

# Prevalence of Preterm Birth in Pakistan: A Systematic Review and Meta-Analysis

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## Abstract

**Objective:** This study is designed to systematically review the prevalence of preterm birth from previously published studies of Pakistan and to find pooled prevalence from available local data.

**Methodology:** Targeted literature was searched with specific key words such as “preterm birth, prematurity, prevalence and mortality in preterm birth in Pakistan”. Studies with copyright and/or permission issues were excluded. A total of 300 studies were found initially that were somewhat related to the topic, after careful screening only 5 studies met inclusion criteria for current study. To test the null hypothesis for all studies

evaluating effect Cochran's  $Q$  was used and P-values with a level of significance of 5% were considered significant.

**Results:** The pooled prevalence of Preterm Birth was found to be 18.89% using fixed effect, 16.81% using random effect and 18.89% using fixed effect heterogeneity. I-squared for each effect model was  $> 75\%$ . On applying Chi<sup>2</sup> test we obtained significant p-value i.e. p-value  $< 0.01$ .

**Conclusion:** Through this meta-analysis we found one of the highest pooled prevalence of preterm birth in Pakistan. Reducing preterm birth can result in improvement of overall neonatal health and significantly reduce neonatal mortality in future.

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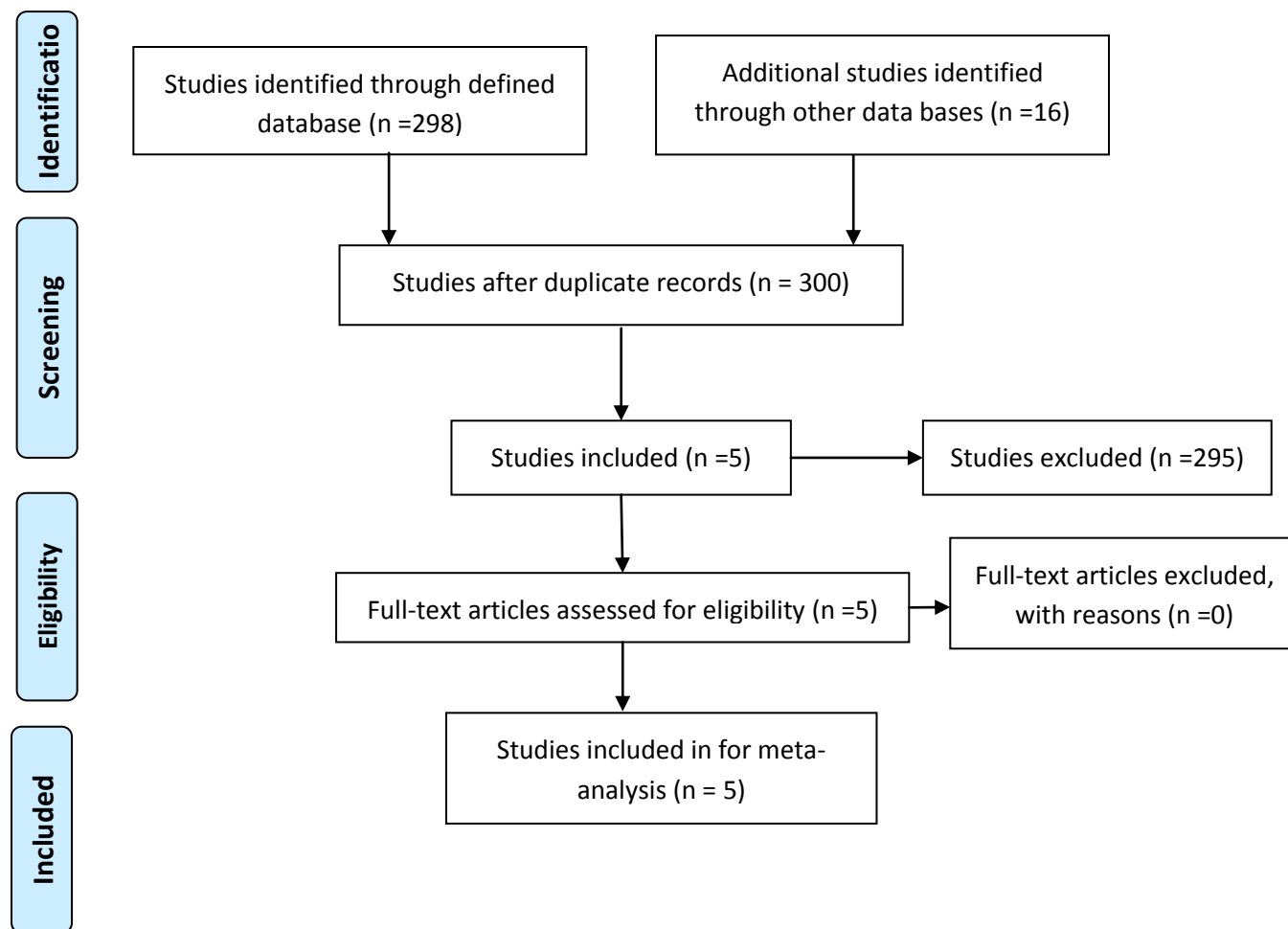
## Contribution

