International Journal of Community Medicine and Public Health
*Biswas P et al. Int J Community Med Public Health. 2019 Dec;6(12):5250-5255*
http://www.ijcmph.com
pISSN 2394-6032 | eISSN 2394-6040

DOI: http://dx.doi.org/10.18203/2394-6040.ijcmph20195480

**Original Research Article**

# Maternal anemia and low birth weight in a community development block of Purba Bardhaman, West Bengal: a retrospective cohort analysis

**Puspendu Biswas, M. Samsuzzaman*, Amitava Chakraborty, Dilip Kumar Das**

Department of Community Medicine, Burdwan Medical College and Hospital, West Bengal, India

**Received:** 08 October 2019
**Revised:** 16 November 2019
**Accepted:** 18 November 2019

***Correspondence:**
Dr. M. Samsuzzaman,
E-mail: max.samsuzzaman@gmail.com



## ABSTRACT

**Background:** Being both highly prevalent public health problems in India, anemia in pregnancy (AIP) is hypothesized as a potential risk factor for low birth weight (LBW) baby as pregnancy outcome. In this context, this study was conducted among pregnant mothers registered in last 2 years under Bhatar block of Purba Bardhaman district, West Bengal. Objectives of this study were to assess the relationship of LBW babies with maternal anemia in antenatal period and also with background characteristics and pregnancy related factors.
**Methods:** A retrospective cohort analysis was conducted among postnatal mothers who were registered during their pregnancy in sub-centers of this block during a reference period from April'15$^{th}$ - March'17$^{th}$. The study subjects were identified from the records of each sub-centre and further categorized into two groups: Exposed (anemic) - Hb <11 gm% in any antenatal visits and Non-exposed(non-anemic) - Hb ≥11 gm% in all antenatal visits. Sample size of 988 for each group was calculated. From each sub-centre's antenatal record 26 subjects for each group were selected by simple random sampling. Data collected with predesigned pretested schedule and data analyzed using Microsoft Excel and SPSS 20. Logistic regression was performed to establish association.
**Results:** Overall incidence of LBW was 8.1%; in anemic, non-anemic group incidence were 10.5%, 5.7% respectively. AIP had relative risk 1.85 (1.36-2.54) over LBW. On multivariable logistic regression, LBW was significantly associated with AIP (2.11, 1.51-2.95), multi-parity (0.63, 0.44-0.9), inadequate ANC visits (2.7, 1.75-4.15) and female gender (1.64, 1.19-2.27).
**Conclusions:** Anemia in pregnancy significantly increases risks of LBW which also strongly associated with female new-born, primi-parity, and incomplete ANC visits.

**Keywords:** Anemia, Cohort, Low birth weight, Pregnancy, Retrospective

## INTRODUCTION

Despite being a major public health issue, anemia in pregnancy (AIP) is surprisingly still not well understood in terms of its definition, prevalence, incidence and the effectiveness of iron supplements in improving pregnancy outcomes.[1] There is ambiguity in systems of measurement criteria for the onset of anemia during pregnancy. Some authors considered "anemia at first antenatal care visit "as a measure of occurrence of AIP, while others considered any antenatal low hemoglobin (Hb) measurement throughout the course of pregnancy.[2,3] There is no universal standard for the exact timing of measurement for the onset of anemia that would clearly differentiate between incident and prevalent cases. Another factor that adds to the complexity in measuring anemia in pregnancy is the variation among researchers in specifying the cutoff point of Hb level; while some

investigators defined it as Hb <11.0 g/dl as per the recommendation of the WHO, others adopted different cutoff points such as <10.0 and <10.5 g/dl as recommended by other agencies in the USA.[4-7]

