



# The Relationship Between the Social Determinants of Health and Preterm Birth in Iran Based on the WHO Model: A Systematic Review and Meta-analysis

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## Abstract

**Objectives:** Despite medical advances in the diagnosis and treatment of diseases, preterm birth is still a global problem. The aim of this study was to investigate the relationship between the social determinants of health and preterm birth in Iran based on the WHO model.

**Materials and Methods:** This systematic review and meta-analysis was performed based on the studies conducted in Iran. An advanced search was carried out in seven databases (Iranmedex, Magiran, SID, Irandoc, PubMed, Google Scholar, and Scopus) for relevant articles published during 2000-2016 using the keywords 'social determinants of health', 'preterm birth', and their Persian equivalents and MeSH terms. All the articles were screened by 2 of the researchers in 3 steps. After looking for relevant articles based on the reference list, quality assessment was performed using a STROBE checklist. After extracting the required data, they were combined using a random model and the heterogeneity of the studies was evaluated using the I<sup>2</sup> index and the data were analyzed in STATA-11.

**Results:** A total of 16 studies were included in the analysis of the relationship between the intermediate determinants of health and preterm birth; however, only 6 truly investigated the relationship between structural determinants and preterm birth. The overall odds ratios for the relationship of the structural and intermediate social determinants of health with preterm birth were estimated as 1.43 (0.84%-2.41%; 95% CI) and 2.17 (1.75%-2.68%; 95% CI). The results showed that preterm birth was more common in women with anxiety, depression, unwanted pregnancies, poor health behaviors (smoking, the use of alcohol and drugs), inadequate prenatal care, and those who were abused and exposed to secondhand tobacco smoke ( $P < 0.05$ ).

**Conclusions:** The results of the reviewed studies suggest that preterm birth is a common problem associated with several social determinants of health. Life skills, self-care training, and increased prenatal care are therefore recommended to reduce preterm birth, especially in high-risk pregnant women.

**Keywords:** Preterm birth, Social determinants of health, Iran, Systematic review

## Introduction

Despite medical advances, preterm birth is still a global problem in all countries (1,2). According to the WHO, preterm birth is defined as babies born alive before 37 weeks of pregnancy (3). Preterm Delivery is the leading cause of infant mortality in 24% of the cases (4,5). Statistics released from developed countries such as the United States, the United Kingdom, and Scandinavian countries reveal the growth of this problem in the past 2 decades (5). In general, the prevalence of preterm birth is 9.6%, but its distribution varies across the world, as 85% of the cases occur in Asia and Africa (6). In Iran, the prevalence of preterm birth is between 5.6% and 34.9%; in the United States, the prevalence has been reported as 12%-13% (7,8). In the Global Burden of Disease analysis, preterm birth has the highest rate of mortality and lifelong complications. In addition to the complications and costs of being born

preterm and the threat of neonatal death, disabilities are also higher in these children when they reach school age, such as cerebral palsy, neurodevelopmental disorders, digestive problems, respiratory diseases, and serious disorders in acquiring the skills needed to perform daily life activities (9,10). Several factors are associated with preterm birth, including certain social determinants. Given the conceptual framework of these determinants, recognizing the cause of these diseases is very important (8). In today's world, health perspectives have become broader in scope and the non-medical determinants of health have become more emphasized as a result. Each of these determinants severely affects health per se or in interaction with the other determinants and causes inequalities in health (11). According to the conceptual framework of the WHO Commission on Social Determinants of Health (CSDH), the key factors

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at play are: (1) Structural social determinants, including education, income, gender, and race, (2) Intermediate social determinants, including living conditions, access to food, psychosocial factors, and behavioral factors, (3) Factors underlying socioeconomic policies, including macroeconomic policies and social policies (the labor market, housing, culture and social values), and (4) The level of health inequality. These factors affect each other and ultimately influence the health (12,13). Studies have reported several physiological and psychological risk factors for preterm birth, including being of black race, age under 17 and over 35, low education, low socioeconomic status, poor access to prenatal care, being subject to physical abuse, the type of nutrition, long work hours, psychological characteristics, infection, poor health behaviors (smoking and the use of alcohol and drugs), being subject to violence and behavioral abuse, stress, depression, an increased risk of unwanted pregnancy, poor financial and social support, and stressful occupations (14-18). Several social factors influence preterm delivery, including biological and genetic factors, maternal or fetal medical conditions, history of preterm birth or stillborn babies, behavioral problems, smoking, low socioeconomic status, a multiple pregnancy, no maternal weight gain during pregnancy, drug abuse, inappropriate family planning, poor antenatal care, absence of the spouse, poor health behaviors, emotional stress, and environmental factors (8). One study showed that the risk of preterm birth is increased in women with a low socioeconomic status, especially those with a low level of education (19). The findings of some studies show that psychological problems during pregnancy are important predictors of gestational age at birth (20). Stress during pregnancy, childbirth, and breastfeeding can be associated with poor pregnancy outcomes and complications such as miscarriage, nausea and vomiting, preeclampsia, weight loss, preterm birth, low birth weight, immunosuppression, and as a result increased episiotomy and neonatal infections and also some degree of postpartum mental disorders (21). Determining the factors affecting birth outcomes help health policymakers develop strategies for planning and implementing appropriate interventions for promoting health and thus contribute to the promotion of maternal and infant health as well. The aim of this study was to assess the relationship between the social determinants of health and preterm birth in Iran based on the WHO model.

