Maternal Anaemia and Neonatal Outcomes

I.A. Deswanto,1 J.N.F. Muhammad,1 A. Sani,1 D. Saptania,1 T.Priyatini2

1Medical Science Program, Faculty of Medicine Universitas Indonesia
2Department of Obstetrics and Gynaecology, Faculty of Medicine Universitas Indonesia

Abstract

This cross-sectional study aims to determine whether maternal anaemia would affect birth outcome – birth weight and length – of the baby and compare this with that of non-anaemic mothers. We used secondary data from Puskesmas Kecamatan Ciracas medical records. All delivery records from October – November 2012 were collected and analysed; samples were divided into two group: Group 1 included anaemic pregnant women and Group 2 non-anaemic pregnant women. Inclusion criteria was all pregnant women 16 years and older and a singleton pregnancy with a complete medical record. All women with a past history of preterm delivery, obstetrical complications or any medical illness, except anaemia, were excluded from the study in order to control for the confounding factors. Out of one hundred and one records, 79 non anaemic subjects and 22 anaemic subjects, were included for the analysis. No significant difference was found in both groups in terms of baby’s birth weight and birth length.

Keywords: maternity anaemia, birth weight, birth length

Anaemia pada Ibu Hamil dan Karakteristik Neonatus

Abstrak

Penelitian potong lintang ini bertujuan menentukan apakah anemia pada ibu hamil akan mempengaruhi kelahiran -berat lahir dan panjang- bayi dan membandingkannya dengan ibu non-anemia. Data penelitian adalah data sekunder dari catatan medis Puskesmas Kecamatan Ciracas. Semua catatan medis dari Oktober - November 2012 dikumpulkan dan dianalisis, sampel dibagi menjadi dua kelompok. Kelompok 1 termasuk ibu hamil anemia dan Grup 2 ibu hamil non-anemia. Kriteria inklusi adalah semua wanita hamil usia > 16 tahun dan kehamilan tunggal dengan catatan medis lengkap. Semua wanita dengan riwayat kelahiran prematur, komplikasi obstetri atau penyakit medis, kecuali anemia, dikeluarkan dari penelitian dengan tujuan untuk mengendalikan faktor perancu. Dari seratus satu catatan, 79 subyek non anemia dan 22 subjek anemia, dimasukkan untuk analisis. Tidak ada perbedaan signifikan yang ditemukan pada kedua kelompok dalam hal berat lahir bayi dan panjang lahir.

Kata kunci: anemia pada ibu hamil, berat lahir, panjang lahir
Introduction

Anaemia is a condition in which the quantity of red blood cells or their oxygen-carrying capability is insufficient to meet physiologic needs.\(^1\) It is one of the most frequent medical problems in pregnancy (Figure 1). According to WHO criteria, haemoglobin (Hb) concentration of less than 11 g/dl and haematocrit of <0–33 is declared as anaemia in pregnancy.\(^2\)

Approximations from the World Health Organization report that 41.8% (95% CI 39.9 – 43.8%) of pregnant women are anaemic and iron deficiency is the major aetiology of anaemia in pregnancy.\(^3\) In Indonesia, according to National Household Survey (Survei Kesehatan Rumah Tangga/SKRT 2005), 50.9% of pregnant women suffer from iron deficiency anaemia (IDA). IDA is associated with a number of harmful outcomes for both infant and mother including premature labour and small for gestation infan,\(^4\) postpartum anaemia,\(^5\) emotional instability,\(^6\) and increased rates of depression.\(^5,7\) Additionally, several trials link maternal IDA to low infant iron stores, raising the likelihood of injurious effects on infant neurodevelopment.\(^8\)

Low birth weight (LBW) is one of major determinants of morbidity, disability, and mortality in infancy and childhood, and has a long term impact on health outcomes in adult life. Worldwide, neonatal mortality is 20 times more likely for LBW babies compared to heavier babies (≤2.5 kg).\(^9\) Studies about the association of maternal anaemia on adverse pregnancy outcomes particularly LBW babies have been inconsistent. Further, there is insufficient information to assess overall adverse impact of anaemia during pregnancy. The present study aims to determine whether maternal anaemia would affect the birth outcome – birth weight and length – of the baby and compare this with that of non-anaemic mothers.

Methods

The study is a cross-sectional in design, comparing the effect of maternal anaemia on birth outcome (i.e. birth weight and length) of the baby with that of non-anaemic mothers. This trial took place at the obstetric ward of Puskesmas Kecamatan Ciracas, East Jakarta. Secondary data from Puskesmas medical records were used. All delivery records from October – December 2012 were collected and analysed; samples were divided into two group: Group 1 included anaemic pregnant women and Group 2 non-anaemic pregnant women. Demographic data, socio-economic profile, antenatal and obstetric history were pooled and analysed. The blood Hb level and birth outcomes were taken from the labour room record.