The role of anemia in pregnancy and iron on the growing fetus has been studied in the last few decades. The outcome of these studies is either inconclusive or at the most supportive of the popular notions held so far regarding pregnancy outcome and anemia.[8-12] Low birth weight is a major public health problem in India and influenced by several factors including maternal anemia. Some studies revealed that maternal anemia during 3rd trimester of pregnancy is associated with LBW baby; some other studies indicated that maternal anemia onset in any trimester leads to LBW baby.[8-12]

But in our country both anemia in pregnancy and proportion of low birth weight babies are quite high. According to NFHS-4 report, the proportion of anemia in pregnancy is 53.6% (54.2% in urban and 53.3% in rural) in West Bengal, and 50.3% in India (45.7% in urban and 52.1% in rural).[13,14] On the other hand, according to UNICEF 2014, the proportion of LBW baby is 28% in India and 22.6% in West Bengal.[15] Anemia in pregnancy is a potential risk factor for low birth weight baby as pregnancy outcome and there is a direct relationship between low levels of hemoglobin during pregnancy and low birth weight.[16,17] A small increase in the risk of LBW associated with anemia during pregnancy might have a significant impact in public health perspectives. However, comprehensive evidence is still lacking in developing countries than in developed countries. Many aspects of this priority concern, particularly the potential programmatic and behavioral factors not yet adequately studied in different geographical and socio-cultural context.

Thus, a retrospective cohort study was conducted among pregnant mothers registered during a reference period of 2 years in the sub-centres of a block of Purba Barddhaman district, West Bengal with the aim of examining the effect of 'anemia in pregnancy' as a risk factor over the pregnancy outcome 'low birth weight baby'. The specific objectives were to assess the relationship between low birth weight baby and maternal anemia in antenatal period and to assess the relationship between low birth weight babies with early antenatal registration, adequate antenatal visits, IFA tablets consumption, weight gain during pregnancy.

## METHODS

A retrospective cohort analysis was conducted in Bhatar block in Purba Bardhaman district, West Bengal during May to October 2017. Bhatar is one of the 23 blocks in the district and is the rural field practice area of the Department of Community Medicine, Burdwan Medical College, West Bengal. The block has a population of 263064 as per census 2011. Health facilities in the block include one rural hospital, 6 primary health centers and 38 sub-centers. Bhatar block has 14-gram panchayats with 104 inhabited villages.

Study subjects were postnatal mothers who were registered during their pregnancy in any of the 38 sub-centers of this block during a reference period of two years from April'15th - March'17th. Such antenatal mothers registered in the reference period and delivered with a live birth before the day of data collection were included in the analysis. But all registered antenatal mothers having abortion, still births, twin babies and still in antenatal period were excluded.

Applying the eligibility criteria so defined, the study subjects were identified from the records of each sub-centre and further categorized into two groups as follows:

- Exposed (anemic) - mothers with recorded Hb level <11 gm% in any antenatal visits and
- Not-exposed (non-anemic) - mothers with recorded Hb level ≥11 gm% in all antenatal visits.

A minimum sample size of 960 postnatal mothers for each of exposed and non-exposed group was calculated using Kelsey sample size calculation formula = $(Z_{\alpha/2}+Z_{1-\beta})^2 PQ(r+1)/ r(p_1-p_2)^2$ where, $P=(p_1+rp_2)/2$, Q = (1-P), r =Ratio of non-exposed and exposed, $p_1$=proportion of anticipated outcome in exposed group, $p_2$=proportion of anticipated outcome in non-exposed group.[18] We considered 95% confidence interval, 80% power, anticipated outcome of LBW in anemic mother 13% and anticipated outcome of LBW in non-anemic mother 9% and 1:1 ratio of exposed and non-exposed.[19]

Pregnancies registered within reference period were reported to be almost equal in all 38 sub-centres. Study subjects were recruited from each sub-centre with equal representation i.e. 26 (960/38=25.26=26) for each of exposed and non-exposed group. From the sampling frame of exposed and non-exposed group prepared based on eligibility in each sub-centre, 26 subjects were selected by simple random sampling. Thus, total 988 subjects were selected in each group for this study.

