Original Research Article

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. Birth weight of less than 2.5 kgs, irrespective of gestational age is considered as low birth weight (LBW). 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 diseases. 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.

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.
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.8,9 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.10 A few studies conducted across India have also shown unsatisfactory ANC utilization rates.11-16 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 LWB 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 (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 or more. The mean gravidity was 1.68±2.44 and the mean parity was 0.7 (0.4-1.0). The age of initiation of pregnancy of mothers was 24.63±4.47 years and that of husbands was 25.28±4.3 years.

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)      | 1.76 (0.417)           |
| 21-30 years        | 418 (78.87)                              | 112 (21.13)                              | 530 (81.54)            | 1.15 (0.7-1.9)     | 0.361 (0.54)           |
| ≥31 years          | 37 (71.51)                               | 15 (18.85)                               | 52 (8.00)              | 0.6 (0.3-1.2)      |                        |
| Religion           |                                          |                                          |                        |                    |                        |
| Hindu              | 407 (77.52)                              | 118 (22.48)                              | 525 (80.77)            | 1.15 (0.7-1.8)     | 6.638 (0.0336)         |
| Muslim             | 100 (80.00)                              | 25 (20.00)                               | 125 (19.23)            | 1.15 (0.7-1.8)     |                        |
| Occupation         |                                          |                                          |                        |                    |                        |
| Housewife          | 423 (79.06)                              | 112 (20.94)                              | 535 (82.31)            | 1.15 (0.7-1.8)     | 6.638 (0.0336)         |
| Unskilled worker   | 74 (70.48)                               | 31 (29.52)                               | 105 (16.15)            | 0.63 (0.3-1.0)     |                        |
| Skilled work       | 10 (100.00)                              | 0 (00)                                   | 10 (1.54)              |                    |                        |
| 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)            | 1.15 (0.7-1.8)     |                        |

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)      | 11.77 (0.002)           |
| Primary level                     | 173 (76.89)                              | 52 (23.11)                             | 225 (34.62)             | 0.69 (0.4-1.06)     |                          |
| Secondary & above                 | 255 (82.79)                              | 53 (17.21)                             | 308 (47.38)             | 1                   |                          |
| **Education of husband of mothers**|                                          |                                        |                         |                     |                          |
| Uneducated                        | 69 (70.41)                               | 29 (29.59)                             | 98 (15.08)              | 0.5 (0.3-0.9)       | 5.675 (0.058)           |
| Primary level                     | 132 (75.86)                              | 42 (24.14)                             | 174 (26.77)             | 0.7 (0.4-1.1)       |                          |
| Secondary & above                 | 306 (80.95)                              | 72 (19.05)                             | 378 (58.15)             | 1                   |                          |
| **Gravidity**                     |                                          |                                        |                         |                     |                          |
| Primigravida                      | 283 (77.75)                              | 81 (22.25)                             | 364 (56.00)             | 1                   |                          |
| Multigravida                      | 224 (78.32)                              | 62 (21.68)                             | 286 (44.00)             | 1.03 (0.7-1.5)      |                          |
| **BPL card holder**               |                                          |                                        |                         |                     |                          |
| Yes                               | 177 (85.10)                              | 31 (14.90)                             | 208 (32.00)             | 1.9 (1.25-3.0)       | 8.976 (0.002)           |
| No                                | 330 (74.66)                              | 112 (25.34)                            | 442 (68.00)             | 1                   |                          |
| **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)      | 0.395 (0.82)           |
| 21–30 years                       | 490 (92.45)                       | 40 (7.55)                           | 530 (81.54)             | 1                   |                          |
| ≥31 years                         | 49 (94.23)                        | 3 (5.77)                            | 52 (8.00)               | 1.33 (0.3-4.4)      |                          |
| **Religion**                      |                                   |                                    |                         |                     |                          |
| Hindu                             | 483 (92.00)                       | 25 (8.00)                           | 508 (79.77)             | 1.46 (0.6-3.3)      | 0.834 (0.36)           |
| Muslim                            | 118 (94.4)                        | 7 (5.6)                             | 125 (19.23)             | 1                   |                          |
| **Occupation**                    |                                   |                                    |                         |                     |                          |
| Housewife                         | 498 (93.08)                       | 37 (6.92)                           | 535 (82.31)             | 1                   | NA                      |
| Unskilled worker                  | 93 (88.57)                       | 12 (11.43)                           | 105 (16.15)             | 0.57 (0.2-1.1)      |                         |
| Skilled work                      | 10 (100.00)                       | 0 (0.00)                             | 10 (1.54)               | Undefined           |                         |
| **Residence**                     |                                   |                                    |                         |                     |                          |
| Rural                             | 434 (92.14)                       | 37 (7.86)                           | 471 (72.46)             | 1.46 (0.7-2.5)      | 0.247 (0.619)           |
| Urban                             | 167 (93.3)                        | 12 (6.7)                            | 179 (27.54)             | 1                   |                          |
| **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)       |                          |
| Secondary & above                 | 297 (96.43)                       | 11 (3.57)                            | 308 (47.38)             | 1                   |                          |
| **Education of husband of mothers**|                                   |                                    |                         |                     |                          |
| Uneducated                        | 81 (82.65)                        | 17 (17.35)                           | 98 (15.08)              | 0.33(0.1-0.6)       | 17.075 (0.0001)        |
| Primary level                     | 167 (95.98)                       | 7 (4.02)                             | 174 (26.77)             | 1.68 (0.7-3.9)      |                          |
| 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                   |                          |
| Multigravida                      | 258 (91.63)                       | 28 (8.37)                            | 286 (44.00)             | 0.56 (0.3-1.0)      |                          |
| **BPL card holder**               |                                   |                                    |                         |                     |                          |
| Yes                               | 196 (94.23)                       | 12 (5.77)                            | 208 (32.00)             | 1.49 (0.7-2.9)      | 1.37 (0.24)            |
| No                                | 405 (91.63)                       | 37 (8.37)                            | 442 (68.00)             | 1                   |                          |