### Materials and Methods

This systematic review and meta-analysis study was written based on the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA).

#### Inclusion and Exclusion Criteria

The inclusion criteria consisted of observational and cohort studies reporting the relationship between the

structural or intermediate social determinants of health and preterm birth (defined as birth before 37 weeks of pregnancy). Review articles, case studies, abstracts, posters and letters to the editor, repeated reports of results from other studies, and intervention studies were excluded.

#### Search Strategy

In this study, a search of article titles, keywords and abstracts was carried out in the databases Magiran, SID, Iranmedex, Irandoc, PubMed, Google Scholar, and Scopus using advanced search strategies with Boolean operators. The keywords were related to preterm delivery and the social determinants of health including: 'education status', 'occupation', 'employment', 'income', 'social class', and 'residential status' for the intermediate social determinants of health and 'stress disorders', 'anxiety', 'depression', 'unwanted pregnancy', 'social support', 'violence', 'drug abuse', 'smoking', 'alcohol', 'illicit drugs' and 'food insecurity' for the structural social determinants of health. The Persian equivalents and MeSH terms of these keywords were also used in the search for articles published during 2000-2016.

#### Study Selection

All the articles were filtered in 3 steps. In the first and second steps, the titles and abstracts of the articles were retrieved and reviewed to exclude the irrelevant articles. In the third step, the full-text articles of the selected abstracts were retrieved to determine the relevant articles. Two independent researchers (NSH and AFK) performed these 3 steps. The third researcher (MD) examined the discrepancies between the 2 reviewers.

#### Risk of Biased Assessment

Two independent researchers (NSH and AFK) performed a methodological quality-assessment of the eligible articles using a STROBE (STrengthening the Reporting of OBServational studies in Epidemiology.) checklist. Two reviewers evaluated each article's quality based on the checklist and rated its items with 'yes', 'no', or 'unclear'. Potential disagreements between the researchers were resolved by a third person (MD).

#### Data Extraction

Two independent researchers (NSH and RP) extracted the following data from the eligible articles: general information about the study (study design, sampling method, number of centers, and the scope of the study) and data on the participants (gestational age, sample size, and inclusion and exclusion criteria). Disagreements between the reviewers were resolved by the third researcher (MD).

#### Statistical Analysis

The odds ratio (OR) was used in this meta-analysis as a measure of effect size. The OR represents the odds that an outcome will occur given a particular exposure, compared

to the odds of the outcome occurring in the absence of that exposure. The OR was used because it is a measure that can be used in cohort, cross-sectional, and case-control studies (22). To perform the meta-analysis, the OR was calculated in each study with a 95% confidence interval. If a measure other than the OR was used in a study, the researcher calculated the OR by extracting data from the study. The estimated pooled OR was calculated in STATA-11. All the analyses were performed using the random effect models (23).

The PICO process was used to frame the study question. In this study, ‘population’ referred to the children born to Iranians, ‘intervention’ referred to the structural and intermediate social determinants of health, ‘comparison’ referred to those without the social determinants of health, and ‘outcome’ referred to preterm birth (i.e. birth before 37 weeks of pregnancy). The study examined the articles published from 2000 to 2016 and was developed with an observational design.

**Heterogeneity:** The heterogeneity of the study was assessed using the Chi-square test at a CI of 0.05 and the I<sup>2</sup> statistic was used to examine the amount of heterogeneity. The Begg’s and Egger’s test was used for measuring publication bias and a funnel plot was drawn to show this bias.

The article subjects were classified according to the steps

discussed in Materials and Methods section (Figure 1).

