

The prevalence of iron deficiency anemia during pregnancy in Iran (1991-2015): A systematic review and meta-analysis

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ABSTRACT

Background and aims: The prevalence of iron deficiency anemia (IDA) in pregnant women is in Variable between 40-80% in developing countries. There are some differences among different studies on this disorder. So, this present study is been performed for evaluating the prevalence of IDA among pregnant Iranians with systematic review and meta-analysis method.

Methods: This study is based on received information achieved from Magiran, Iranmedex, SID, Med Lib, Iran Doc, Scopus, Pubmed, Science Direct, Cochrane, Embase, Medline, Springer, Online Library Wiley and Google Scholar in chronological order of 1 January 1991 to 31 march 2015 with using standard key words. Search and extraction of data were done by two independent reviewers. Using random effects model and meta-analysis, the data were analyzed through SPSS.

Results: In the 32 eligible studies, the 63372 individuals have been evaluated. The prevalence of anemia among pregnant Iranians was estimated to be 14.2% (95% CI: 12-16.3%). Most prevalence of anemia was seen in the study, the samples of which were collected in several parts of country, (21.5%) and the lowest prevalence was seen in the West of the country (7%). The prevalence of anemia in urban and rural pregnant women was estimated 13.7% and 20% approximately, respectively.

Conclusion: The prevalence of anemia among pregnant Iranians in the recent 24 years according to WHO system reported to be low in developing countries, that it was related to appropriate planning and caring in pregnancy period in countries.

Keywords: Anemia, Pregnancy, Systematic review, Meta-analysis, Iran.

INTRODUCTION

The anemia is called into the state of decrease in counts size of Red Blood Cells and Hemoglobin, so that the transfer of O₂ and CO₂ is been defeated.^{1,2}

Anemia is one of the most important diseases related to poor nutrition, and one of the

most serious health jeopardy in the over age people, but the most prevalence is reported for 5 years old children and pregnant women. According to WHO statistics, 2 billion persons (25% of population of the world) suffer from anemia that the pregnant women are

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responsible of 56 million. In this statistic, the half of anemia included iron deficiency anemia (IDA) (with ICD code 280.9). The prevalence of that in the developing countries is 35-100%. As the performed studied, the anemia is responsible for 15-20% of pregnant mothers' death.²⁻⁷

Despite IDA hasn't any effect on neonate's haemoglobin, it can cause some problems such as early fatigue, vertigo, pre-term birth, vaginal growth disorder, neonate's anomalies, low weight and death of neonates.⁸⁻¹¹

The requirement of iron augments in pregnant period leads into IDA due to inappropriate diet and lack of supplementary iron. The cut-off point haemoglobin reported by WHO for anemia was less than 11 mg/dl and in order to confirm the Academy of Nutrition and Pregnancy, it is less than 11 mg/dl in first and third trimester and less than 10.5 mg/dl in second trimester, So that the every amount less than 10.5 mg/dl is been considered as anemia.^{12,13}

The systematic review performed by Esmat Baruti; 2005 in Iran was done among 11037 samples, and the minimum and maximum were reported as 4.3 and 21.5% among pregnant women, respectively, and the cumulative prevalence of anemia disorder among pregnant women was estimated 13.6(95% CI: 8.3-19.0) according to WHO (less than 11mgr/dl) standards.¹⁴

There are several studies that they reported different prevalence on anemia among pregnant women (16-47). One of the purposes of meta-analysis studies that included several studies is decreasing the different of parameters corroborating increase the numerous of studies. The other important purpose of this kind is to grasp congruous between parameters and reason of them. In the present study tried by using structured review method and meta-analysis, we achieved the estimation of the prevalence of anemia among pregnant Iranians.

