

# Antenatal care utilisation among low-risk and high-risk pregnant women & its effects on pregnancy outcome

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## Abstract:

**Objective:** To identify the level of utilisation of prenatal services amongst varying risk mothers, to study the factors associated with prenatal care utilisation & to study the association between level of prenatal care utilisation amongst high & low risk women to pregnancy outcome. **Methods:** This was a cross sectional study interviewing all the consecutive mothers admitted in post natal ward of the hospital during June July 2018 using a semi structured questionnaire. Mothers not consenting or from whom complete information could not be obtained were excluded from the study. Kotelchuck's Adequacy of Prenatal Care Utilisation (APNCU) index was used to study utilisation of prenatal care amongst varying risk women & relate it to their pregnancy outcome. **Results:** Out of total of 650 women interviewed, 80.76% of them belonged to low risk category & remaining 19.24% were high risk category. 82% of the women had inadequate ANC utilisation. Age, residence or parity had no significant effect on utilisation level of prenatal care. Education positively affected utilisation of prenatal care. The numbers of ultrasound examinations per prenatal visit 0.54 & it was significantly higher in low risk mothers as compared to high risk mothers. **Conclusion:** Only less than one fifth of the women had adequate ANC utilisation. High risk women had significantly higher ANC utilisation level as compared to low risk women. Education significantly affected higher utilisation of prenatal care. Overuse of obstetric sonography was observed. Higher chances of low birth weight babies & NICU admissions were observed amongst women with inadequate APNCU index.

**Key words:** Antenatal care, High risk pregnancy, Pregnancy outcome, Prenatal care, Utilisation

## Introduction

India has achieved a significant socio-economic development in the last decade. However the progress in maternity outcome is stagnating [1]. Prenatal care is one of the most important factor determining pregnancy outcomes [2]. However few studies have quantified prenatal care & studied its effectiveness.

In order to have an impact on pregnancy outcome, prenatal care has to be adequate. There are several guidelines to describe adequate prenatal care initiation, frequency of visits & prenatal care content [3-5]. The adequacy of prenatal care is usually determined by the initiation of care & number of prenatal visits [6]. Kotelchuck's Adequacy of Prenatal Care Utilisation (APNCU) index is globally accepted & widely used prenatal care utilisation index [7].

There are a few studies assessing ANC utilisation & its associated factors in developing countries [8-10]. However the comparison between high risk & low risk women is missing in these studies. Contrary to developing countries, similar studies conducted in developed countries have found that low risk women have more frequently used prenatal services as compared to high risk women [11,12]. A few studies also highlighted underutilisation of prenatal care services in high risk women [13,14]. In resource poor settings such as India, this inequitable utilisation leads to wastage of precious resources.

This study was therefore conducted with the objective to identify the level of utilisation of prenatal services amongst varying risk mothers, study the factors associated with prenatal care utilisation & to study the association between level of prenatal care utilisation amongst high & low risk women to pregnancy outcome.

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## Methods

**Study design and population-** This was a cross-sectional study conducted at a tertiary care centre of Gujarat. Ethical clearance to conduct the study was obtained from institution Ethics committee. All the consecutive women delivering in the labour unit & admitted in post-natal ward of department of Obstetrics & Gynaecology of the hospital during June - July 2018, were included in the study. All the mothers were clearly explained the purpose of the study & an informed verbal consent was taken. Data was collected using a pre-tested semi structured questionnaire containing information on demographic details of the mothers, initiation of prenatal care, frequency of prenatal care visits, frequency of obstetric sonography, pre-existing diseases or any high risk conditions & pregnancy outcome. The mothers who did not consent for the study & mothers with an unknown number of prenatal visits or insufficient information were also excluded from the study.

**Description of variables-** Classification of Pregnancies: women with pre-existing medical conditions (Hypertension, diabetes, asthma, etc) or complications that developed during the pregnancy (anteartum haemorrhage, pre-eclampsia, gestational diabetes, multiple gestation, hydramnios) or having a bad obstetric history, were classified as women with high risk pregnancies. The other women without these risk factors were classified under low risk.