**Results**

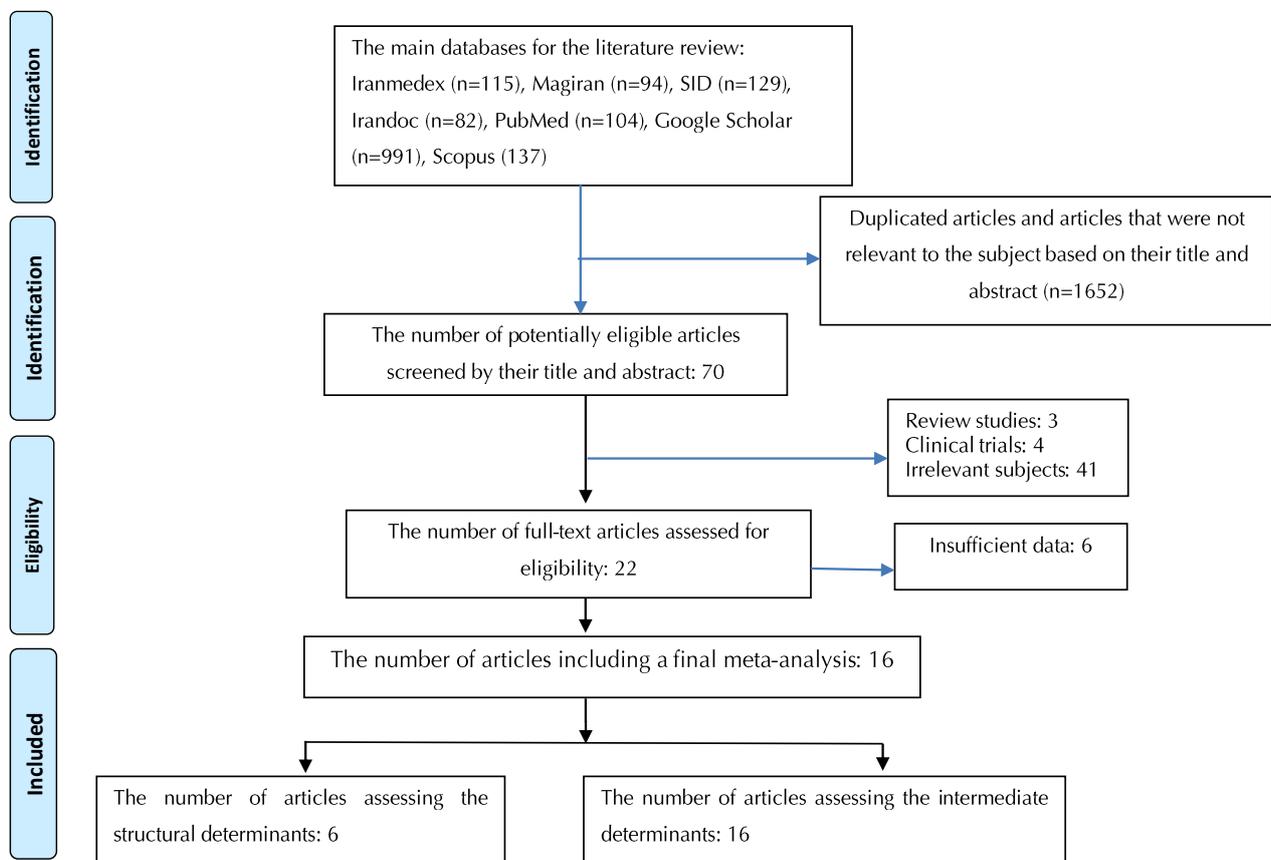
**The Eligible Studies and the Quality Assessment of the Articles**

This systematic review and meta-analysis analyzed 16 papers (Table 1) and the total sample size examined was 13,066. Of the 16 papers reviewed, 9 were cross-sectional (24-32), 4 were cohort (33-36), and 3 were case-control (37-39).

As shown in Tables 2 and 3, some of the papers had investigated several determinants together.

Six of the studies had also examined the relationship between the structural determinants of health and preterm birth, and 4 of these 6 had examined preterm birth in relation to education (29,30,33,36), 5 in relation to occupation (29,30,36,37,39), and 2 in relation to the place of residence (29,39), as shown in Table 2.

All 16 studies had examined the relationship between the intermediate determinants of health and preterm birth, but of all the determinants based on the WHO model, only 7 were examined, including anxiety in 3 studies (33-35), depression in 2 (33,36), violence in 7 (24,26-28,32,36), unwanted pregnancy in 2 (29,36), poor health behaviors in 2 (37,38), exposure to secondhand tobacco smoke in 3 (31,36,40), and prenatal care in 2 studies (36,39) (Table 3).