Relevant data were collected using a pretested and predesigned schedule for both groups from records at the sub-centres. Data were collected regarding date, Hb% and maternal weight in all 4 ANC visits; date of last menstrual periods; mother's age; parity; religion (Hindu/ Muslim); number of IFA tablets given, delivery place (institutional/ home), newborn gender (male/ female) and birth weight of newborns. Some of the variables of interest for analysis were defined/ described as follows: mother's age at pregnancy (early ≤19 years, normal 20-29 years and elderly ≥30 years), parity (primi/ multipara), antenatal registration (early ≤12 weeks, delayed >12 weeks), completed 4 ANC visits (yes/ no), adequate weight gain (≥9 kg in antenatal period), adequate IFA tablets consumption (at least 200 tablets for anemic and

100 tablets for non-anemic mothers). Principal exposure variable was anemia in antenatal period and principal outcome variable was low birth weight (birth weight <2.5 kg).

The collected data was rechecked for completeness and consistency, entered in the computer Microsoft Excel data sheets and was analyzed using principles of descriptive and inferential statistics through SPSS 20 statistical software. Relative risk of anemia in pregnancy over LBW baby as pregnancy outcome was calculated. Association of other exposure factors with low birth weight as dependent variable was assessed on basis of calculating unadjusted and adjusted odds ratio with 95% confidence interval by univariable and multivariable logistic regression respectively. All variables were included in bivariate and multivariate analysis.

Prior to data collection, permission was obtained from the district and block health authorities. Cooperation was sought from the health workers for review of records at the sub-center level and before reviewing those records, the nature and purpose of the study was also briefed. The ethical approval was obtained from the institutional ethics committee of Burdwan Medical College, West Bengal.

## RESULTS

Incidence of LBW in anemic, non-anemic group in pregnancy and allover are 10.5%, 5.7% and 8.1% among the antenatal mothers registered within April'15$^{th}$ - March'17$^{th}$ in Bhatar block. Anemia during pregnancy relative risk 1.85 (1.36-2.54), odds ratio 1.96 (1.4-2.74), attributable risk percentage 9.95% over risk of LBW baby as pregnancy outcome (Figure 1). All variables are almost comparable among both groups except adequate IFA tablet, complete 4 ANC visits (Table 1).

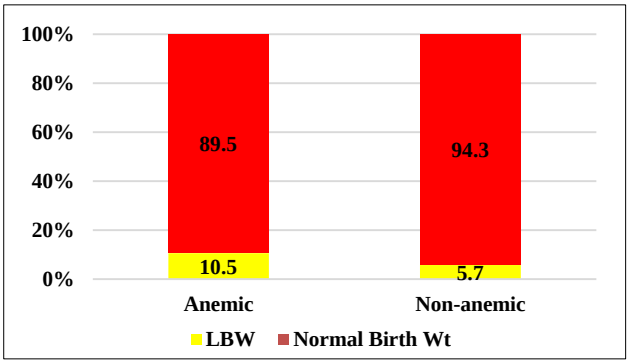


**Figure 1: Distribution of LBW baby in anemic and non-anemic group (n=1976; RR=1.85 (1.36-2.54)).**

**Table 1: Distribution of background characteristics and pregnancy related factors in anemic and non-anemic group (n=1976).**