All Authors have contributed in Study Design, Data Collection, Data Analysis, Data Interpretation, Manuscript Writing and Approval.

## Introduction

In human preterm birth (PTB) is defined as a baby born before 37 weeks or 259 days of gestation.<sup>1,2</sup> Babies born before 32 weeks of gestation are called very preterm infants and those born before 28 weeks of gestation are called extremely preterm infants.<sup>3</sup> A preterm birth may be due to spontaneous labour with intact membranes, premature rupture of the membranes (PPROM), labour induction or caesarean delivery for maternal or fetal indications.<sup>4</sup>

Literature has reported a number of risk factors for PTB.<sup>5</sup> Almost 15 – 25% of PTBs are due to fetal or maternal complications during pregnancy.<sup>6</sup> Across 184 countries, the rate of PTB ranges from 5 to 18% of all babies born.<sup>7,8</sup> The prevalence of PTB is also increasing in developing countries with an alarming level and is up to 12% among all new borns.<sup>9</sup> Almost 15 million infants are born preterm every year around the globe. More than 60% of PTBs occur in South Asia, Sub-Saharan Africa, and even in some of the developed



**Fig. 1:** PIRSMa Diagram for Inclusion of Studies.

countries such as the United States of America.<sup>7</sup> The prevalence of PTB is almost 5% in Europe and 18% in Africa.<sup>8</sup> In Asian region, unfortunately Pakistan has an increasing statistics with 748,100 PTB annually and has fourth highest number after India, China and Nigeria.<sup>10</sup> Despite of this, very few studies are currently available on Pakistani population in this regard. This study is designed to systematically review the prevalence of PTB birth taking studies from Pakistan and to find pooled prevalence of available local data. As the prevalence of PTB is inconsistent ranging from 11.4<sup>11</sup> to 22.8%<sup>12</sup> on local population and Pakistan is labeled at 4<sup>th</sup> position in terms of PTB<sup>10</sup> with prevalence of 15.8%, it is imperative to establish definitive statistics using local data.<sup>8</sup>

## Materials and Methods

**Literature Searching Strategies:** All literature was

searched out with specific key words “preterm birth, prematurity, prevalence and mortality in preterm birth” The related literature was found using, Google, Google Scholar, PubMed, eMedicine, and HEC digital library, etc. All the studies containing **keywords of** “prevalence of preterm birth” in their title and **abstracts were searched** and taken in research. Studies available as per our defined databases which are published in at least peer reviewed journals were included in this study. Studies with copyright or permission issues **were excluded.**

## Statistical Analysis

All relevant **literature, after collection was entered, managed and analyzed** using “MetaXL” **addin** available for Microsoft **Excel program.** The application “Meta-Analysis of Prevalence” was used to conduct whole analysis.<sup>13</sup> The following statistical tests were

applied to meet the objectives of study. Pooled Statistics, I-squared, **Cochran's Q and Chi<sup>2</sup>** tests were used for fixed effect, random effect and fixed effect heterogeneity along with forest plot and **Funnel plots were** used. Tau<sup>2</sup> was also used for random effects. An initial descriptive analysis was done in tabular and graphical form. I<sup>2</sup> test was calculated using Heterogeneity analysis (% of variation due to non-sampling error). We considered I<sup>2</sup> > 75% as high heterogeneity.<sup>14</sup> To test the null hypothesis for all studies Cochran's Q was used and P-value ≤ 0.05 was considered as significant.