METHODS

This study is a regular review and systematic one. The results are according to published articles in Iranian and foreign Journals. In order to achieve Persian and Latin documentaries, the websites such as Magiran, Iranmedex, SID, Med Lib, Iran Doc, Scopus, PubMed, science Direct, Cochrane, Embase, Medline, Springer, Online Library Wiley and Google Scholar in the chronological order 1 January 1991 to 31 march 2015 by using standard key words were searched. The keywords included prevalence, anemia, haemoglobin, Ferritin, pregnancy, the pregnant period cares and combining them and Persian equivalent for Iranian websites. The quality of the studies was evaluated on their performance and studding method, so the STORBE check list was used including 22 parts related to certain studies.¹⁵

The inclusion standards considered as the prevalence of anemia among pregnant Iranians according to WHO standards (HB less than 11 mg/dl) in Persian and English languages in 1991-2015. All of the studies which had mistaken in choosing the sample amount and irrelevancy issue were ruled out. In the next step, the reviewer evaluated the different aspect of methodology like sampling methods, measuring varieties, statically analysing and purposes of study by using STORBE check list including 22 parts. In this check list, the lowest achieved score was 15.5 to analysed studies and their data were collected for meta-analysis process. Every disagreement in beliefs of 2 reviewers was analysed by third reviewers. To thwart of bias, the search was done by 2 independent researchers and the repeated studies were omitted, so the 580 related studies were found about anemia of pregnant Iranians. The 350 studies were omitted because of repeated and unrelated. From 230 last studies, the 199 were omitted by reading full-text and being unrelated and not having entrance criterions (Figure 1).

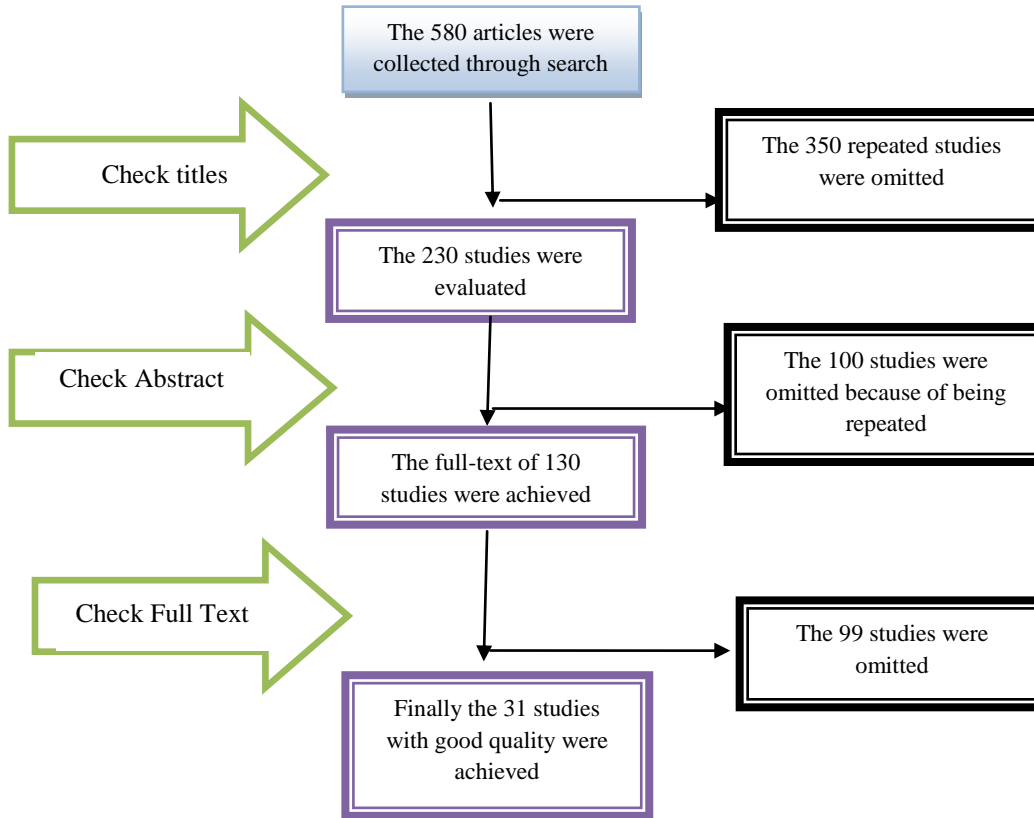


Figure 1: The entrance steps of systematic review and meta-analysis

All of the appropriated inclusion studies were prepared to extract by using past-prepared check list. The check list included authors, year, location, type of study, samples volume, mean age, pregnancy age, HB cut-off point, the prevalence of anemia, Ferritin cut-off point, the prevalence of IDA, the prevalence of lacking of Iron and rural or urban sample volume.

