## **Original Research Article**

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# A cross sectional study for utilisation of antenatal care services and its association to birth weight of babies in a tertiary care centre in Western India

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#### **ABSTRACT**

**Background:** Low birth weight is a major public health problem in India. Amongst several factors affecting birth weight, the two crucial factors are demographic characteristics of mothers and utilisation of antenatal care services. Identification of these bottlenecks will help in forming suitable strategies to mitigate the problem of low birth weight in developing countries.

**Methods:** This was a cross-sectional study conducted in a medical college hospital of Gujarat. All the mothers admitted in maternity ward for delivery during July 2017 and had given informed consent, were involved in the study. Interview consisted of demographic characteristic of mothers, utilisation of antenatal services and records of pregnancy outcome. Data were entered in excel 2010 and analysed using Epi info 7.2. Strength of association between LBW and risk factors was obtained using odds ratio test.

**Results:** Majority of the mothers had registered for antenatal care within the first trimester (78%) and had taken minimum of four ANC visits (93%). One fifth (18%) of the mothers had babies weighing less than 2.5 kgs. Lower education status of mothers, multigravida, and mothers with less than four ANC visits, preterm births and female foetus were significantly at higher risk of low birth weight as compared to their counterparts.

**Conclusions:** The factors determining LBW were lower education status of mothers, multigravidity, inadequate ANC visits, preterm births and female sex of foetus. We recommend that increasing the education status of masses, particularly of females and ensuring adequate ANC utilisation will reduce the problem of LBW.

**Keywords:** Antenatal care, Low birth weight, Maternity care, Risk factors

### INTRODUCTION

The survival of a newborn beyond infancy depends largely on his birth weight.<sup>1</sup> Birth weight of less than 2.5 kgs, irrespective of gestational age is considered as low birth weight (LBW).<sup>2</sup> LBW babies who survive are more prone to infections and malnutrition which leads to their poor growth and development. During adulthood they are more likely to suffer from diabetes and cardiovascular diseses.<sup>3</sup>

LBW is a major public health problem. Globally around 16% of newborn are LBW with maximum prevalence in developing countries. Almost every third child is LBW is south asia. As per NFHS-3 report the prevalence of LBW was about 23% for rural and 19% for urban population. 4

There are several factors contributing to LBW such as demographic and obstetric characteristics of mothers, utilisation of health care services, calorie intake, nutrition status of mothers, stress factors, etc.<sup>5-9</sup> While

demographic risk factors are not modifiable to a certain extent, the focus of attention needs to be shifted to utilisation of antenatal services.

Utilisation of ANC services positively affects the birth weight of babies. <sup>8,9</sup> However, the utilization of ANC services is not universal across India which was reflected during National Family Health Survey 4 where only half of all the pregnant women had more than four visits. <sup>10</sup> A few studies conducted across India have also shown unsatisfactory ANC utilization rates. <sup>11-16</sup> It is crucial to identify the different factors that affect the utilization of ANC services during pregnancy. The identification of these bottlenecks will help policy makers to make appropriate strategies for improving mother and child health.

The present study was conducted with the following objectives:

- To study the demographic characteristics of mothers delivering in tertiary care centre
- To study the utilisation of antenatal care services amongst them
- To study the relation between demographic characteristics and utilisation of antenatal care services as well as birth weight of babies

#### **METHODS**

This was a cross sectional study conducted in Obstetrics and Gynaecology department of a medical college hospital in Gujarat. All mothers who were admitted in maternity ward for the month of July 2017 were included in the study. Seriously ill mothers or mothers with intrauterine foetal death or mothers whose interview could not be completed were excluded from the study. A total of

650 mothers who consented were interviewed using a predesigned pre tested semi-structured questionnaire. The questionnaire consisted of questions related to socio-demographic characteristics of mothers, obstetric history of mother, utilisation of antenatal care services – in terms of initiation and number of ANC visits and outcome of pregnancy. The birth weight of newborn was recorded by trained nursing staff using digital weighing scale within one hour of birth. Ethical clearance was obtained from Institutional Ethics Committee.