Continued.
### 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)   | 0.67 (0.71)              |
| 21 – 30 years                                  | 98 (18.63)                    | 428 (81.37)                   | 1               |                          |
| ≥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)  |                          |
| **Occupation**                                 |                               |                               |                 |                          |
| Housewife                                      | 96 (18.05)                    | 436 (81.95)                   | 1.9 (0.2-15.8)  | 0.59 (0.74)              |
| Unskilled worker                               | 20 (19.61)                    | 82 (80.39)                    | 2.1 (0.2-18.3)  |                          |
| 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               |                          |
| **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)   | 4.24 (0.119)             |
| Primary level                                  | 28 (16.28)                    | 144 (83.72)                   | 0.9 (0.5-1.5)   |                          |
| Secondary & above                              | 64 (17.11)                    | 310 (82.89)                   | 1               |                          |
| **Gravidity**                                  |                               |                               |                 |                          |
| Primigravida                                   | 55 (15.15)                    | 308 (84.85)                   | 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)  | 0.14 (0.7)               |
| No                                             | 78 (17.77)                    | 361 (82.23)                   | 1               |                          |
| **Early Registration of Pregnancy**            |                               |                               |                 |                          |
| Yes                                            | 90 (17.89)                    | 413 (82.11)                   | 1               | 0.11 (0.73)              |
| No                                             | 27 (19.15)                    | 114 (80.85)                   | 1.08 (0.6-1.7)  |                          |
| **Total number of ANC visits**                 |                               |                               |                 |                          |
| <4 visits                                      | 18 (36.73)                    | 31 (63.27)                    | 2.9 (1.5-5.4)   | 12.29 (0.0004)           |
| ≥4 visits                                      | 99 (16.64)                    | 496 (83.36)                   | 1               |                          |
| **Time taken to reach the usual place of ANC visits** |                   |                               |                 |                          |
| <30 min                                        | 73 (17.3)                     | 349 (82.7)                    | 1               | 0.62 (0.43)              |
| >30 min                                        | 44 (19.82)                    | 178 (80.18)                   | 1.18 (0.7-1.7)  |                          |
| **Gestational age at delivery**                |                               |                               |                 |                          |
| <37 weeks                                      | 42 (43.75)                    | 54 (56.25)                    | 4.9 (3.0-7.8)   | 49.63 (0.00)             |
| ≥37 weeks                                      | 75 (13.69)                    | 473 (86.31)                   | 1               |                          |
| **Mode of delivery**                           |                               |                               |                 |                          |
| Vaginal                                        | 82 (17.67)                    | 382 (82.33)                   | 1               | 0.27 (0.6)               |
| Surgical                                       | 35 (19.44)                    | 145 (80.56)                   | 1.12 (0.7-1.7)  |                          |
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 2.9±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 education (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 (≤ 20 years – OR 0.8, ≥ 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=0.056) 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 7.3±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 (OR 1.33, 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 (≤ 20 years – OR 0.84, ≥ 31 years – OR 1.33, p=0.82), 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 2.8±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, ≥ 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 mission) for the health and well being of mother and baby. 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. 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.

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.
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.