Statically analysis

The prevalence of anemia was considered as binomial distribution in every study, and its variance was calculated. The incongruous of studies was calculated through Q test and I2 index. According to incongruous, it was used as the random effect model for combining the results of studies. The data were analysed by Stata Ver.11.1 software.

The p-value of tests was considered as 0.05.

RESULTS

In the systematic review of initial studies, the 580 studies were elicited, and the 130 related studies were detected with review of titles and abstracts, and the 31 studies were meta-analysis with 63372 volume samples and 25.6 years old mean age (95% CI: 21.99-29.21). In this number, the 6 studies were performed in West (19.3%), the 10 in Centre (32.3%), the 7 in South (22.6%), the 6 in North (19.3%), the 1 in East (3.2%), and one of them (3.2%) was performed in several sections of countries (Table 1).

Table 1: Detailed characteristics of 32 articles included in the systematic review on the prevalence of anemia during pregnancy in Iran

| Author | Place of study (source) | Sample size | Place | Year | Gestational age (Week) | Hb cut-off Point (gr/d) | Prevalence of anemia | Ferritin cut-off point for IDA (ng/dl) | Prevalence of iron deficiency |
|----------------------------|-------------------------|-------------|-------|------|--------------------------------------|-------------------------|----------------------|--|-------------------------------|
| Ranaei ¹⁶ | Sanandaj | 1137 | Urban | 2009 | | 11 | 8 | | |
| Sadeghian ¹⁷ | Tabas | 34 | Rural | 2010 | | 11 | 5.9 | | |
| Mirzaie ¹⁸ | Kerman | 2213 | | 2005 | First and second and third trimester | 11 | 4.7 | | |
| Sharifi ¹⁹ | Shiraz | 400 | Both | 2011 | | 11 | 12.3 | | |
| Soofizadeh ²⁰ | Sanandaj | 1500 | Urban | 2009 | First trimester | 11 | 7.1 | | |
| Mostaaajeran ²¹ | Isfahan | 7233 | Both | 2010 | | | 9.4 | | |
| Alizadeh ²² | Ardabil | 312 | | 2011 | third trimester | 11 | 23.2 | | |