**Figure 1.** The Steps of the Search and Selection of Articles for the Meta-analysis.

**Table 1.** Assessing the Quality of the Relevant Articles Using the Quality Assessment of Diagnostic Accuracy Studies (QUADAS) Criteria

Study	Criteria								
	Study Design	Setting	Participants	Variables	Data Sources	Bias Statement	Study Size	Quantitative Variables	Statistical Methods
Mirzaie, 2007	/	/	-	/	/	?	?	-	+
Faramarzi, 2005	/	/	-	/	+	?	?	-	+
Khodakarami, 2009	/	+	/	+	+	+	?	-	+
Shahhosseini, 2008	/	/	/	/	/	?	-	?	/
Nojomi, 2006	/	/	/	/	-	?	/	?	+
Sehhati-Shafai, 2013	-	/	/	?	/	/	?	?	+
Dolatian, 2008	-	-	/	-	+	?	?	?	+
Rajaeefard, 2007	-	+	-	+	/	-	?	?	?
Neshat, 2013	/	-	/	+	+	+	?	?	+
Soleimani, 2011	/	/	/	/	/	?	?	?	+
Negahban, 2010	/	/	/	+	-	?	?	?	+
Hassan, 2013	/	+	+	/	/	/	/	?	+
Alizadeh, 2014	+	+	/	+	/	?	?	?	+
Derakhshi, 2014	+	/	-	/	-	?	+	?	+
Bakhteyar, 2013	+	-	-	/	-	?	?	?	+
Nasiri Amiri, 2009	/	-	/	-	+	?	?	?	+

Where (+) indicates a high quality, (/) a moderate quality, (-) a low quality and (?) designates an 'unclear quality'.

**Table 2.** Details of the Studies Conducted on the Relationship Between the Structural Social Determinants of Health and Preterm Birth in Iran

Author	Title	CI	OR	Sample Size	Type	City
<b>Education</b>						
Alizadeh et al (36)	The relationship between social determinants of health and pregnancy outcomes	2.64-7.03	4.31	600	Cohort	Tabriz
Neshat et al (33)	The relationship between preterm birth and anxiety, stress and depression during pregnancy in referrals to health centers in Dorud in 2011	0.57-16.41	3.06	300	Cohort	Dorud
Sehati Shafaei et al (29)	The prevalence and risk factors of preterm labor in health education centers in Northwest Iran	0.69-2.30	1.26	960	Cross Sectional	Ardabil
Mirzaei et al (30)	The contributing factors of preterm delivery in parturient women at a teaching hospital in Iran	0.73-2.24	1.28	988	Cross Sectional	Kerman
Overall Education		0.98-4.30	2.05	2848	-	-
<b>Occupation</b>						
Alizadeh et al (36)	The relationship between social determinants of health and pregnancy outcomes	0.36-3.86	1.18	600	Cohort	Tabriz
Derakhshi et al (39)	The risk factors of preterm labor in the West of Iran: A case-control study	0.29-2.38	0.83	600	Case Control	Sanandaj
Sehati Shafaei et al (29)	The prevalence and risk factors of preterm labor in health education centers in Northwest Iran	0.26-0.49	0.36	960	Cross Sectional	Ardabil
Bakhteyar et al (37)	Factors associated with preterm delivery in women admitted to hospitals in Khorramabad: A case control study	2.91-18.38	7.32	524	Cross Sectional	Khorram Abad
Mirzaei et al (30)	The contributing factors of preterm delivery in parturient women at a teaching hospital in Iran	0.80-1.60	1.13	988	Cross Sectional	Kerman
Overall Occupation		0.47-2.97	1.18	3672	-	-
<b>Place of Residence</b>						
Sehati Shafaei et al (29)	The prevalence and risk factors of preterm labor in health education centers in Northwest Iran	0.60-2.02	1.10	960	Cross Sectional	Ardabil
Derakhshi et al (39)	The risk factors of preterm labor in the West of Iran: A case-control study	0.90-1.82	1.28	600	Case Control	Sanandaj
Overall Place of Residence		0.91-1.67	1.23	1560	-	-
Overall Structural Social Determinants of Health		0.84-2.41	1.43	-	-	-

**Table 3.** Details of the Studies Conducted on the Relationship Between the Intermediate Social Determinants of Health and Preterm Birth in Iran