#### Statistical analysis

Data was entered in Microsoft excel 2010 and analysed using epi-info version 7.2 Association of risk factors for LWB and utilisation of ANC services were obtained using chi-square test at a level of significance of p<0.05. The strength of association of these factors to LBW was assessed through odds ratio (OR) at 95% confidence interval (CI).

#### **RESULTS**

#### Demographic characteristics of study population

Majority (81%) of the mothers in the study belonged to 21–30 years age group. The mean age of mothers was 24.63±3.82 years. Over 80% of them belonged to Hindu families and were housewife by occupation. Around 3/4<sup>th</sup> (73%) of the mothers were from rural areas. One fifth (18%) of the mothers were illiterate. The mean years of schooling of mothers were 7.62±4.47 years and that of husbands were 8.14±4.3 years. Over half (56%) of the mothers were primigravida, one fourth were second gravida and remaining were third gravida or more. The mean gravidity was 1.68±0.94. One third (32%) of the mothers had BPL cards.

Table 1: Association of early registration of pregnancy to demographic characteristics of mothers.

Variables	Early registration of pregnancy n=507 (%)	Late registration of pregnancy n=143 (%)	Total n=650 (% column)	ODD ratio (95% CI)	Chi–test value (P value)	
Age						
≤20 years	52 (76.47)	16 (23.53)	68 (10.46)	0.8 (0.4-1.5)		
21-30 years	418 (78.87)	112 (21.13)	530 (81.54)	1	1.76 (0.417)	
≥31 years	37 (71.15)	15 (18.85)	52 (8.00)	0.6 (0.3-1.2)	_	
Religion		-	•	•		
Hindu	407 (77.52)	118 (22.48)	525 (80.77)	1	0.261 (0.54)	
Muslim	100 (80.00)	25 (20.00)	125 (19.23)	1.15 (0.7-1.8)	0.361 (0.54)	
Occupation						
Housewife	423 (79.06)	112 (20.94)	535 (82.31)	1		
Unskilled worker	74 (70.48)	31 (29.52)	105 (16.15)	0.63 (0.3-1.0)	6.638 (0.0336)	
Skilled work	10 (100.00)	0 (00)	10 (1.54)	Undefined	_	
Residence						
Rural	360 (76.43)	111 (23.57)	471 (72.46)	0.7 (0.4-1.09)	2.44 (0.117)	
Urban	147 (82.12)	32 (17.88)	179 (27.54)	1		

Continued.

Variables	Early registration of pregnancy n=507 (%)	Late registration of pregnancy n=143 (%)	Total n=650 (% column)	ODD ratio (95% CI)	Chi–test value (p value)	
Education						
Uneducated	79 (67.52)	38 (32.48)	117 (18)	0.43 (0.2-0.7)		
Primary level	173 (76.89)	52 (23.11)	225 (34.62)	0.69 (0.4-1.06)	11.77 (0.002)	
Secondary & above	255 (82.79)	53 (17.21)	308 (47.38)	1		
Education of husband o	f mothers					
Uneducated	69 (70.41)	29 (29.59)	98 (15.08)	0.5 (0.3-0.9)		
Primary level	132 (75.86)	42 (24.14)	174 (26.77)	0.7 (0.4-1.1)	5.675 (0.058)	
Secondary & above	306 (80.95)	72 (19.05)	378 (58.15)	1		
Gravidity						
Primigravida	283 (77.75)	81 (22.25)	364 (56.00)	1	0.021 (0.96)	
Multigravida	224 (78.32)	62 (21.68)	286 (44.00)	1.03 (0.7-1.5)	0.031 (0.86)	
BPL card holder	•	•				
Yes	177 (85.10)	31 (14.90)	208 (32.00)	1.9 (1.25-3.0)	9.076 (0.002)	
No	330 (74.66)	112 (25.34)	442 (68.00)	1	8.976 (0.002)	
Time taken to reach the usual place of ANC visits						
≤30 min	347 (81.65)	78 (18.35)	425 (65.38)	1	9.517 (0.002)	
>30 min	160 (71.11)	65 (28.89)	225 (34.61)	0.5 (0.3-0.8)		