| Vaghari ²³ | Gorgan | 48 | Urban | 2007 | | 11 | 25.8 | | 35.6 |
| Rahbar ²⁴ | Semnan | 546 | | 2010 | First trimester | | 32.1 | 25 | |
| Akbarzadeh ²⁵ | Shiraz | 89 | Rural | 2009 | First and second and third trimester | 10.5 | 29.2 | | |
| Pasdar ²⁶ | Kermanshah | 32450 | | 2010 | First and second and third trimester | 11 | 3.6 | | |
| Riahinejad ²⁷ | Isfahan | 280 | Urban | 2012 | third trimester | 11 | 4.6 | | |
| Farji ²⁸ | Rasht | 555 | Urban | 2008 | First trimester | 11 | 21.3 | 12 | |
| Yazdani ²⁹ | Shiraz | 2000 | Urban | 2002 | | 11 | 9 | | |
| Asnafi ³⁰ | Babol | 214 | | 2000 | First and second and third trimester | 10.5 | 9.4 | | |
| Khademi ³¹ | Bandar-abbas | 401 | Both | 2001 | First and second and third trimester | 10.5 | 17.5 | | |
| Jalali ³² | Eslam-shahr | 266 | Urban | 2004 | First and second and third trimester | 11 | 10.2 | 10 | 37.3 |
| Navidian ³³ | Zahedan | 287 | Urban | 2003 | third trimester | 11 | 12.9 | | |
| Safavi ³⁴ | Several regions of Iran | 4368 | Both | 2001 | second and third trimester | 10.5 | 21.5 | 12 | 42.2 |
| Kalantari ³⁵ | Isfahan | 799 | Urban | 1999 | Second trimester | 11 | 14.2 | 12 | 42.7 |
| Ghasemzadeh ³⁶ | Tehran | 308 | Urban | 2004 | | 11 | | 15 | 50.9 |
| Rahbar ³⁷ | Semnan | 691 | Urban | 1999 | third trimester | | 16.9 | | |
| Yarahmadi ³⁸ | Kermanshah | 326 | | 1999 | | | 17.2 | | |
| Lotfizadeh ³⁹ | Tehran | 417 | | 1995 | | 11 | 17.5 | 12 | |
| Soheilzadeh ⁴⁰ | Varamin | 251 | | 1993 | | | 26.1 | | 34.8 |
| Salarilak ⁴¹ | Orumie | 400 | Urban | 1998 | | 11 | 4.3 | | |
| Hajian ⁴² | Babol | 871 | | 2004 | | 11 | 6.4 | | 13.8 |
| Borna ⁴³ | Tehran | 970 | Urban | 2002 | third trimester | 10.5 | 14.9 | | |
| Davaritanha ⁴⁴ | Tehran | 302 | Urban | 2003 | First and second and third trimester | 11 | 8.6 | | |
| Karimi ⁴⁵ | Shiraz | 263 | Urban | 1999 | Second trimester | | 16.7 | | |
| Fararoei ⁴⁶ | Fars province | 3371 | Both | 1996 | | 11 | 4.1 | | 28.5 |
| Vahidinia ⁴⁷ | Hamedan | 378 | Urban | 2000 | | 11 | 4.8 | | |