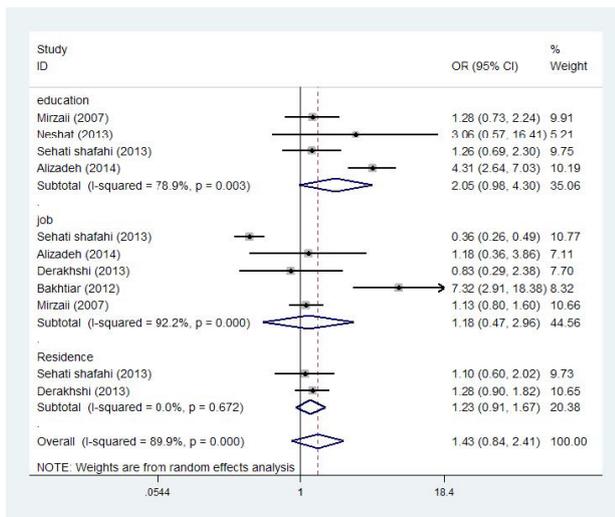
Author	Title	City	Type	Sample Size	OR	CI
<b>Anxiety</b>						
Neshat et al (33)	The relationship between preterm birth and anxiety, stress and depression during pregnancy in referrals to health centers in Dorud in 2011	Dorud	Cohort	300	3.06	0.57-16.41
Nasiri Amiri et al (34)	Association between prenatal anxiety and spontaneous preterm birth	Babol	Cohort	682	3.10	2.50- 3.84
Shahhosseini et al (35)	Role of anxiety during pregnancy in preterm delivery	Sari	Cohort	262	1.58	1.20-2.09
Overall Anxiety				-	-	1244 2.44 1.45-4.10
<b>Depression</b>						
Alizadeh et al (36)	The relationship between social determinants of health and pregnancy outcomes	Tabriz	Cohort	600	1.81	1.36-2.40
Neshat et al (33)	The relationship between preterm birth and anxiety, stress and depression during pregnancy in referrals to health centers in Dorud in 2011	Dorud	Cohort	300	3.21	1.63-6.31
Overall Depression Unwanted Pregnancy				-	-	900 2.21 1.29-3.78
Alizadeh et al (36)	The relationship between social determinants of health and pregnancy outcomes	Tabriz	Cohort	600	1.81	1.36-2.40
Sehati Shafaei et al (29)	The prevalence and risk factors of preterm labor in health education centers in Northwest Iran	Ardabil	Cross Sectional	960	1.10	0.60-2.02
Overall Unwanted Pregnancy				-	-	1560 2.57 1.38-4.79
<b>Violence</b>						
Alizadeh et al (36)	The relationship between social determinants of health and pregnancy outcomes	Tabriz	Cohort	600	4.17	3.10-5.59
Hassan et al (41)	Maternal outcomes of intimate partner violence during pregnancy: A study in Iran	Miandoab	Cross Sectional	1300	1.54	1.16-2.04
Soleymani et al (28)	Correlation between partner violence and preterm labor	Tehran	Cross Sectional	600	1.33	1.07-1.65
Khodakarami et al (26)	Woman abuse and pregnancy outcome among women in Khorramabad	Khorramabad	Cross Sectional	313	1.67	0.55-5.06
Dolatian et al (32)	Relationship between partner abuse during pregnancy and pregnancy outcomes	Gachsaran	Cross Sectional	500	5.30	1.90-14.76
Nojomi et al (25)	Prevalence of physical violence against pregnant women and effects on maternal and birth outcomes	Tehran	Cross Sectional	403	2.60	1.73-3.90
Faramarzi et al (27)	Prevalence, maternal complications and birth outcomes of physical, sexual and emotional domestic violence during pregnancy	Babol	Cross Sectional	3275	2.90	2- 4.20
Overall Violence				-	-	6991 2.39 1.58-3.62
<b>Poor Health Behaviors</b>						
Bakhteyar et al (37)	Factors associated with preterm delivery in women admitted to hospitals in Khorramabad: A case control study	Khorramabad	Case Control	524	2.21	0.31-15.67
Rajaeefard et al (38)	Preterm delivery risk factors: A prevention strategy in Shiraz, Islamic Republic of Iran	Shiraz	Case Control	1118	6.69	2.20-20.31
Overall Poor Health Behaviors				-	-	1642 5.11 1.94-13.42
<b>Secondary Exposure to Tobacco Smoke</b>						
Alizadeh et al (36)	The relationship between social determinants of health and pregnancy outcomes	Tabriz	Cohort	600	1.87	0.94-3.71
Negahban et al (31)	Passive smoking during pregnancy and obstetric outcomes in pregnant women referring to Rafsanjan Nicknafas Hospital	Rafsanjan	Cross Sectional	641	2.59	1.46-4.59
Mirzaei et al (30)	The contributing factors of preterm delivery in parturient women at a teaching hospital in Iran	Kerman	Cross Sectional	988	1.21	1.03-1.42
Overall Secondary Exposure to Tobacco Smoke				-	-	2229 1.69 1.01-2.84
<b>Prenatal Care</b>						
Alizadeh et al (36)	The relationship between social determinants of health and pregnancy outcomes	Tabriz	Cohort	600	1.51	1.13-2.01
Derakhshi et al (39)	The risk factors of preterm labor in the West of Iran: A case-control study	Sanandaj	Case Control	600	1	0.60-1.66
Overall Prenatal Care				-	-	1200 1.30 0.88-1.92
Overall Intermediate Social Determinants of Health				-	-	- 2.17 1.75-2.68