## Results

### Systematic Review

A total of 300 studies were found initially that were somewhat related to the topic, after careful screening only 5 studies met inclusion **criteria. There** are few studies available on Pakistan population on prevalence of PTB, **and these studies, too, were** not exclusively done **for PTB, but** in their published data we found some related statistics of PTB. In the light of this, in 2004, a study reported prevalence of PTB as 15.7%.<sup>15</sup> **Though** their objective was to compare **fetomaternal** outcome in females related to their Hb levels. When we explored their data and published statistics we found that in their study 15/132 females (regardless of maternal Hb level) delivered preterm babies. Further they added that the risk of PTB was 4 times higher in anemic mothers when compared with non-anemic mothers.<sup>15</sup> Another study focused on perinatal out-

come with relation to maternal Hb. We found through this study that the prevalence of preterm babies was 14.46% in 2008. They focused on perinatal complications, duration of gestational age, birth weight and infants characteristics after birth.<sup>16</sup> **Badshah et al, published** a study aiming to explore the factors for low birth weight **babies. We did** a detailed review of their study and found that 237/1039 were preterm babies (we adjusted the statistics for 22.8% prevalence of PTB, in original document the statistics is given 229/1039 that does not make the prevalence as 22.8%)<sup>12</sup>. Another study met our search criterion with title of "The association between parity, infant gender, higher level of paternal education and PTB in Pakistan" which was conducted in 2011 by Shaikh K et al. They included a total of 132 pregnant females and reported lowest prevalence of PTB as 11.4%.<sup>11</sup> Yet one more study was done for assessment of addiction habits and oral hygiene of pregnant females after delivery. This cross sectional study reported that the PTB among all females delivered at "Gynecology Unit I of **Abbasi Shaheed** Hospital and Medical and Dental College" Karachi was 17.9%. They concluded that preterm delivery of babies was high in mothers having poor oral hygiene.<sup>17</sup> **Hence, through accessible** researches meeting inclusion criteria of our study, we found no consistency on prevalence of PTB. There is no increasing or decreasing trend over the period of 12 years (studies were available from 2004 to 2015) which necessitated the need of pooled prevalence to see a broader and clearer picture regarding preterm birth.<sup>11,12,15-17</sup>

**Table 1:** Prevalence of Preterm Birth in different Studies of Pakistan.

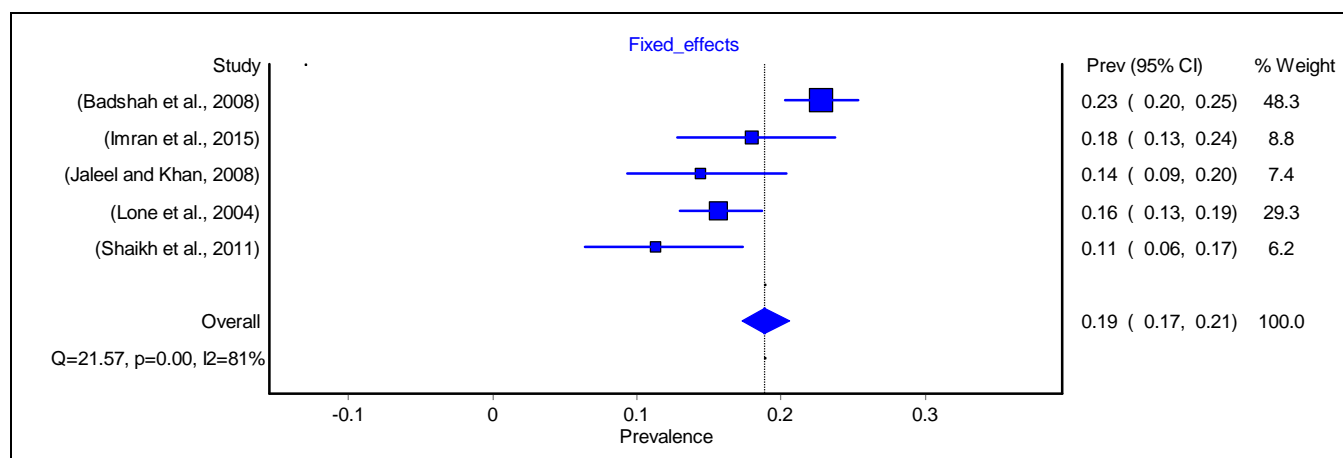
| Study                                 | Sample Size | Cases | Prevalence Rate |
|---------------------------------------|-------------|-------|-----------------|
| (Shaikh et al., 2011) <sup>11</sup>   | 132         | 15    | 11.4%           |
| (Jaleel and Khan, 2008) <sup>16</sup> | 159         | 23    | 14.46%          |
| (Lone et al., 2004) <sup>15</sup>     | 629         | 99    | 15.7%           |
| (Imran et al., 2015) <sup>17</sup>    | 189         | 34    | 17.9%           |
| (Badshah et al., 2008) <sup>12</sup>  | 1039        | 237   | 22.8%           |