The prevalence of anemia among pregnant Iranians according to WHO reports is estimated to be 14.2% (95% CI: 12-16.3). The lowest and the most reported prevalence of anemia in existence studies is related to Kermanshah; 2010 (4.1%) and Isfahan; 2012 (46%) (Figure 2).

The prevalence of anemia among pregnant Iranians was collected in chart 2 in order to geographic differential, so the most prevalence of anemia was seen in the study, which it is used the samples collected in several parts of country, (21.5%) and the lowest prevalence was seen in the West of country (Figure 3).

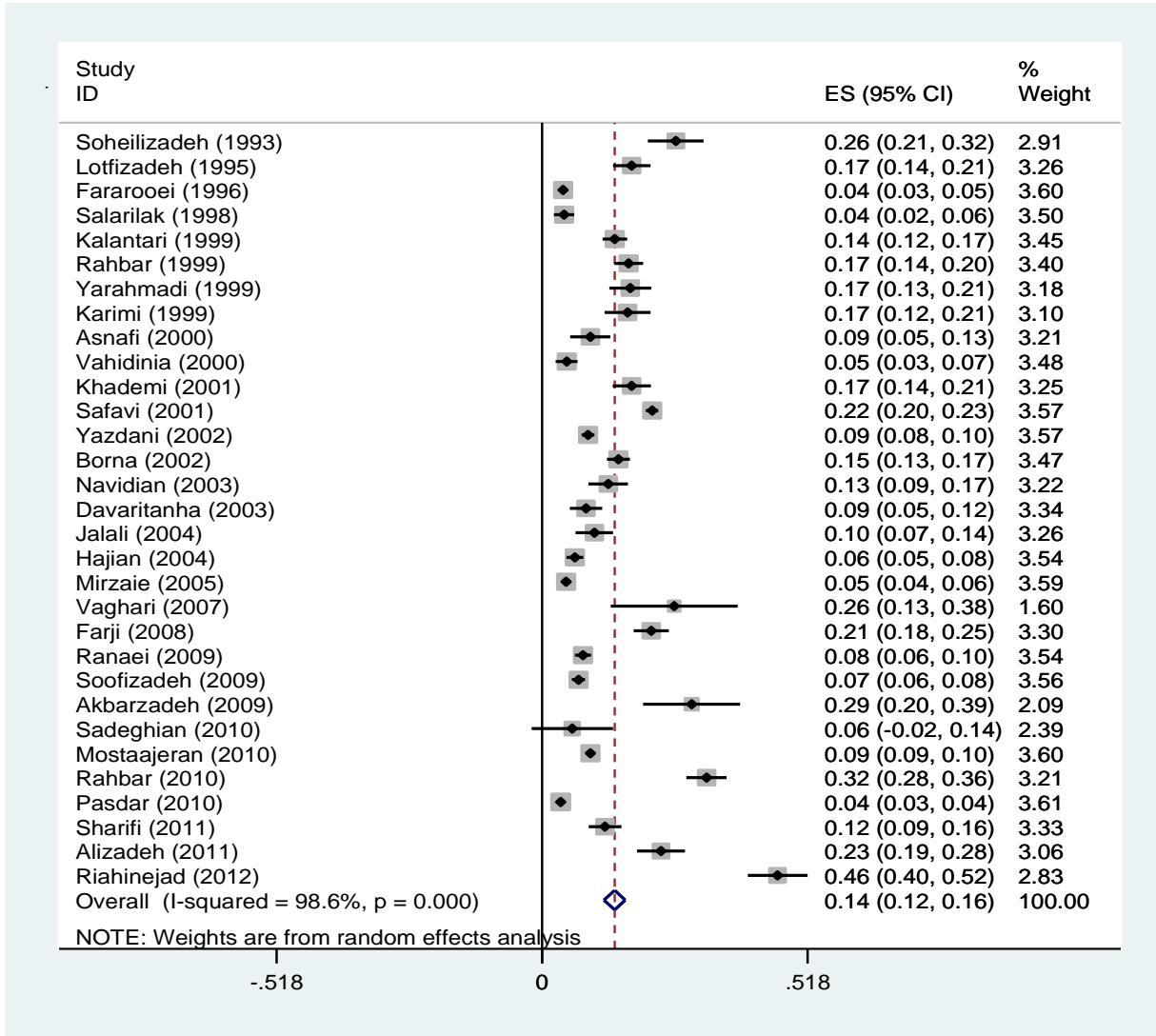


Figure 2: The prevalence of anemia according to WHO definition (HB less than 11mg/dl)

In Iranians pregnant and based on random effect model, and mean point of each segment showed the estimation of percent and the length of each segment showed the 95% confidential interval in each study. The mark diamond showed the prevalence of each study.