Table 2: Association of number of ANC visits to demographic characteristics of mothers

Variables	Four or more ANC visits n=601 (%)	Less than four ANC visits n=49 (%)	Total n=650 (% column)	Odd Ratio (95% CI)	Chi –test value (p value)	
Age			_			
≤20 years	62 (91.18)	6 (8.82)	68 (10.46)	0.84 (0.3-2.0)		
21–30 years	490 (92.45)	40 (7.55)	530 (81.54)	1	0.395 (0.82)	
≥31 years	49 (94.23)	3 (5.77)	52 (8.00)	1.33 (0.3-4.4)		
Religion						
Hindu	483 (92.00)	42 (8.00)	525 (80.77)	1	0.834 (0.36)	
Muslim	118 (94.4)	7 (5.6)	125 (19.23)	1.46 (0.6-3.3)	0.834 (0.30)	
Occupation						
Housewife	498 (93.08)	37 (6.92)	535 (82.31)	1		
Unskilled worker	93 (88.57)	12(11.43)	105 (16.15)	0.57 (0.2-1.1)	NA	
Skilled work	10 (100.00)	0 (0.00)	10 (1.54)	Undefined		
Residence						
Rural	434 (92.14)	37 (7.86)	471 (72.46)	0.84 (0.4-1.6)	0.247 (0.610)	
Urban	167 (93.3)	12 (6.7)	179 (27.54)	1	0.247 (0.619)	
Education			-			
Uneducated	92 (78.63)	25 (21.37)	117 (18)	0.13 (0.0-0.2)	40.056 (0.00)	
Primary level	212 (94.22)	13 (5.78)	225 (34.62)	0.6 (0.2-1.3)	40.056 (0.00)	
Secondary & above	297 (96.43)	11(3.57)	308 (47.38)	1		
<b>Education of husband of</b>	f mothers		-			
Uneducated	81 (82.65)	17 (17.35)	98 (15.08)	0.33(0.1-0.6)		
Primary level	167 (95.98)	7 (4.02)	174 (26.77)	1.68 (0.7-3.9)	17.075 (0.0001)	
Secondary and above	353 (93.39)	25 (6.61)	378 (58.15)	1	_	
Gravidity				-		
Primigravida	343 (94.23)	21 (5.77)	364 (56.00)	1	2.715 (0.05)	
Multigravida	258 (91.63)	28 (8.37)	286 (44.00)	0.56 (0.3-1.0)	3.715 (0.05)	
BPL card holder						
Yes	196 (94.23)	12 (5.77)	208 (32.00)	1.49 (0.7-2.9)	1 27 (0 24)	
No	405 (91.63)	37 (8.37)	442 (68.00)	1	1.37 (0.24)	

Continued.

Variables	Four or more ANC visits n=601 (%)	Less than four ANC visits n=49 (%)	Total N=650 (% column)	Odd Ratio (95% CI)	Chi –test value (P value)	
Time taken to reach the	usual place of ANC	visits				
<30 min	399 (93.88)	26 (6.12)	425 (65.38)	1	2.556 (0.050)	
>30 min	202 (89.78)	23 (10.22)	225 (34.61)	0.57 (0.3-1.0)	3.556 (0.059)	
Registration of pregnance	y					
Early	480 (79.86)	27 (55.10)	507(78.00)	1	16 102 (0.00)	
Late	121 (20.13)	22 (44.89)	143(22.00)	0.3 (0.1-0.5)	16.193 (0.00)	

Table 3: Association of birth-weight to demographic characteristics & antenatal care services.

