As in our study, providing the required informed decision-making for pregnant women, oral folic acid and iron supplementation early in pregnancy, and emphasis on the importance of tests, defined as a minimum package of antenatal care would lead to the broad coverage of the target population even in case of limited hospital visits. The unexpected finding of the prominently increased rate of cesarean deliveries in pregnant women who began antenatal care early in pregnancy with frequent follow-up is valuable in clinical and public health decision processes, especially during the nationwide efforts to decrease the cesarean delivery rates.

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