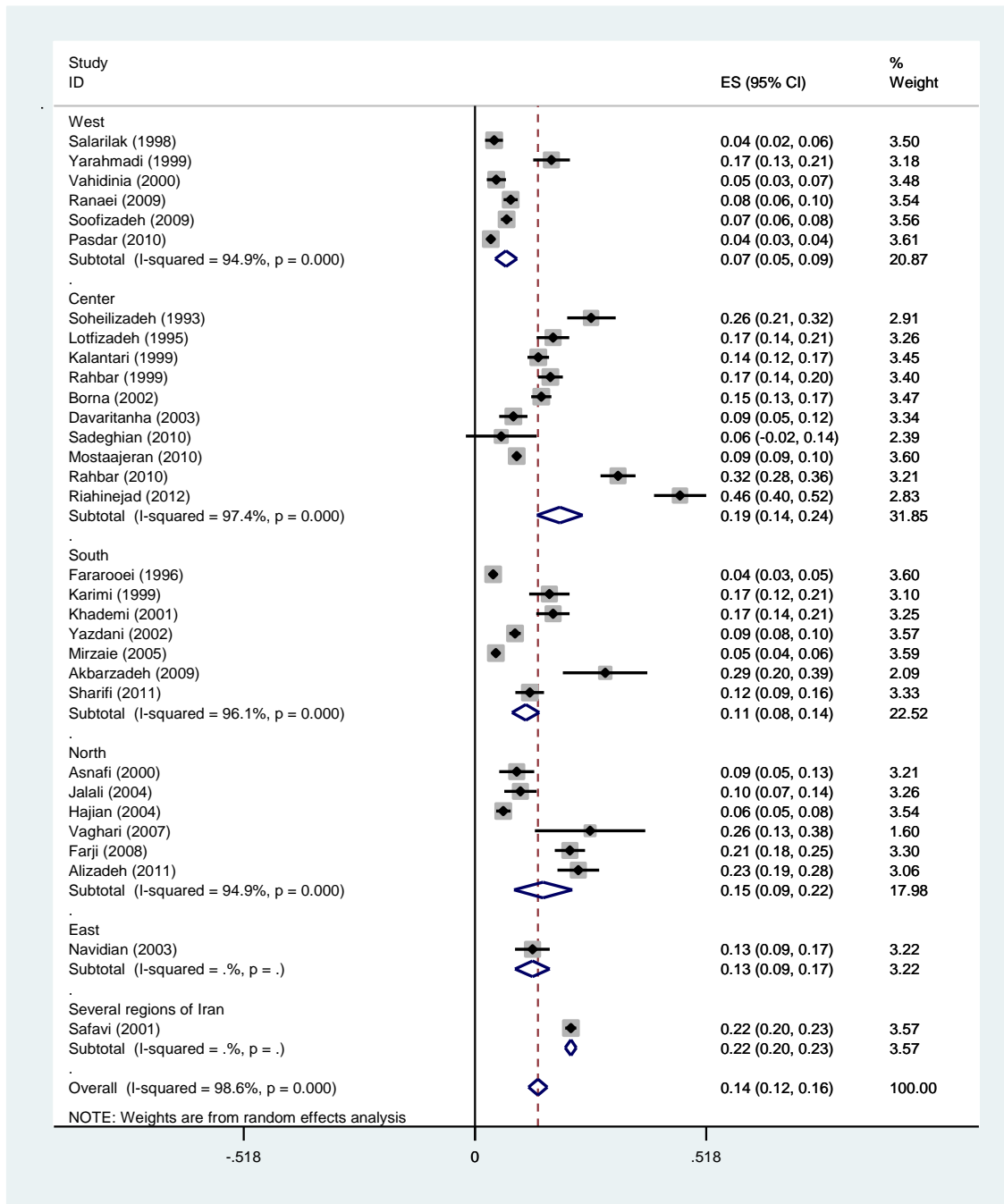


Figure 3: The prevalence of Anemia among Iranians pregnant based on geographic differentiated according to WHO definition (HB less than 11 mg/dl)

Based on random effect model, and mean point of each segment showed the estimation of percent and the length of each segment showed the 95% confidential interval in each study. The mark diamond showed the prevalence of each study.

The prevalence of anemia in urban pregnant women was estimated to be 20%

approximately, that it was more than rural pregnant women with 13.7% (Figure 4).