Generation of Results

As shown in Figure 2, evaluating the relationship between education and preterm birth, Alizadeh et al showed that preterm birth is more common in illiterate compared to educated women. The odds of preterm birth were 4.31 times higher in illiterate compared to educated women (2.64%-7.03%: 95% CI) (36); but in the studies by Neshat et al (33), Mirzaei et al (30), and Sehati Shafaei et al (29), this was not statistically significant ( $P > 0.05$ ).

In 5 studies that examined the relationship between job and preterm birth, there was no statistically significant relationship between woman's job and preterm birth (29,30,36,37,39). Moreover, in the review of the relationship between the place of residence and preterm birth, the difference was not statistically significant between the prevalence of preterm birth in women living in rural areas compared to urban residents (29,39). In general, the overall estimated OR for the relationship between the structural social determinants of health and preterm birth was 1.43 (0.84%-2.41%: 95% CI), which was not statistically significant between the structural social determinants of health and preterm birth ( $P > 0.05$ ).

The overall estimated OR for the relationship between the intermediate social determinants of health and preterm birth was 2.17 (1.75%-2.68%: 95% CI) and the OR for the different subcategories of the intermediate factors was 2.44 (1.45%-4.10%: %95 CI) for anxiety, 2.21 (1.29%-3.78%: 95% CI) for depression, 2.21 (1.29%-3.78%: 95% CI) for unwanted pregnancy, 2.39 (1.58%-3.62%: 95% CI) for domestic violence, 5.11 (1.94%-13.43%: 95% CI) for poor health behaviors, 1.69 (1.01%-2.84%: 95% CI) for exposure to secondhand tobacco smoke, and 1.30 (0.88%-1.92%: 95% CI) for prenatal care; thereby showing the prevalence of preterm birth to be 2.44 times higher in women with



**Figure 2.** The Structural Determinants of Health by Author's Name, Year of Publication, OR, and 95% CI; each line segment shows the length of the confidence interval (the points above the null line indicate a positive relationship and the points below the null line represent the inverse relationship).

anxiety, 2.21 times higher in those with depression, 2.21 times higher in those with unwanted pregnancies, 2.39 times higher in those subjected to violence, 5.11 times higher in those with poor health behaviors, 1.69 times higher in those exposed to secondhand tobacco smoke, and 1.30 times higher in those receiving inadequate prenatal care (Figure 3).

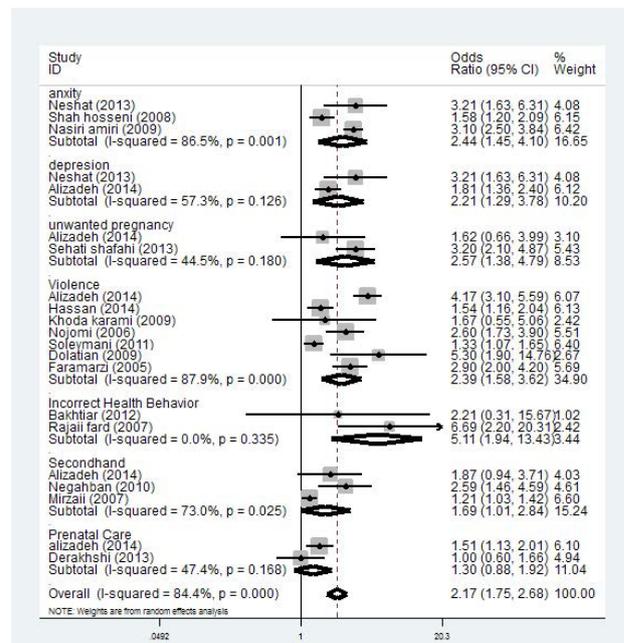
Heterogeneity Results and Publication Bias

According to the results of the chi-square test, there was a significant heterogeneity between the structural determinants of health and its subcategories such as education and occupation ( $P < 0.001$  for all). According to the I2 index, the amount of heterogeneity for the structural determinants of health and some of its subcategories, including education and occupation, was 93%, 92%, and 94%, respectively (Figure 2). Heterogeneity was also observed for the intermediate determinants of health and some of its subcategories (Figure 3).