Inclusion criteria was all pregnant women 16 years and older and a singleton pregnancy with a complete medical record. In Group 1 pregnant women having Hb levels <11 g/dl in labour and in Group 2 pregnant women having Hb levels ≥11 g/dl in labour were included in this study. All women with a past history of preterm delivery, obstetrical complications or any medical illness, except anaemia, were excluded from the study in order to control for the confounding factors.
Data was analysed using SPSS-17. Descriptive statistics were used to calculate means and standard deviations for numerical data. These were compared using t-test at a confidence level of 95%. Frequencies were calculated for categorical data. These were compared using χ² test, and $p<0.05$ was statistically significant.

**Results**

A total of 109 records were identified; 79 non anaemic subjects and 22 anaemic subjects, were included for the analysis. There were 28 records excluded from the statistical analysis for the unavailability of Hb concentration measurement result. The background characteristics of the subjects are presented in Table 1. No significance difference was found between the two groups analysed in terms of age, occupation, number of children, history of delivery and problems in pregnancy, birth attendant, family planning, body weight, body height, mid-arm circumference, and iron supplementation therapy. The average Hb concentration was 12.03 ± 0.89 and 10.00 ± 0.78 for non-anaemic and anaemic subjects, respectively ($p = 0.00$).

### Table 1. Background Characteristics of Subjects Included in The Study

|                       | Non – anaemic Subjects (N = 79) | Anaemic Subjects (N = 22) | OR     | 95% CI      | Sig*  |
|-----------------------|---------------------------------|---------------------------|--------|-------------|-------|
| Age (mean ± SD, years)| 28.41 ± 5.38                    | 28.85 ± 5.35              | 0.74   |             |       |
| Patient’s Occupation  |                                 |                           |        |             |       |
| Housewife             | 69 (87.3)                       | 21 (95.5)                 | 0.33   | 0.02 – 2.77 | 0.45  |
| Private Sector Worker | 9 (11.4)                        | 1 (4.5)                   | 2.70   | 0.32 – 60.16| 0.67  |
| Civil Servant         | 1 (1.3)                         | 0 (0.0)                   | ∞      | 0.02 – ∞    | 1.00  |
| Partner’s Occupation  |                                 |                           |        |             |       |
| Private Sector Worker | 50 (63.3)                       | 13 (59.1)                 | 1.19   | 0.41 – 3.46 | 0.81  |
| Self Employed         | 15 (19.0)                       | 4 (18.2)                  | 1.06   | 0.28 – 4.31 | 1.00  |
| Labourer              | 12 (15.2)                       | 4 (18.2)                  | 0.81   | 0.21 – 3.39 | 0.75  |
| Civil Servant         | 1 (1.3)                         | 1 (4.5)                   | 0.27   | 0.01 – 10.37| 0.39  |
| Student               | 1 (1.3)                         | 0 (0.0)                   | ∞      | 0.02 – ∞    | 1.00  |
| Number of Children    |                                 |                           |        |             |       |
| (mean ± SD)           | 2.00 ± 0.93                     | 2.05 ± 0.78               | 0.81   |             |       |
| History of Delivery   |                                 |                           |        |             |       |
| Normal Delivery       | 72 (91.1)                       | 21 (95.5)                 | 0.49   | 0.02 – 4.40 | 0.68  |
| Vacuum or Forcep      | 2 (2.5)                         | 0 (0.0)                   | ∞      | 0.07 – ∞    | 1.00  |
| Extraction            |                                 |                           |        |             |       |
| History of Problems in Pregnancy or Delivery |   |                           |        |             |       |
| IUFD or Abortion      | 5 (6.3)                         | 1 (4.5)                   | 1.46   | 0.15 – 34.85| 0.05  |
| None                  | 71 (90.9)                       | 18 (81.8)                 | 1.97   | 0.44 – 8.44 | 0.29  |
| Birth Attendant       |                                 |                           |        |             |       |
| Midwife               | 63 (79.7)                       | 17 (77.3)                 | 1.16   | 0.32 – 4.05 | 0.77  |
| Doctor, midwife       | 7 (8.9)                         | 2 (9.1)                   | 0.97   | 0.16 – 7.39 | 1.00  |
| Doctor                | 4 (5.1)                         | 2 (9.1)                   | 0.53   | 0.06 – 4.56 | 0.61  |
| Family Planning       |                                 |                           |        |             |       |
| Injection             | 24 (30.4)                       | 5 (22.7)                  | 1.48   | 0.44 – 5.23 | 0.59  |
| Injection, pill       | 2 (2.5)                         | 0 (0.0)                   | ∞      | 0.07 – ∞    | 1.00  |
| Pill                  | 21 (26.6)                       | 3 (13.6)                  | 2.29   | 0.56 – 10.88| 0.21  |
| Implant               | 0 (0.0)                         | 1 (4.5)                   | 0.00   | 0.00 – 4.85 | 0.22  |
| No contraception      | 30 (38.0)                       | 13 (59.1)                 | 0.42   | 0.15 – 1.22 | 0.09  |
| Body Weight (mean ± SD, kg) | 59.93 ± 13.76                | 64.91 ± 11.11             | 0.14   |             |       |
| Body Height (mean ± SD, cm) | 153.81± 4.79              | 154.53 ± 4.79             | 0.54   |             |       |
| Mid Arm Circumference (mean ± SD, cm) | 25.84 ± 1.74               | 26.46 ± 2.78              | 0.24   |             |       |
| Iron Supplementation  |                                 |                           |        |             |       |
| SF                    | 76 (96.2)                       | 21 (95.5)                 | 1.21   | 0.05 – 14.24| 1.00  |
| No supplement         | 3 (3.8)                         | 1 (4.5)                   | 0.83   | 0.07 – 21.82| 1.00  |
| Haemoglobin concentration (mean ± SD, g/dl) | 12.03 ± 0.89               | 10.00 ± 0.78              | 0.00   |             |       |