Variables	Birth weight <2.5 kg* (n=117)	Birth weight >2.5 kg* (n=527)	OR (95% CI)	Chi – test value (p value)			
Age							
≤20 years	12 (17.65)	56 (82.35)	0.9 (0.4-1.8)				
21 – 30 years	98 (18.63)	428 (81.37)	1	0.67 (0.71)			
≥31 years	7 (14.00)	43 (86.00)	0.7 (0.3-1.6)				
Religion							
Hindu	95 (18.27)	425 (81.73)	1	0.02 (0.89)			
Muslim	22 (17.74)	102 (82.26)	0.96 (0.5-1.6)	0.02 (0.89)			
Occupation							
Housewife	96 (18.05)	436 (81.95)	1.9 (0.2-15.8)				
Unskilled worker	20 (19.61)	82 (80.39)	2.1 (0.2-18.3)	0.59 (0.74)			
Skilled work	1 (10.00)	9 (90.00)	1				
Residence							
Rural	83 (17.7)	386 (82.3)	0.8 (0.5-1.3)	0.25 (0.61)			
Urban	34 (19.43)	141 (80.57)	1	0.25 (0.61)			
Education							
Uneducated	31 (26.96)	84 (73.04)	2.2 (1.3-3.8)				
Primary level	43 (19.28)	180 (80.72)	1.4 (0.9-2.3)	9.64 (0.008)			
Secondary & above	43 (14.05)	263 (82.89)	1				
Education of husband of mothers							
Uneducated	25 (25.51)	73 (74.49)	1.6 (0.9-2.8)				
Primary level	28 (16.28)	144 (83.72)	0.9 (0.5-1.5)	4.24 (0.119)			
Secondary & above	64 (17.11)	310 (82.89)	1				
Gravidity							
Primigravida	55 (15.15)	308 (84.85)	1	<b>7</b> 00 (0 0 <b>2</b> 1)			
Multigravida	62 (22.06)	219 (77.94)	1.5 (1.06-2.3)	5.09 (0.024)			
BPL card holder	,	,	,				
Yes	39 (19.02)	166 (80.98)	1.08 (0.7-1.6)	0.44 (0.5)			
No	78 (17.77)	361 (82.23)	1	0.14 (0.7)			
Early Registration of Pr		. , ,					
Yes	90 (17.89)	413 (82.11)	1	0.44.(0.74)			
No	27 (19.15)	114 (80.85)	1.08 (0.6-1.7)	0.11 (0.73)			
Total number of ANC vi		(00100)	2100 (010 211)				
<4 visits	18 (36.73)	31 (63.27)	2.9 (1.5-5.4)				
>4 visits	99 (16.64)	496 (83.36)	1	12.29 (0.0004)			
Time taken to reach the usual place of ANC visits							
<30 min	73 (17.3)	349 (82.7)	1				
>30 min	44 (19.82)	178 (80.18)	1.18(0.7-1.7)	0.62 (0.43)			
Gestational age at delivery							
<37 weeks	42 (43.75)	54 (56.25)	4.9 (3.0-7.8)				
≥37 weeks	75 (13.69)	473 (86.31)	1	49.63 (0.00)			
	, , (10.0)	.70 (00.01)	•				
	82 (17.67)	382 (82.33)	1				
				0.27 (0.6)			
Mode of delivery Vaginal Surgical	82 (17.67) 35 (19.44)	382 (82.33) 145 (80.56)	1.12 (0.7-1.7)	0.27 (0.6)			

Continued.

Variables	Birth weight <2.5 kg*(n=117)	Birth weight ≥2.5 kg* (n=527)	OR (95% CI)	Chi–test value (p value)
Sex of baby				
Male	51 (15.13)	286 (84.87)	1	4 27 (0.02)
Female	66 (21.5)	241 (78.5)	1.5 (1.02-2.29)	4.37 (0.03)

<sup>\*</sup>excluding six twin deliveries (n=644)