**Adequacy of antenatal care utilisation index-** Adequacy of antenatal care utilisation was assessed using Adequacy of Prenatal care utilisation (APNCU) Index [7]. The APNCU index is based on two separate indices on initiation of ANC & ratio of observed ANC visits to expected ANC visits. The expected numbers of ANC visits depend on the length of gestation period & are based on the American College of Obstetricians and Gynaecologists (ACOG) recommended visits [5]. Both these indices were combined into a single summary index for antenatal care utilisation as under:

**Table-1: Adequacy of Prenatal Care Utilization (APNCU) Index: Definition of Categories.**

Category	Month Prenatal Care Began	% of Expected Prenatal Care Visits
Adequate Intensive	1, 2, 3, or 4	110% or more
Adequate Basic	1, 2, 3, or 4	80 – 109%
Intermediate	1, 2, 3, or 4	50 – 79%
Inadequate	Month 5 or later	Less than 50%
Unknown	Prenatal care information not recorded	

**Pregnancy outcomes-** The key pregnancy outcomes defined & analysed were preterm births (birth before 37 completed weeks of gestation), birth by caesarean section, low birth weight (< 2500 g at birth) & conditions of baby at birth requiring neonatal intensive care unit admission (NICU).

**Data analysis-** Data were entered in Microsoft excel 2010 & analysed using epi-info version 7.2. Descriptive statistics were used to present the level of utilisation of prenatal care as Adequate plus, Adequate & Inadequate APNCU index (Intermediate, inadequate or unknown). However for further analysis adequate plus & adequate category were merged & represented as Adequate APNCU index. Similarly intermediate, inadequate or unknown APNCU index were merged & represented as inadequate APNCU index.

Cross tabulations were performed amongst high risk & low risk pregnant women to find association between demographic factors & level of utilisation of prenatal care, between frequency of obstetric sonography performed & risk level of pregnant women & between level of utilisation of prenatal care & pregnancy outcome. Data were analysed using chi-square statistics, independent sample t-test & multivariate logistic regression.

## Result

Table 2 shows the Antenatal Care Utilisation as per APNCU index amongst low risk & high risk pregnant women. A total of 650 women were interviewed during the study period. Around four fifth (80.76%) of them belonged to low risk category & remaining one fifth (19.24%) were categorised as high risk. Overall more than 82% of the women had inadequate ANC utilisation while only 15% had adequate ANC utilisation & only 2% of them had intense ANC utilisation. Inadequate ANC utilisation was very high in low risk women (85.14%) as well as high risk women (72%). Adequate utilisation of ANC was only around 15% in low risk women as compared to 27% in high risk women. The difference in ANC utilisation amongst low risk & high risk women was statistically significant.

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**Table-2: Antenatal Care Utilisation as per APNCU index amongst low risk & high risk pregnant women**

Risk Level	APNCU index n (%)			Sample Size N (%)	Chi value (P)
	Inadequate	Adequate	Adequate plus		
Low risk	447 (85.14)	69 (13.14)	9 (1.71)	525 (100)	12.14 (p = 0.002)
High risk	90 (72.00)	31 (24.8)	4 (2.4)	125 (100)	
<b>Total</b>	<b>537 (82.61)</b>	<b>100 (15.39)</b>	<b>13 (2.00)</b>	<b>650 (100)</b>	

Table 3 shows the factors associated with utilisation of antenatal care services amongst low risk & high risk pregnant women. Majority of the mothers (90.3%) belonged to age group 20 to 30 years representing 92.4% of the low-risk women and 81.6 % of the high-risk women. Less than one tenth (9.6 %) of the mothers were either more than 30 years or less than 20 years of age. Only 17.21% of women in 20 – 30 years age group had adequate APNCU index while the same for older (>30 years) or younger(<20 years ) women was 19.05 %. Little less than three fourth of them belonged to rural areas (72.5%). There was no difference in adequate APNCU index amongst urban & rural women (17%). Nearly half of all the mothers (47.4%) had secondary education while around two fifth (18%) were illiterate. Ten percent of uneducated women 17.3% of women with primary education & 20.13% women with secondary or higher education had adequate APNCU index. Over half (57.8%) of the women were nullipara. Little less than one fifth of the nullipara (18.6%) & multipara (15.69%) had adequate APNCU index.