### Meta-Analysis

The pooled prevalence of preterm **birth was** 18.89% using fixed effect, 16.81% using random effect and 18.89% using fixed effect heterogeneity. I-squared for each effect model was > 75%, Cochran's Q value was significant (p-value < 0.01) that indicates huge heterogeneity in these researches, p-value < 0.01. On applying Chi<sup>2</sup> test, we obtained significant p-value i.e. p-value < 0.01.

**Table 2:** Meta-analysis Table.

|                            |                            | Prevalence     | 95% Lower C.I | 95% Higher C.I | Weight% |
|----------------------------|----------------------------|----------------|---------------|----------------|---------|
| Fixed effect               | Pooled Statistics          | 0.1889         | 0.172689      | 0.205796       | 100     |
|                            | I-squared                  | 81.4574        | 56.96425      | 92.0107        |         |
|                            | Cochran's Q                | <b>21.5720</b> |               |                |         |
|                            | Chi <sup>2</sup> , p-value | <b>0.0002</b>  |               |                |         |
| Random effect              | Pooled                     | 0.1681         | 0.128236      | 0.212025       | 100     |
|                            | I-squared                  | 81.4575        | 56.96425      | 92.0107        |         |
|                            | Cochran's Q                | 21.5720        |               |                |         |
|                            | Chi <sup>2</sup> , p-value | 0.0002         |               |                |         |
|                            | tau <sup>2</sup>           | 0.0123         |               |                |         |
| Fixed effect heterogeneity | Pooled Statistics          | 0.1889         | 0.138262      | 0.242622       | 100     |
|                            | I-squared                  | 81.4574        | 56.96425      | 92.0107        |         |
|                            | Cochran's Q                | 21.5720        |               |                |         |
|                            | Chi <sup>2</sup> , p-value | 0.0002         |               |                |         |