Table 1 describes the relation between registration of pregnancy and demographic characteristics of the mothers. Over three fourth (78%) of the mothers had early registration (within first trimester) of their pregnancy. The mean of gestational age at registration of pregnancy was 2.92±1.21 months. Among the studied demographic characteristics, a few significantly affected early registration of pregnancy. They were: occupation (labourer-OR 0.6, p=0.03), mother's (uneducated-OR 0.43, p=0.002), economic class (BPL card present - OR 1.9 p=0.002) and distance of place of ANC visit (>30 min - OR 0.5, p=0.002). Average time taken by mothers to reach usual place of ANC visit was 39.34 minutes. Mothers age ( $\leq$  20 years – OR 0.8,  $\geq$ 31 years -OR 0.6, p=0.4), religion (Muslim-OR 1.15, P 0.5), residence (Rural- OR 0.7, p=0.1), husbands education (Uneducated- OR 0.5, p=0.058) or mothers gravidity status (Multigravida- OR 1.03, p=0.86) were not significantly associated with early registration of their pregnancy.

Table 2 describes the relation between number of ANC visits and demographic characteristics of the mothers. Almost 93% of the mothers had taken a minimum of four ANC visits as recommended. Mean number of ANC visits by mothers were 7.34±3.34. All the mothers involved on skilled work (100%) and over 90% of housewives had completed minimum of four ANC visits. The odds of completing at least four recommended ANC visits by mothers were significantly higher in educated mothers (uneducated mothers - OR 0.13, p 0.00) and educated husbands (uneducated husbands - OR 0.33, p 0.00). Those mothers who took less than 30 minutes to reach the usual place of ANC visits had higher number of ANC visits as compared to those who took more than 30 minutes (OR 0.57). But this difference was not statistically significant (p 0.059). Those mothers who had early registration of pregnancy had significantly higher odds of completing at least 4 ANC visits (OR - 0.3 for late registration, p=0.00). Mother's age ( $\leq$  20 years – OR  $0.84, \ge 31 \text{ years} - \text{OR } 1.33, \text{ p=}0.82), \text{ religion (Muslim -}$ OR 1.46, p=0.36), residence (Rural – OR 0.84, p=0.619), gravidity status (Multigravida - OR 0.56, p=0.05) or economic status of mothers (BPL – OR 1.49, p=0.24) was insignificant in deciding the number of ANC visits.

Table 3 describes the relation of birth-weight of babies to the demographic characteristics of mothers and ANC services. One fifth (18%) of the babies had birth weight less than 2.5 kgs. The average birth weight of the babies was 2.82±0.46 kgs. Further the study shows that the odds of having Low birth weight babies were significantly

higher in uneducated mothers (26.96%), multigravida (22.06%), mothers with less than 4 ANC visits (36.73%), mothers with preterm births (43.75%) and female babies (21.5%) as compared to their counterparts (OR = 2.2, 1.5, 2.9, 4.9 and 1.5 respectively). The occurrence of LBW babies was two times higher in labourer mothers (20%) and housewives (18%) as compared to mothers involved in skilled work (10%). But this difference was not statistically significant. However, maternal age (<20 years – OR 0.9,  $\geq 31$  years – OR 0.7, p=0.71), religion (Muslim - OR 0.96, p=0.89), residence (Rural - OR 0.8, p=0.61), husbands education status (Uneducated - OR 1.6, p=0.119), BPL status (BPL-OR 1.08, p=0.7), early registration of pregnancy (late registration- OR 1.08, p=0.7) and time taken to reach the usual place of ANC visits (>30 min –OR 1.18, p=0.43) did not significantly affect the birth weight of the babies.

#### **DISCUSSION**

This study was conducted to study the utilisation of ANC services in Saurashtra region of Gujarat and to find out factors affecting birth weight of the baby. Several programs/ schemes are initiated by the government under NRHM (National Rural Health missionfor the health and well being of mother and baby). <sup>17</sup> But the outcome of such programs depends on the utilisation of these services.

The main components of ANC services are early registration, regular ANC visits and prescribed drug intake (IFA and TT). It is proved by several research studies that earlier initiation and regular ANC visits helps in preventing adverse pregnancy outcomes. <sup>18,19</sup> Therefore utilisation of ANC services in the present study was classified in two major components – early registration and a minimum of four ANC visits.