**Table-3: Factors associated with adequate utilisation of antenatal care amongst low risk & high risk pregnant women**

Factors	Low risk pregnant women N = 525		High risk pregnant women N = 125		All N = 650	
	Adequate ANC utilisation n=78 Yes	Odds ratio (95% CI)	Adequate ANC utilisation n=35 Yes	Odds ratio (95% CI)	Adequate ANC utilisation Yes	Odds ratio (95% CI)
<b>Age</b>						
< 20 or > 30	7 (17.5)	1.23 (0.5-2.9)	5 (21.74)	0.66 (0.2-1.9)	12 (19.05)	1.13 (0.5-2.2)
20 - 30	71 (14.64)	1	30 (29.41)	1	101 (17.21)	1
<b>Residence</b>						
Rural	60 (15.75)	1.3 (0.7 – 2.3)	22 (24.44)	0.54 (0.2-1.2)	82 (17.41)	1.00 (0.6-1.5)
Urban	18 (12.5)	1	13 (37.14)	1	31 (17.32)	1
<b>Education</b>						
Uneducated	7 (8.14)	0.42 (0.1-0.9)*	5 (16.13)	0.36 (0.1 – 1.1)	12 (10.26)	0.4 (0.2-0.8)*
Primary level	27 (14.75)	0.83 (0.4-1.4)	12 (28.57)	0.75 (0.3-1.8)	39 (17.33)	0.8(0.5-1.2)
Secondary & above	44 (17.19)	1	18 (34.62)	1	62 (20.13)	1
<b>Parity</b>						
Multipara	26 (12.21)	0.69 (0.4-1.1)	17 (27.87)	0.9 (0.4 – 2.1)	43 (15.69)	0.81 (0.5-1.2)
Nullipara	52 (16.67)	1	18 (28.13)	1	70 (18.62)	1

\*statistically significant

Multivariate regression was used to study the demographic factors contributing to ANC utilisation. Overall & low risk women aged < 20 or > 30 years had slightly higher odds (OR = 1.13 & 1.23 respectively) of adequate ANC utilisation level as compared to women between 20 to 30 years of age. However high risk women in same age group had lower odds of adequate ANC utilisation (OR = 0.66). Uneducated women had significantly lower ANC utilisation level as compared to women with secondary level of education (Low risk & all, OR = 0.4). In high risk group also illiterate women had low rates of adequate ANC utilisation (although not statistically significant) as compared to women with secondary level of education (high risk, OR = 0.36). Multipara had slightly lower adequate ANC utilisation as compared to Nullipara (OR = 0.81) although this difference was not significant.

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**Table-4: Relation of Prenatal visits & obstetric ultrasonography amongst low risk & high risk pregnant women**

Abdominal Ultrasonography	Low risk pregnant women n (%) N = 525	High risk pregnant women n (%) N = 125	T test P value	All N = 650
Mean ANC visits	7.49 + 3.28	8.75 + 3.40	t= 3.82, p<0.01*	7.73 +3.34
Mean of total number of times USG done	4.13 + 2.09	4.54 + 2.67	t= 1.84, p=0.06	4.21 + 2.22
USG /visit	0.55	0.51		0.54

\*statistically significant

Table 4 shows the relation between number of prenatal visits & performing of obstetric sonography. The mean of prenatal visits amongst all women was 7.73 +3.34. High risk pregnant women had significantly higher frequency of prenatal visits as compared to low risk pregnant women (t= 3.82, p<0.01). On an average 4.21 times sonography was performed during all prenatal visits. The average number of obstetric sonography performed amongst high risk mothers (4.54) did not differ significantly (p=0.06) with that of low risk mothers (4.13). The numbers of ultrasound examinations per prenatal visit was slightly higher 0.55 in low risk mothers as compared to high risk mothers (0.51).