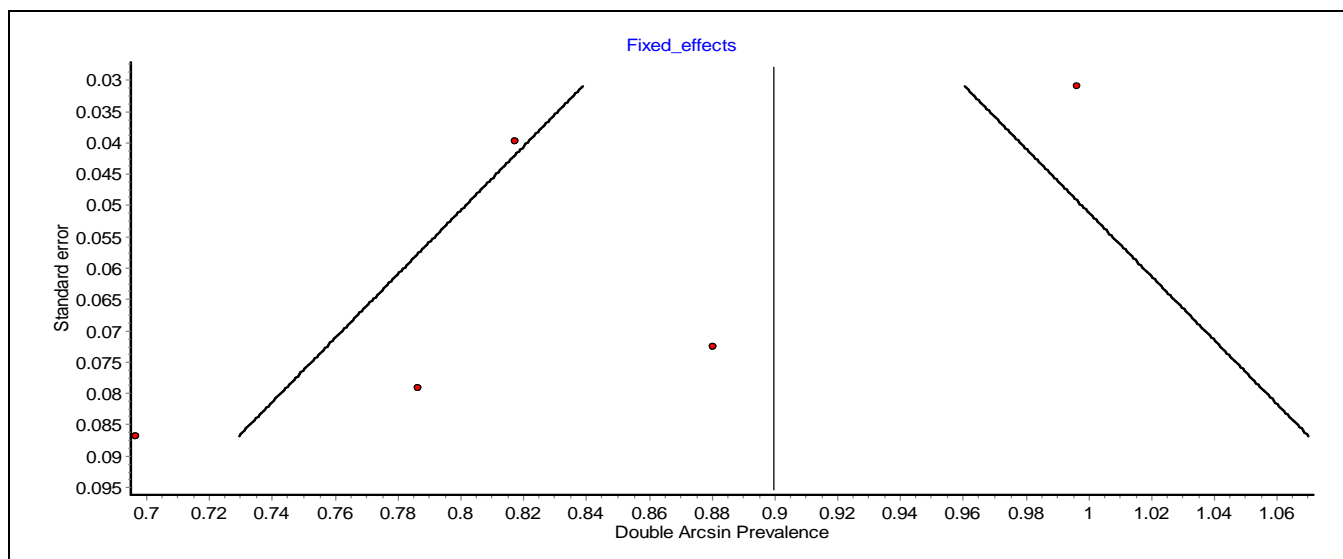


**Fig. 2:** Forest Plot Depicting Prevalence of Preterm Birth in different Studies using Fixed Effect Technique.

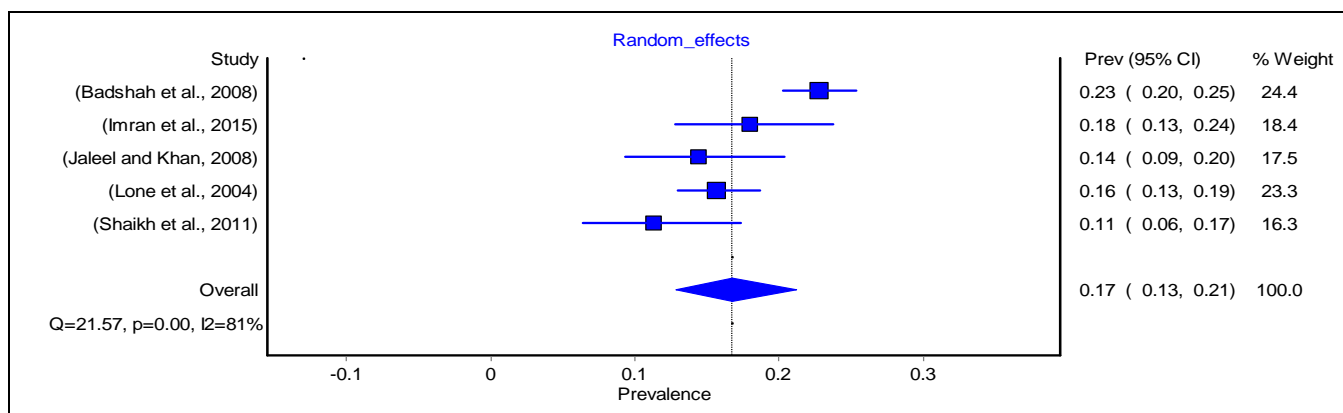
## Discussion

The preterm birth rate has increased by 33% in the last 25 years, almost entirely due to the rise in late preterm births.<sup>18</sup> Literature reports that preterm birth is more common in male infants i.e. 55.03%.<sup>19</sup> One of the largest data based study consisting 99 countries reported overall prevalence of preterm birth to be 11.1%.<sup>8</sup> Another study compiled data of Low- and middle- income countries and reported prevalence of preterm births 8.2%.<sup>20</sup> Unfortunately, despite of much work