* chi-square test for categorical data analyses, t-test for continuous data analyses
OR = Odds Ratio; 95% CI = 95% Confidence Interval; Sig. = significance
Table 2 shows the neonatal outcomes in both groups. No significant difference was found in both groups in terms of baby’s birth weight and birth length.

**Discussion**

This study has been constructed with the purpose of discovering the correlation between maternal anaemia and neonatal birth weight. Taking this into consideration, we have gathered a total of 101 subjects that had been divided into anaemic (22 subjects) and non-anaemic group (79 subjects). From the results of our data analysis, it is found that there is no significant difference between anaemic and non-anaemic groups in their baby’s birth weight as well as birth length. The difference in birth weight and length was not only insignificant but also the mean birth weight and length was lower in non-anaemic group compared to those from anaemic subjects. This result is contradicting the data found in a review conducted by Allen et al in which lower birth weight was found in anaemic women.8

This phenomenon can be explained by a number of reasons. One of the possible explanations is the severity of anaemia in the anaemic subjects. The mean Hb concentration in the anaemic subjects from Puskesmas Kecamatan Ciracas is 10.00 ± 0.78 g/dL which is considered to be mild-moderate anaemia. It is hypothetically possible for the low birth weight to be directly proportional to lower Hb concentration. Secondly, non-significant difference in birth weight may be caused by the difference in the population size of both study groups. The reason for this difference in numbers between both groups is inevitable due to the nature of our cross-sectional study design. The effect of this problem can be minimized in future studies by recruiting larger number of study populations. Nevertheless, the difference in the number of anaemic and non-anaemic group may also indicate the success of iron supplementation in reducing the prevalence of anaemia in Puskesmas Kecamatan Ciracas.

Future studies that investigate further into the effect of iron supplementation to maternal anaemia and also birth weight may be conducted.

Lastly, the outcome of low birth weight is affected by many factors other than anaemia. We have tried to minimize the presence of confounding factors by applying inclusion criteria and exclusion criteria into the process of subject recruitment. Additionally, there are no significant differences in term of background characteristics between the 2 groups. Nevertheless, despite all the effort to minimize any presence of confounding factors we are still unable to eliminate a number of elements that may be strongly correlated with birth weight. One study conducted by Rode et al has demonstrated the inverse relationship between maternal weight gain low birth weight.10 Although we are aware of this factor, we are still unable to collect data regarding the maternal weight gain throughout the process of pregnancy. This inability to include progress of maternal weight gain is due to incomplete or irregular antenatal care. Furthermore, some mothers underwent antenatal care outside Puskesmas Kecamatan Ciracas that implies that data from previous antenatal visits are not readily available in the labour room records.

**Conclusion**

To conclude, the association between maternal anaemia and low birth weight could not be established. These results can be caused by a number of factors such as the severity of anaemia in our study population, the large gap in numbers between anaemia and non-anaemic group as well as the presence of other confounding factors that is relatively hard to be eliminated in the settings of our studies. Nevertheless, the data from our studies may be used as references for further studies in the near future. If future studies are to be conducted, it is ideally recommendable to use prospective cohort study design that is initiated in the time of first antenatal visits with larger study populations.
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