**Table-5: Pregnancy outcome in Low risk & high risk pregnant women – Change the format of this table risk factor to outcome:**

Risk level	APNCU index category	Pre-term (%)	ODDS ratio (CI)	Surgical delivery (%)	ODDS ratio (CI)	LWB (%)	ODDS ratio (CI)	NICU admission (%)	ODDS ratio (CI)
Low risk	Inadequate N = 447	34 (7.61)	0.27 (0.14–0.5)*	97 (21.7)	0.58 (0.3-0.9)*	82 (18.34)	1.72 (0.8-3.5)	19 (4.25)	0.82 (0.2-2.4)
	Adequate N=78	18 (23.08)	1	25 (32.05)	1	9 (11.54)	1	4 (5.13)	1
High risk	Inadequate N=90	14 (15.56)	0.7 (0.2 -2.0)	46 (51.11)	1.24 (0.5-2.7)	27 (30)	3.32 (1.06-10.33)*	13 (14.44)	5.7 (0.7-45.65)
	Adequate N=35	7 (20.00)	1	16 (45.71)	1	4 (11.43)	1	1 (2.86)	1
All	Inadequate N=537	48 (8.94)	0.34 (0.2 – 0.5)*	143 (26.63)	0.63 (0.4-0.9)*	109 (20.3)	1.95 (1.05-3.6)*	32 (5.96)	1.36 (0.5-3.5)
	Adequate N=113	25 (22.12)	1	41 (36.28)	1	13 (11.5)	1	5 (4.42)	1

\*statistically significant

Table 5 shows pregnancy outcome in varying risk pregnant women. Nearly one tenth (8.9%) of all women with inadequate APNCU index had preterm births which was 0.34 times less than women with adequate APNCU index. Similarly the risk for preterm births amongst low risk & high risk mothers with inadequate APNCU were 0.27 & 0.7 times lower than those with adequate APNCU index respectively.

The chances for surgical delivery were higher for high risk women with inadequate APNCU index (OR 1.24, CI 0.5-2.7) & lower amongst low risk mothers with inadequate APNCU index (OR 0.58, CI 0.3-0.9) as compared to women with adequate APNCU index.

Overall the surgical delivery rates were lower amongst women with inadequate APNCU index (OR 0.63, CI 0.4-0.9) as compared to women with adequate APNCU index.

The chances of having a low birth weight baby amongst low risk, high risk & all women with inadequate APNCU index were 1.72, 3.32 & 1.95 times higher as compared to women with adequate APNCU index respectively.

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The need for NICU admission of new-born amongst high risk mothers with inadequate APNCU index was 14.4% while the same for all other categories of women was around 5%. NICU admission was 1.36 times higher amongst all women with inadequate APNCU index as compared to all women with adequate APNCU index.

**Discussion**

The present study shows alarmingly high rates of inadequate ANC utilisation (82.6%) irrespective of risk category. More importantly the concern is for high risk women where inadequate ANC utilisation was about 72%. Since the high risk women require more frequent ANC visits to monitor their conditions, they were required to have more of intense ANC utilisation. However only 2.4% of the high risk mothers had "Adequate-plus" ANC utilisation. The remaining 97.6% of the mothers were presumed to have low utilisation of ANC services. Yeoh PL et al reported that around 26% of the high risk women were deemed to have low ANC utilisation in Malaysia [15]. A very high utilisation of ANC (65%-75%) amongst low risk women was reported by studies in United States [12,14]. Correspondingly adequate & adequate plus utilisation of ANC amongst low risk women in the present study was only 13.14% & 1.7% respectively. The finding of the present study indicates the strong need for increasing the ANC utilisation. (Table 2)

Studies analysing the risk factors for ANC utilisation did not classify the women based on their risk level. So comparison with other studies can only be done for overall findings irrespective of risk level.