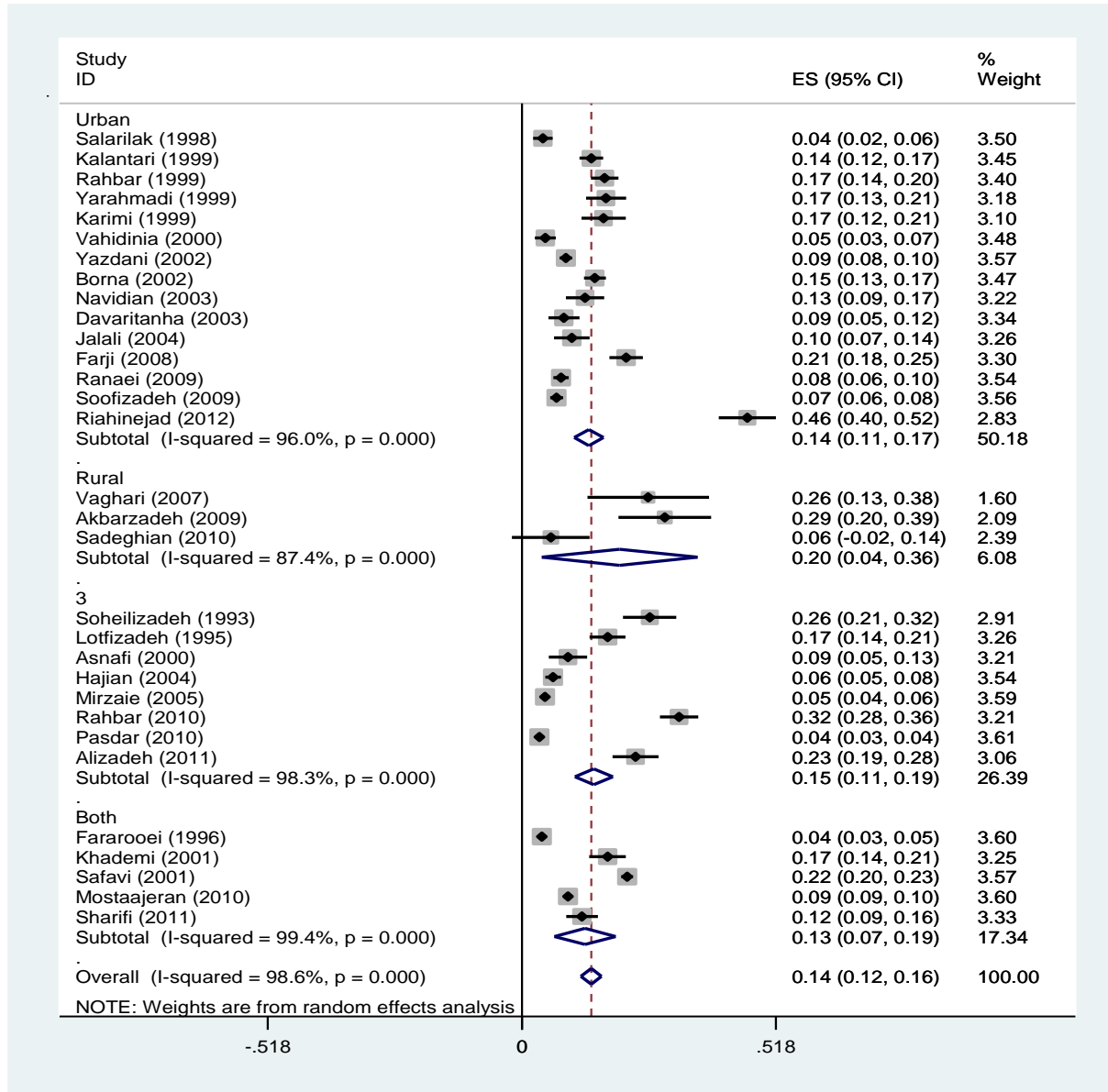


Figure 4: The prevalence of anemia among Iranians pregnant based on rural and urban differentiated according to WHO definition (HB less than 11 mg/dl)

Based on random effect model, and mean point of each segment showed the estimation of percent and the length of each segment showed the 95% confidential interval in each study. The mark diamond showed the prevalence of each study. (3= Unknown)

In line with evaluating the relation between the prevalence of anemia among pregnant Iranians and the year of study,

Meta regression model was used. Although the curve had downtrend, there wasn't any statistically relation ($P=0.318$) (Figure 5).