The first antenatal visit/registration with public health system must be done by first trimester of pregnancy. This helps in early initiation of ANC services, monitoring of pregnancy related events and identification of risk factors requiring referral. In the present study early registration was observed in more than three fourth (78%) of the mothers which is a very encouraging finding. This is slightly higher than NFHS 4 data where 70% of mothers of urban area had early registration of pregnancy. <sup>10</sup>

A minimum of four ANC visits are required for safe maternity as per WHO guidelines. According to world health statistics report (2014) only 50% of the mothers had received a minimum of four recommended ANC

visits.<sup>20</sup> Study by Bhagwa in Manipal showed coverage of four ANC visits in pregnant women to be around 97%.<sup>12</sup> NFHS 4 revealed coverage of four ANC visits to be around 67% for urban areas.<sup>10</sup> The corresponding finding in the present study was 92.5% which is much higher as compared to NFHS 4. The difference is attributed to change in demographic characteristics of study population and easy accessibility of health facilities in the region.

There are several factors that affect the utilisation of ANC services such as demographic characteristics of mother, accessibility and acceptability of services, sociocultural factors etc. 11-16 Factors significantly associated with earlier initiation of ANC services for the present study were higher education status of mothers, involvement in skilled work, higher socio-economic status and a distance of less than 30 minutes to reach the usual place of ANC visits. Factors significantly associated with completing a minimum of four ANC visits were education status of mothers and her husband, working status of mothers and time of initiation of ANC visits. Gupta in a study conducted in rural areas of north India, had showed age, literacy of the mother, SES, and type of family as significantly influencing ANC service utilization.11 Rawat in a similar study had identified mother's education, caste, economic status and birth order to be influencing ANC utilisation. 13 Similar results were also obtained by other authors from different regions. 12,14,16,21

The prevalence of LBW in the present study was 18% with mean birth weight being  $2820\pm460$  g. NFHS -3 revealed a LBW prevalence of 19% for urban areas. Similar studies conducted across India had nearly the same magnitude of prevalence of LBW ranging from 14% to 36%.  $^{5-9}$ 

Metgud et al in a study in Karnataka, identified maternal illiteracy, exposure to passive smoking, maternal age, weight gain during pregnancy, high risk pregnancy and late antenatal registration as the risk factors significantly associated with the birth weight of a newborn. Noor et al performed similar study in Madhya Pradesh and found that gestational age and parity were the important maternal parameters influencing the birth weight of the child.<sup>22</sup> Kumar et al in Haryana determined that sex of baby, type of family, socioeconomic status, maternal education and maternal occupation, were important risk factors leading to LBW.8 Similarly Johnson also found statistically significant associations between birth weight and economic status, maternal pregnancy weight gain, number of ANC visits and maternal education.9 The present study identified lower education status of mothers, multigravidity, inadequate ANC visits, preterm births and female sex as risk factors for LBW babies. The findings of the present study are largely similar to that of other studies. A few of the differences could be because difference in demographic and socio-cultural

characteristics of study populations as well as the study designs in different studies.

The most common factor significantly affecting utilisation of ANC services as well as birth weight of newborns in the present study was education status of the mothers. Luckily it is also a modifiable risk factor. Improving the education status of women will enhance their autonomy and health care decision making abilities. Educated women are more likely to identify the need and use quality health care services and thus benefit the family and thereby society.<sup>23</sup>

#### **CONCLUSION**

Higher education status of mothers, higher socioeconomic status (non BPL card holders) and less than 30 minutes of time taken to reach the usual place of ANC visits positively affected the early registration of pregnancy. Similarly education status of mothers and their husbands, mother's occupation and early registration of pregnancy significantly affected in completion of minimum of four ANC visits. The factors determining LBW were lower education status of mothers, multigravidity, inadequate ANC visits, preterm births and female sex of foetus. We recommend that increasing the education status of masses, particularly of females and ensuring adequate ANC utilisation will reduce the problem of LBW.

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