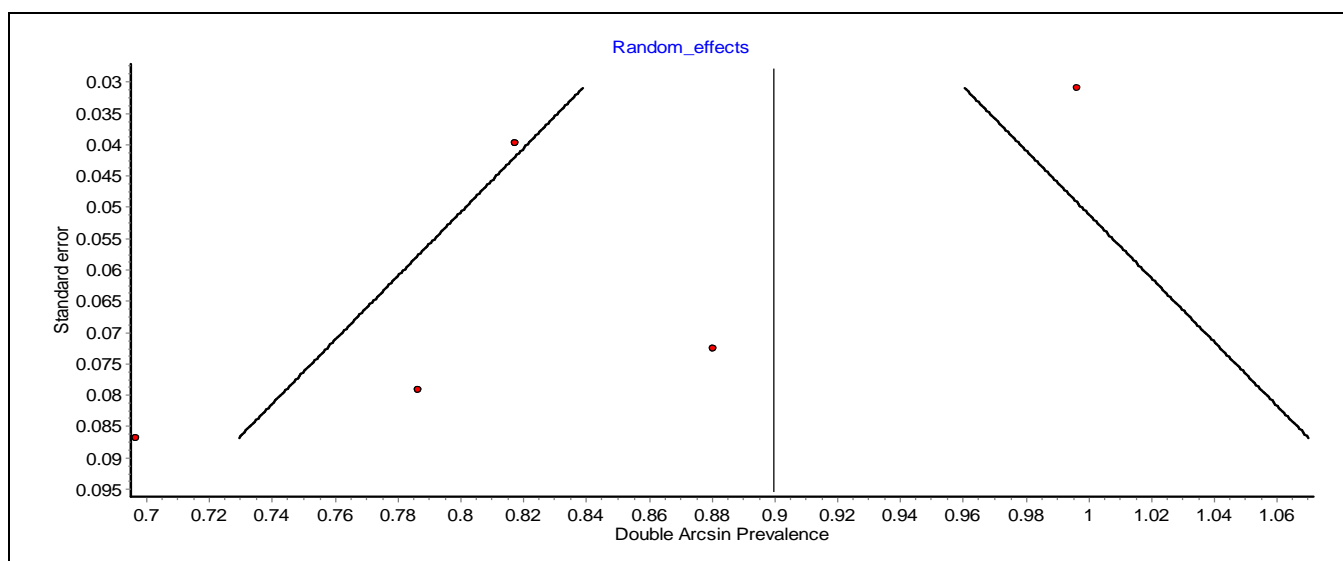
done in past and also being done currently, no consistency could yet be established regarding prevalence of preterm birth worldwide, as the range of the PTB prevalence has been reported to be as low as 1.52<sup>21</sup> to as high as 41.5%.<sup>22</sup> The difference in these statistics may be due to different designs, restricted venues, and limited or specific study objectives. In current meta-analysis we found one of the highest pooled prevalence of PTB i.e. 18.89% using fixed effect, 16.81% using random effect and 18.89% using fixed effect hetero-