| Characteristics | Anemic group (%) (n=988) | Non-anemic group (%) (n=988) | Test of significance (Chi-square test) |
|---|---|---|---|
| **Mother's age at pregnancy (years)** | | | |
| ≤19 | 350 (35.4) | 308 (31.2) | P=0.078 |
| 20-29 | 612 (61.9) | 644 (65.2) | |
| ≥30 | 26 (2.6) | 36 (3.6) | |
| **Parity** | | | |
| Primipara | 502 (50.8) | 530 (53.6) | P=0.207 |
| Multipara | 486 (49.2) | 458 (46.4) | |
| **Early antenatal registration ≤ 12 weeks** | | | |
| Yes | 771 (78) | 741 (75) | P=0.11 |
| No | 217 (22) | 247 (25) | |
| **Complete antenatal visits** | | | |
| Yes | 915 (92.6) | 864(87.4) | P=0.00 |
| No | 73 (7.4) | 124(12.6) | |
| **Adequate weight gain in pregnancy** | | | |
| Yes | 173 (17.5) | 160 (16.2) | P=0.435 |
| No | 815 (82.5) | 828 (83.8) | |
| **Adequate IFA given in pregnancy** | | | |
| Yes | 779 (78.8) | 983 (99.5) | P=0.00 |
| No | 209 (21.2) | 5 (0.5) | |
| **New-born gender** | | | |
| Male | 504 (51) | 494 (50) | P=0.653 |
| Female | 484 (49) | 494 (50) | |
| **Religion** | | | |
| Hindu | 496 (50.2) | 488 (49.4) | P=0.719 |
| Muslim | 492 (49.8) | 500 (50.6) | |

Note: All parenthesis shows column percentage.

**Table 2: Bivariate and multivariable analysis of background characteristics and pregnancy related factors with LBW new-borns (n=1976).**

| Factors | LBW | | Bivarriate analysis UOR (95% CI) | Multivarriate analysis AOR (95% CI) |
|---|---|---|---|---|
| | Yes (%) | No (%) | | |
| **Anemic in pregnancy** | | | | |
| Yes | 104 (10.5) | 884 (89.5) | 1.96 (1.4, 2.74) 1 | 2.11 (1.51, 2.95) 1 |
| No | 56 (5.7) | 932 (94.3) | | |
| **Mother's age (years)** | | | | |
| ≤19 | 64 (9.7) | 594 (90.3) | 1.43(0.96,2.12) 1<br>0.93 (0.38, 2.44) | 1.08 (0.7, 1.67) 1<br>1.31 (0.51, 3.37) |
| 20-29 | 92 (7.3) | 1164 (92.7) | | |
| ≥30 | 4 (6.5) | 58 (93.5) | | |
| **Parity** | | | | |
| Primipara | 99 (9.6) | 933 (90.4) | 10.64 (0.46, 0.88) | 10.63 (0.44, 0.9) |
| Multipara | 61 (6.5) | 883 (93.5) | | |
| **Religion** | | | | |
| Hindu | 82 (8.3) | 902 (91.7) | 10.99 (0.72, 1.35) | 11.01 (0.73, 1.39) |
| Muslim | 78 (7.9) | 914 (92.1) | | |
| **Early registration ≤ 12 weeks** | | | | |
| Yes | 127 (8.4) | 1385 (91.6) | 10.92 (0.63,1.34) | 10.94 (0.63, 1.38) |
| No | 33 (7.1) | 431 (92.9) | | |
| **Adequate weight gain** | | | | |
| Yes | 25 (7.5) | 308 (92.5) | 11.1 (0.71, 1.68) | 11.11 (0.72, 1.71) |
| No | 135 (8.2) | 1508 (91.8) | | |
| **Adequate IFA receive** | | | | |
| Yes | 140 (7.9) | 1622 (92.1) | 11.19 (0.73,1.95) | 10.73 (0.43, 1.26) |
| No | 20 (9.3) | 194 (90.7) | | |
| **New-born gender** | | | | |
| Male | 65 (6.5) | 933 (93.5) | 10.66 (0.48, 0.9) | 11.64 (1.19, 2.27) |
| Female | 95 (9.7) | 883 (90.3) | | |
| **Completed 4 antenatal visits** | | | | |
| Yes | 132 (7.4) | 1647 (92.6) | 12.27 (1.50, 3.44) | 12.7 (1.75, 4.15) |
| No | 28 (14.2) | 169 (85.8) | | |
| Maternal weight on first visit (mean±SD | 44.74±7.51 | 44.91±773 | 0.99 (0.98, 1.02) | 0.99 (0.97-1.02) |

Note: UOR-unadjusted odds ratio, AOR- adjusted odds ratio; Nagelkerke 0.053 (53% variation was explained).