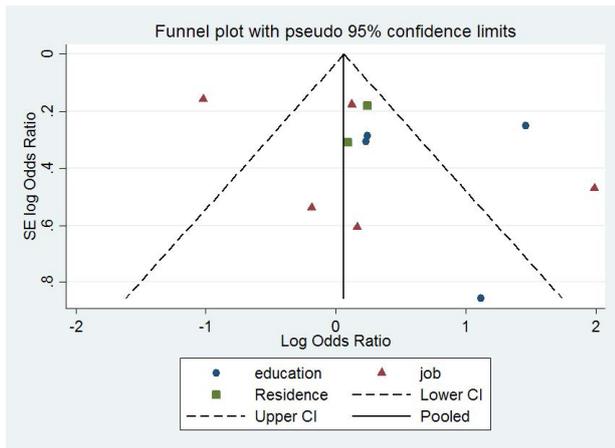
Examining publication bias using Begg's and Egger's tests showed the complete lack of publication bias ( $P = 0.938$ ). The funnel plot showed nearly symmetrical results for each of the studies and thus revealed the lack of publication bias (Figures 4 and 5).

Discussion

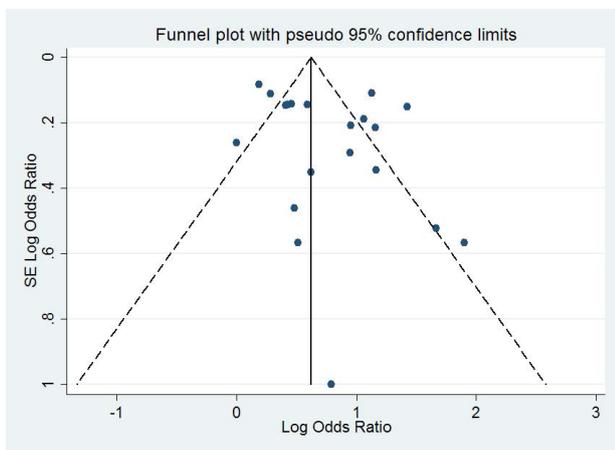
This study was conducted to determine the relationship between the social determinants of health and preterm birth. As noted in the findings, the majority of the reviewed papers had only examined some of the aspects of the social determinants of health (discussed at length in this



**Figure 3.** The Intermediate Determinants of Health by Author's Name, Year of Publication, OR, and 95% CI; each line segment shows the length of the confidence interval.



**Figure 4.** The Funnel Plot for the Studies Entered Into the Meta-analysis of the Structural Determinants of Health by Type of Structural Factor.



**Figure 5.** The Funnel Plot for the Studies Entered Into the Meta-analysis of the Intermediate Determinants of Health.

section). In developed countries, studies have investigated the role of many structural determinants in the incidence of preterm delivery, such as socioeconomic status, education, occupation, and income. Socio-economic status is one of the most important determinants of health and mortality; some resources claim the socioeconomic index to be a combination of 3 indicators, including education, occupation, and income. Families in lower socioeconomic levels face issues such as malnutrition, inadequate prenatal care, addiction, smoking and the use of alcohol, consecutive pregnancies, stress, and so on, which lead to increased adverse pregnancy outcomes (42). Only 6 of the studies had investigated the structural determinants of health, and of all the structural determinants at play, only 3 (education, occupation, and the place of residence) were examined in relation to preterm birth. In the review of the relationship between education and preterm birth, the results obtained in one study showed that preterm birth was more common in illiterate than educated

women (36). Moreover, considering the relationship between employment status and preterm birth, there was no significant association (29,30,36,37,39). Given that the studies that had assessed the relationship between preterm birth and income did not have a uniform definition of income and their classifications were different, this determinant was not entered into the analysis. Regarding the relationship between the place of residence and preterm birth, there was no significant association between the rate of preterm birth in rural residents compared to urban ones (29,39). Attending the results of the general review of structural determinants, there was no significant association between the rate of preterm birth and education in women (2.05 [0.98%-4.30%: 95% CI]), job (1.18 [0.47%-2.96%: 95% CI]), and the place of residence (1.23 [0.91%-1.67%: 95% CI]) ( $P > 0.05$ ).

Given that pregnancy outcomes are very much affected by the mother's socioeconomic status and since socioeconomic differences are one of the components of infant health and pregnancy outcomes (6), improved health equity requires the adoption of measures beyond the current focus on the immediate causes of diseases, and a special attention should be paid to their root causes (12,43).