**Fig. 3:** Funnel Plot Depicting High Variation in different Studies using Fixed Effect Technique.



**Fig. 4:** Forest Plot Depicting Prevalence of Preterm Birth in different Studies using Random Effect Technique.



**Fig. 5:** Funnel Plot Depicting High Variation in different Studies using Random Effect Technique.

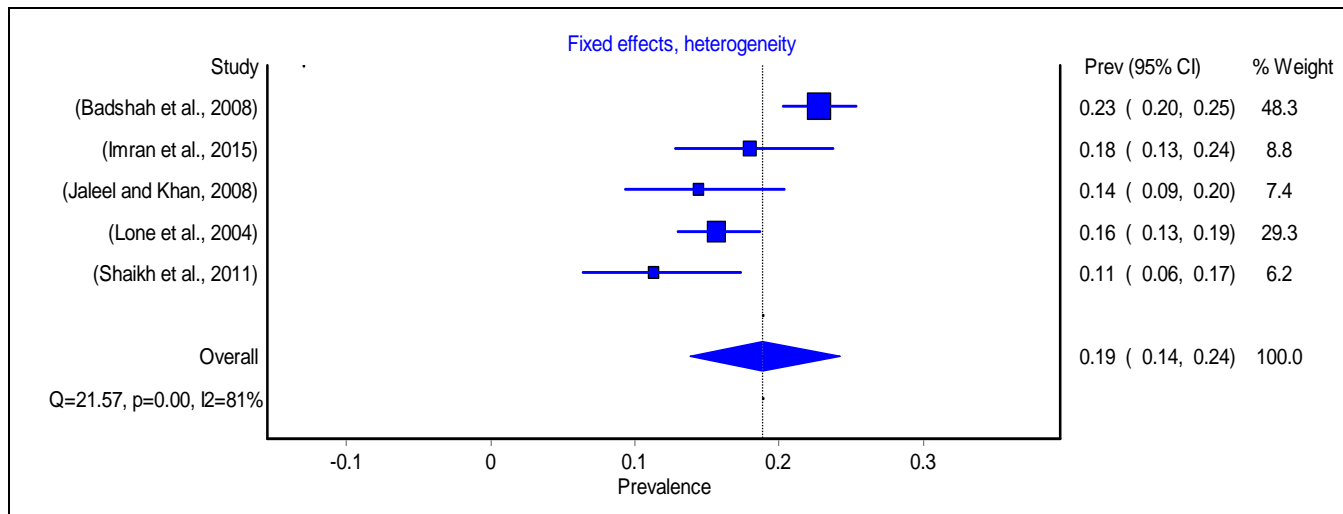


Fig. 6: Forest Plot Depicting Prevalence of Preterm Birth in different Studies using Fixed Effect Heterogeneity Technique.

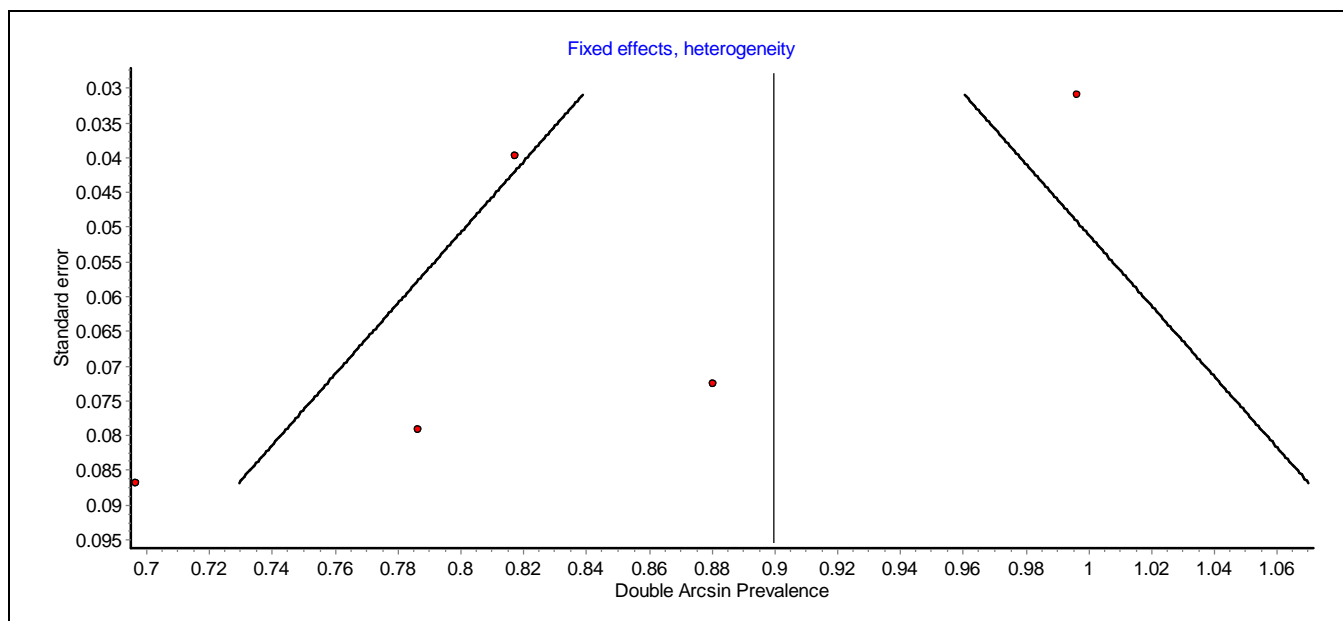


Fig. 7: Funnel Plot Depicting High Variation in different Studies using Fixed Effect Heterogeneity Technique.

genity. I-squared for each effect model was > 75%, Cochran’s Q was high with significant p-value i.e. < 0.01. More in-depth studies are warranted to get further in-depth results in this regard.

### Conclusion

Through this meta-analysis we found one of the highest pooled prevalence of preterm birth. Health policy makers and gynecologists should put a serious focus on reducing the risk of preterm birth. Early screening

of fetal, maternal and social risk factors leading to preterm birth must be initiated in order to reduce its incidence. Reducing preterm birth can result in better health outcomes such as improvement of overall neonatal health and significantly reduced neonatal mortality in future.

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