Bivariate analysis reveals that LBW babies are significantly associated with anemia in pregnancy (UOR 1.96, 1.4-2.74), multi-parity (UOR 0.64, 0.46-0.88), incomplete ANC visits (UOR 2.27, 1.50-3.44) and newborn female gender (UOR 0.66, 0.48-0.9) (Table 2). Other factors like mother's age, religion, early ANC registration, adequate IFA, adequate weight gain in pregnancy found to have no significant association with LBW (Table 2).

On multivariable logistic regression, LBW babies are also significantly associated with anemia in pregnancy (AOR 2.11, 1.51-2.95), multi-parity (AOR 0.63, 0.44-0.9), incomplete ANC visits (AOR 2.7, 1.75-4.15) and female gender (AOR 1.64, 1.19-2.27) and no association with maternal weight (AOR 1.11, 0.72-1.71), mother's age ≤ 19 (AOR 1.08, 0.7-1.67), mother's age ≥ 30 (AOR 1.31, 0.51-3.37), Religion (AOR 1.01, 0.73-1.39), early registration (AOR 0.94, 0.63-1.38), adequate weight gain (AOR 1.11, 0.72-1.71) and adequate IFA tablet (AOR 0.73, 0.43-1.26) (Table 2).

## DISCUSSION

Cumulative incidence of LBW in anemic, non-anemic group in pregnancy and out of all pregnancy outcomes are 10.5%, 5.7% and 8.1%. A study by Jagdish et al shows similar findings i.e. LBW in anemic mother 13% and LBW in non-anemic mother 9% and 11% LBW out of all births.[19]

This study shows that anemia during pregnancy is highly associated with LBW [Relative risk 1.85 (1.36-2.54)]. With proper preventive approach to anemia status in pregnancy, we can reduce 9.9% risk of developing LBW babies as pregnancy outcome. Lee et al, Sukrat et al, Haider et al, Malhotra et al and Rahmati et al shows similar findings that hemoglobin less than 11 g/dl increases LBW risk in pregnancy.[20-23]

LBW is also associated and increased with risk of primi-parity (AOR 1.59, 1.11-2.27). Dougherty et al and Roosmallen et al report the mean birth weight of neonates

born to primiparous mothers were less than that for multiparous mothers by 104 g and 100 g, respectively.[24,25] Murphy et al showed a slight increase in birth weight with increasing parity in the lower parity groups.[26]

This study also shows that female newborns (AOR 1.64, 1.19-2.27) are significantly more associated with risk of LBW. Studies by Dougherty et al and Hirve and Ganatraet al report that risk of LBW more in females compared to males.[24,27]

This study also reveals LBW also significantly associated with incomplete 4 ANC visits (AOR 2.7, 1.75-4.15). Study reveals insignificant association with mother's age at pregnancy. Maternal age had no significant association with LBW which is consistent with studies conducted by Mavalankar et al in India and Fikree and Berenes et al in Pakistan.[28,29] But, in contrast, Yadav et al and Joshi et al found more risk of delivering LBW babies by teenage mothers.[30,31]

This study also reveals no significant association with initial Hb level, initial maternal weight on 1st visit and weight gain through 4 visits. But, study by Hosen et al conclude that maternal weight at 1st visit (<45 kg) and weight gain (<7 kg) during pregnancy have been found to be consistently associated with LBW.[32]

This study shows insignificant association between LBW and religion which was suggested by Yadav et al and Bhaskar et al.[33,34] Study by Jagadish et al shows mid-trimester drop of mean Hb level seen in nonanemic mothers was not seen in anemic mothers.[19]

As a record based, study cannot reflect all socio-demographic variables and antenatal factors (like socio-economic status, maternal educational status, actual IFA tablet consumption, Hb% status before pregnancy, antenatal nutrition, complications, co-morbidities etc.) cannot be included in the study. A prospective cohort design will give more valid results. The large sample size and temporality due to cohort design still gives some strength in spite of such limitations.