The present study did not find any association between maternal age & adequate utilisation of ANC services. Studies in China & Indonesia also did not find any significant association between maternal age & ANC utilisation [9,10]. However there are contrasting studies which indicate that higher maternal age either increases [8] or decreases ANC utilisation [16]. These findings indicate that association of maternal age on ANC utilisation of ANC depends on study settings.

Slightly lower rate of adequate APNCU index amongst multipara in the present study could be due to the fact that they have already undergone the pregnancy experience once & felt less need for periodic follow up in current pregnancy. Also the added responsibility of caring for their children at home makes them to visit ANC less frequently. This finding is supported by studies in other countries [9,10]. Higher education attainment significantly increased adequacy of ANC utilisation in the present study. Studies from other developing countries are in agreement with the present study [8,10]. (Table 3)

Although there were significantly more prenatal visits amongst high risk mothers as compared to low risk

mothers no significant difference was observed in average number of times obstetric sonography performed in both the groups. The fact that ultrasound examinations per prenatal visit being higher 0.55 in low risk mother as compared to high risk is contrary to what was expected. Studies in Uganda & Labrador also found no significant differences in the number of sonography between low- and high-risk pregnancies [17,18]. The ultrasound examination per prenatal visit was as high as 0.6 in Turkey [19]. This indicates over use of technology & focuses on indicates non judicious use of technology. A need based approach following evidence based guidelines is needed for appropriate use of technology. (Table 4)

A study on 5.9 lakh live births to study APNCU index & its relation with preterm births found preterm births to be proportionately higher in women with adequate plus or adequate APNCU index [14]. A similar study done in Canada did not find any association between antenatal care & prenatal births. Results of the present study are in agreement with the above studies [20]. This controversial finding indicating that women with adequate APNCU index have more preterm births is explained by the fact that the APNCU index is based on observed to expected ANC visit ratio. Around one third of the expected visits are in last month of gestation. Women with preterm births will have shorter gestational period which will thereby decrease the denominator in Observed to expected ratio leading to increase in O/E ratio. Consequently the result needs to be interpreted with caution regarding this apparent bias in the APNCU index.

The findings of the present study regarding surgical delivery are in agreement with that of Petrou S et al which established a significant positive association between number of ANC visits & births by caesarean section [21].

Risk of low birth weight baby in the present study was found to be two to three times higher amongst women with inadequate APNCU index. Similar results were obtained by studies of Petrou S et al [21] & Handler A et al [22] where an inverse association was obtained between prenatal care & birth of LBW baby. Higher incidence of low birth weights amongst women with inadequate antenatal care was also documented by Yeoh PL et al in Malaysia [15]. A study in Bangladesh reported that the mean birth weight of babies was about 700 grams higher amongst mothers who had 7 or more antenatal visits as compared to those who had 1 – 3 visits [23].



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The present study showed high NICU admission rates amongst women with inadequate APNCU index. A study in Finland found slightly higher NICU admission rates (OR = 1.14, CI 0.69-1.86) amongst women with 5 or less ANC visits as compared to those with 6 or more ANC visits [13]. Increased neonatal mortality although non-significant was associated inadequate prenatal care in a study by Chen XK et al in USA which is relevant to the findings of the present study [12].

## Conclusion

Adequate prenatal care utilisation as per APNCU index was observed in less than one fifth of all the women. High risk women had significantly higher ANC utilisation level as compared to low risk women. Education was the single most important factor determining adequate ANC utilisation.

Excessive use of obstetric sonographic was observed indicating the need for risk based approach & following of protocols for obstetric sonographic examinations. Women with inadequate APNCU index were more likely to have surgical delivery, low birth weight babies & NICU admission of new born as compared to women with adequate APNCU index.

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