Many studies have examined the intermediate determinants of preterm delivery. According to recent reports, preterm delivery is related to stressful life events, anxiety, depression, occupational stress, and physical abuse (44,45). Mental health during pregnancy affects maternal health as well as fetal health and growth. Recent studies suggest that pregnancy outcomes are linked to stressful life events, anxiety, depression, stressful jobs, physical abuse, and low social support (45,46). Of the studies that had examined the intermediate determinants of health, only 7 determinants were examined in relation to preterm birth, including anxiety, depression, and violence as the psychological determinants. Three studies had examined anxiety (33-35), 2 depression (33,36), and seven violence (27,28,32,36,41), and their results revealed the high incidence of preterm birth in those with anxiety, depression, and violence compared to those without these determinants. Some of the studies discussed the adverse effects of psychosocial factors such as stress during pregnancy, childbirth, and breastfeeding on pregnancy outcomes such as miscarriage, nausea and vomiting, preeclampsia, weight loss, preterm birth, low birth weight, immunosuppression, and the subsequent increase in episiotomy and neonatal infections and some degree of postpartum mental disorder (21,47). In one study, Rondo et al found a direct relationship between maternal psychosocial stress or distress and low birth weight, preterm birth, and intrauterine growth retardation (48). In a review study conducted on the relationship between unwanted pregnancies and preterm birth in Tabriz, the risk of preterm birth was 1.63 times higher in women with unwanted pregnancies compared to those with wanted

pregnancies (36); this OR was 3.20 in the study by Sehati Shafaei et al. In the present study, the odds of preterm birth was 3.20 times higher in women with unwanted pregnancies compared to those with wanted pregnancies (29).

The other social determinants of health include poor health behaviors (smoking, alcohol consumption, and drug use) and exposure to secondhand tobacco smoke. Drug abuse during pregnancy is one of the most serious problems associated with extensive medical, legal, and social risks (49,50). One study showed that the risk of preterm birth was 2.21 times higher in women with poor health behaviors compared to others (37). In another study, the risk of preterm birth was 6.69 times higher in women with poor health behaviors (38). Studies have shown that drug abuse has many harmful effects on the infants, including preterm birth, expedited birth, placental abruption, meconium contamination, reduced growth parameters, increased central and autonomic nervous symptoms, and increased referrals to pediatricians (50,51).

Of the studies conducted in Iran, only 2 had investigated the relationship between prenatal care and preterm birth. One study found that women who had received inadequate prenatal care were 1.51 times more at risk for preterm birth compared to those who had received regular prenatal care (36); however, another study found the risk of preterm birth to be identical in women with and without adequate prenatal care (39). The review of studies showed that the attendance at prenatal and pregnancy care classes, which offer a lot of information and care measures and the first-hand experience of other mothers, may play a significant role in decreasing the prevalence of diseases and their complications and improving health through the promotion of knowledge and skills and can also reduce the mother's anxiety (52). The many complications of preterm birth necessitate further attention to the risk factors associated with this condition. Prospective studies with larger sample sizes appear mandatory to take account of regional differences in some of the determinants of preterm birth.

### Study Limitations

The purpose of performing meta-analyses is to carry out a systematic review of documents and quantitatively summarize the results of different studies, combine these results, and offer a general interpretation of them; the present study succeeded in providing a general conclusion gathered from all the reviewed studies. To increase the knowledge and awareness of researchers and academics about the effect of the social determinants of health on pregnancy outcomes and to address the lack of studies on the relationship between the social determinants of health and pregnancy outcomes such as preterm birth, longitudinal and prospective studies should be conducted on this topic with larger sample sizes.

The limitations of this study include (1) the review of

studies solely conducted in Iran; (2) the lack of access to unpublished papers and reports; (3) the inability to compare and analyze the results of studies for reasons such as: the small number of studies conducted on the relationship between the social determinants of health and preterm birth, the lack of accurate, standard and acceptable reports in some of the papers, the different methods of sampling used, the different sample sizes examined, and the failure to determine the qualitative value of each of the studies reviewed.

### Conclusions

Despite the differences between the reviewed studies in terms of sample size, study type, and so on, the overall prevalence of preterm birth is relatively high in Iran and is a common health problem associated with several social determinants of health. Further training, especially in terms of self-care, improved male participation in prenatal care and better prenatal care services offered at health centers, particularly for high-risk age groups, are essential measures for reducing adverse pregnancy outcomes. Etiological studies could also be helpful to this end.

### Conflict of Interests

No conflict of interests is declared by the authors in this study.

### Ethical Issues

This study was approved by the Research Council of SBMU under the ethics code IR.SBMU.PHNM.1395.525, dated 24 October 2016.

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