## CONCLUSION

This study concludes that anemia in pregnancy significantly increases risks of LBW as pregnancy outcome which also strongly associated with female new-born, primi-parity, incomplete ANC visits. Strengthening of the existing adolescent and maternal health interventions focusing towards anemia screening and prevention among reproductive age group women would reduce the incidence of LBW babies.

## ACKNOWLEDGEMENTS

We would like to acknowledge Institutional Ethics Committee of Burdwan Medical College for issuing the ethical approval of this study and also acknowledge all health professionals of Bhatar block, Purba Bardhaman for their kind support.

*Funding: No funding sources*
*Conflict of interest: None declared*
*Ethical approval: The study was approved by the Institutional Ethics Committee*

## REFERENCES

1. World Health Organization (WHO). Pregnancy, Childbirth, Postpartum and New-born Care: A guide for essential practice. Geneva: World Health Organization; 2006.
2. Bugg GJ, Atwal GS, Maresh M. Grand multipara in a modern setting. BJOG. 2002;109(3):249-53.
3. Bai J, Wong F, Bauman A, Mohsin M. Parity and pregnancy outcomes. Am J Obstet Gynecol. 2002;186:274-8.
4. Hughes PF, Morrison J. Birth weight distribution in the United Arab Emirates. Asia Oceania J Obstet Gynaecol. 1994;20:73-6.
5. Haniff J, Das A, Onn LT, Sun CW, Nordin NM, Rampal S, et al. Anemia in pregnancy in Malaysia: a cross-sectional Survey. Asia Pac J Clin Nutr. 2007;16(3):527-36.
6. Aziz FA. Pregnancy and labor of grand multiparous Sudanese women. Int J Gynaecol Obstet. 1980;18:144-6.
7. ACOG Practice Bulletin No. 95: Anemia in pregnancy. Obstet Gynecol. 2008;112:201.
8. Jaleel R, Khan A. Severe anemia and adverse pregnancy outcome. J Surg Pak (International). 2008;13:147-50.
9. Rusia U, Madan N, Agarwal N, Sikka M, Sood SK. Effect of maternal iron deficiency anemia on foetal outcome. Indian J pathol Microbiol. 1995;38:273-9.
10. Haggaz AD, Radi EA, Adam I. Anemia and low birth weight in western Sudan. Trans R Soc Trop Med Hyg. 2010;104:234-6.
11. Levy A, Fraser D, Katz M, Sheiner E. Maternal anemia during pregnancy is an independent risk factor for low birthweight and preterm delivery. Eur J Obstet Gynecol Reprod Biol. 2005;122:182-6.
12. Bondevik GT, Lie RT, Ulstein M, Kvale G. Maternal hematological status and risk of low birth weight and preterm delivery in Nepal. Acta Obstet Gynecol Scand. 2001;80:402-8.
13. Ministry of Health and Family Welfare. National Family Health Survey-4 West Bengal Factsheet. 2015-2016:1-6.
14. Ministry of Health and Family Welfare. National Family Health Survey-4 India Factsheet. 2015-2016:1-8.
15. Low birth weight database. Available at: https://data.unicef.org/topic/nutrition/low-birthweight/. Accessed on 4th September 2018.
16. Salimi S, Nakhostin B, Alijahan J, Hazrati S. Relationship hemoglobin and mother bmi in