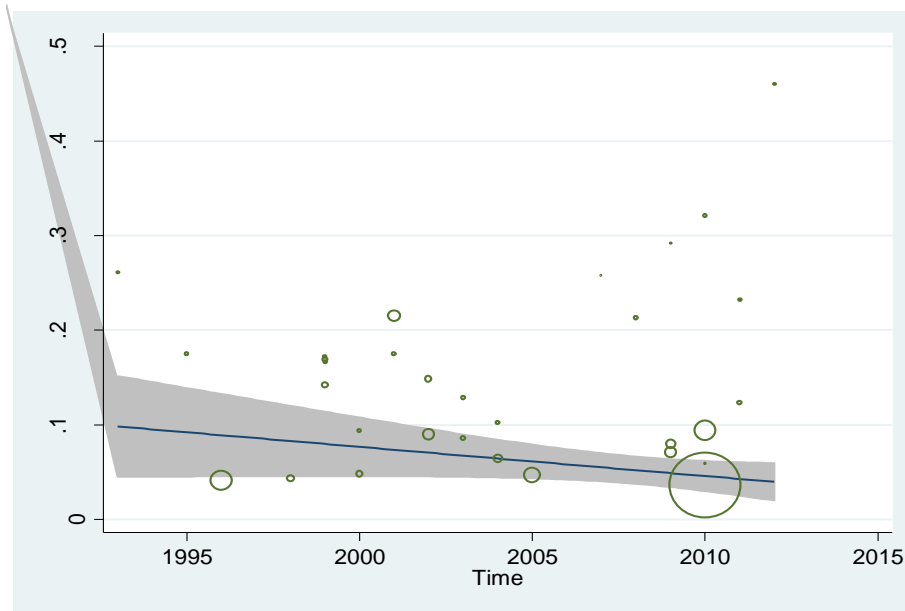


Figure 5: The Meta regression of the prevalence of Anemia among Iranians pregnant according to year of study

The circles show the weight of studies.

DISCUSSION

The most prevalence anemia is IDA around the world.⁴⁷ There are some reasons for IDA in pregnancy period such as inappropriate absorbance, chronic bleeding, malabsorption, haemolysis or combining of them.⁴⁸ The severe mothers' anemia has some consequences like pre-term birth (69.3%), post-delivery bleeding (26%), oligohydramnion (23.8%), myocardial infarction (18%), pre-eclampsia (17%), eclampsia (14%), placental abruption (3%).⁴⁹

In the present study the prevalence of anemia is 14.2% among pregnant Iranians that increases in comparison of systematic

review done in 1993-2005, although it is less than WHO report for developing country.⁵ However, it should be noted that could be listed pregnant women studied in Iran, are mostly attended in health centres who are regularly given iron and folic acid supplements. In addition, national programs for nutritional fortification of flour with iron and folic acid may also help to reduce the overall prevalence of anemia.

The prevalence of anemia among pregnant women in other countries, including Egypt (26%), Africa (52-31%), Central and Eastern Europe (14-40%) is

different.⁵¹ The difference in the prevalence of anemia in various locations, is related to multiple factors such as the social and economic conditions, iron status, and parasitic and infectious diseases.

In this study, the most prevalence is reported for central provinces that are in line with result of Safavi done in 11 several parts of country among pregnant women, and lowest prevalence is reported for Western provinces that are in line with result of study done in Kermanshah by Pasdar, which it was evaluated on 32450 pregnant women.²⁶

It seems that the differences in geographic region, life style and diet in several part of Iran are the main reason for wide spread reported answer based on geographic region in different parts of Iran. The prevalence of anemia in regions is related to some agents like social and economic, iron status and prevalence of parasitic and infectious diseases.^{52,53}

The prevalence among rural women is higher than urban and combined rural-urban. However, there isn't any significant relation but this difference may be related to different life style like numerous pregnancies for rural women. However, this association was not statistically significant, the reason for this discrepancy may be due to lifestyle, multiple pregnancy, do not receiving or getting erratic iron and folic acid supplements, and the small sample size studied in rural women pregnant, so prevalence of anemia in pregnant women in rural areas was only studied in 3 studies. This is in line with the result of systematic review; 2005.¹²

There are limitations in this study, Including: 1) Non ability internal resources to search for the key words that can be used to combine keywords 2) Some medical studies were excluded because of

low quality Particularly medical dissertation 3) Nonstandard framework for the evaluation of anemia in published studies. For this reason numbers of studies were excluded.

CONCLUSION

The prevalence of anemia among pregnant Iranians is less than the WHO report for developing country in 24 current years, and it increases in comparison of systematic review; 2005.

One of the restrictions of this study is both the inability of Iranian websites for combined search based on mix-key words and the omitting some references for low quality like medical thesis, as well as the a lack of standard for evaluating the anemia in reported studies.

CONFLICT OF INTEREST

There is no conflict of interest in this study.

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