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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REFERENCES

1. United Nations Children’s Fund and World Health Organization. Low birth weight: Country, Regional and Global estimates. New York: UNICEF, 2014. Available at: https://data.unicef.org/topic/nutrition/low-birthweight#. Accessed on 11 May 2018.
2. WHO, International Classification of Diseases, Tenth Revision, 2018.
3. Park K. Park’s Textbook of Preventive and Social Medicine. 23rd Edition. Jabalpur: M/S Banarsidas Bhanot, 2015.
4. International Institute for Population Sciences (IIPS) and Macro International. National Family Health Survey (NFHS-3), 2005–06: India: Volume I. Mumbai: IIPS, 2007.
5. Shahnawaz K, Choudhary SK, Sarker G, Das P, Pal R, Kumar L. Association between maternal socio-demographic factors and low birth weight newborn in a rural area of Bihar, India. South East Asia J Public Health. 2014;4(1):30-4.
6. Choudhary AK, Choudhary A, Tiwari SC, Dwivedi R. Factors Associated with Low Birth Weight among Newborns in an Urban Slum Community in Bhopal. Indian J Public Health. 2013;57(1):20-3.
7. Metgud CS, Naik VA, Mallapur MD. Factors Affecting Birth Weight of a Newborn – A Community Based Study in Rural Karnataka, India. PLoS ONE. 2012;7(7):e40040.
8. Kumar M, Verma R, Khanna P, Bhalla K, Kumar R, Dhaka R, Chayal V. Prevalence and associate factors of low birth weight in North Indian babies: a rural based study. Int J Community Med Public Health. 2017;4(9):3212-7.
9. Johnson AR, Surekha A, Dias A, William NC, Agrawal T. Low birth weight and its risk factors in a rural area of South India. Int J Community Med Public Health. 2015;2(3):339-44.
10. International Institute for Population Sciences (IIPS) and Macro International. National Family Health Survey (NFHS-4), 20015–16: India: Volume I. Mumbai: IIPS.
11. Gupta RK, Shora TN, Verma AK, Jan R. Knowledge regarding antenatal care services, its utilization, and delivery practices in mothers (aged 15-49 years) in a rural area of North India. Trop J Med Res. 2015;18:89-94.
12. Bhagwan D, Kumar A, Rao CR, Kamath A. Utilization of Antenatal Care Services in a Rural Field Practice Area in Coastal Part of South India. Niti J Community Med. 2016;7(4):335-7.
13. Rawat LK, Prasad JB, Kumar P. Maternal Health Care Services and Its Utilization in Bihar, India. International Journal of Humanities and Social Science Invention. 2015;4(1):73-86.
14. Adhikari T, Sahu D, Nair S, Saha KB, Sharma RK, Pandey A. Factors associated with utilization of antenatal care services among tribal women: A study of selected States. Indian J Med Res. 2016;144:58-66.
15. Roy MP. Underutilization of antenatal care services among tribal women. Indian J Med Res. 2017;145(4):969.
16. Ray S, Bhandari P, Prasad JB. Utilization pattern and associated factors of maternal health care services in Haryana, India: a study based on district level household survey data. Int J Reprod Contracept Obstet Gynecol. 2018;7:1154-63.
17. National Rural Health Mission. Available at: http://nhm.gov.in/images/pdf/RMNCH+A/RMNCH+A_Strategy.pdf. Accessed on 09 May 2018.
18. Fekede B, G/Mariam A. Antenatal care services utilization and factors associated in Jimma Town (south west Ethiopia). Ethiopian Med J. 2002;45:123-33.
19. Antenatal care in developing countries: Promises, Achievements and Missed Opportunities: An analysis of trends, levels and differentials, 1990-2001. WHO 2003. Available at: http://www.childinfo.org/files/antenatal_care.pdf. Accessed on 09 May 2018.
20. World Health Organization. Global Health Observatory (GHO data). Antenatal care situation. Available from URL: http://www.who.int/gho/maternal_health/reproductive_health/antenatal_care_text/en/. Accessed on 08 May 2018.
21. Javali R, Wantamutte A, Mallapur MD. Socio demographic factors influencing utilization of antenatal health care services in a rural area A cross sectional study. Int J Med Sci Public Health. 2014;3:308-12.
22. Noor N, Kural M, Joshi T, Pandit D, Patil A. Study of maternal determinants influencing birth weight of newborn. Arch Med Health Sci. 2015;3:239-43.
23. Mekonnen Y, Mekonnen A. Utilization of maternal health care services in Ethiopia. Calverton, Maryland, USA: ORC Marco; 2002.

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