pregnancy with low birth weight. J Ardebil Univ Med Sci. 2012;15:14-20.
17. Bodeau-Livinec F, Briand V, Berger J, Xiong X, Massougbodji A, Day KP, et al. Maternal anemia in Benin: prevalence, risk factors, and association with low birth weight. Am J Trop Med Hyg. 2011;85(3):414-20.
18. Documentation for Sample Size for a Cross-Sectional, Cohort, or Clinical Trial Studies. Available at: http://www.openepi.com/PDFDocs /SSCohortDoc.pdf. Accessed on 4th September 2018.
19. Kumar KJ, Asha N, Murthy DS, Sujatha MS, Manjunath VG. Maternal anemia in various trimesters and its effect on newborn weight and maturity: an observational study. Int J Prevent Med. 2013;4(2):193.
20. Lee HS, Kim MS, Kim MH, Kim YJ, Kim WY. Iron status and its association with pregnancy outcome in Korean pregnant women. Eu J Clin Nutrit. 2006;60(9):1130.
21. Sukrat B, Wilasrusmee C, Siribumrungwong B, McEvoy M, Okascharoen C, Attia J, et al. Hemoglobin concentration and pregnancy outcomes: a systematic review and meta-analysis. BioMed Res Int. 2013;2013:1-9.
22. Haider BA, Olofin I, Wang M, Spiegelman D, Ezzati M, Fawzi WW. Anaemia, prenatal iron use, and risk of adverse pregnancy outcomes: systematic review and meta-analysis. BMJ. 2013;346:1-19.
23. Rahmati S, Delpishe A, Azami M. Maternal anemia during pregnancy and infant low birth weight: A systematic review and Meta-analysis. Int J Reprod Biomed (Yazd). 2017;15(3):125-34.
24. Dougherty CRS, Jones AD. The determinants of birth weight. Am J Obstet Gynecol. 1982;144:190-200.
25. Van Roosmallen J. Birth weights in two rural hospitals in the United Republic of Tanzania. Bull WHO. 1988;66:653-8.
26. Murphy JF, Dauncey M, Newcombe R, Garcia J, Elbourne D. Employment in pregnancy: prevalence, maternal characteristics, perinatal outcome. Lancet. 1984;1:1163-6.
27. Hirve SS, Ganatra BR. Determinants of low birth weight: a community based prospective cohort study. Indian Pediatr. 1994;31(10):1221-5.
28. Mavalankar DV, Gray RH, Trivedi CR. Risk factors for preterm and term low birthweight in Ahmedabad, India. Int J Epidemiol. 1992;21(2):263-72.
29. Fikree FF, Berenes HW, "Risk factors for term intrauterine growth retardation: a community-based study in Karachi," Bulletin of the World Health Organization. 1994;72:581-7.
30. Yadav S, Choudhary D, Mandal RK, Sharma A, Chauhan SS, Agrawal P. Adverse reproductive outcomes associated with teenage pregnancy. McGill J Med. 2008;11(2):141-4.
31. Joshi HS, Subba SH, Dabral SB, Dwivedi S, Kumar D, Singh S. Risk factors associated with low birth weight in newborns. Indian J Community Med. 2005;30(4):142-3.
32. Hosain M, Chatterjee N, Begum A, Saha SC. Factors associated with low birthweight in Rural Bangladesh. J Trop Pediatr. 2006;52(2):87-91.
33. Yadav DK, Chaudhary U, Shrestha N. Risk factorsassociated with low birth weight. J Nepal Health Res Council. 2011;9(19):159-64.
34. Bhaskar RK, Deo KK, Neupane U, Chaudhary Bhaskar S, Yadav BK, Pokharel HP, et al. A case control study on risk factors associated with low birth weight babies in eastern Nepal. Int J Pediatr 2015: 1-7.

**Cite this article as:** Biswas P, Samsuzzaman M, Chakraborty A, Das DK. Maternal anemia and low birth weight in a community development block of Purba Bardhaman, West Bengal: a retrospective cohort analysis. Int J Community Med Public Health 2019;6:5250-5.