SOCIO-DEMOGRAPHIC FACTORS OF PRETERM BIRTH: A SYSTEMATIC REVIEW

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ABSTRACT: Background: *Preterm Birth (PTB) remains to be a considerable healthcare challenge especially in developing countries. A number of biological, maternal, environmental and socio-demographic risk factors are associated with PTB. Socio-demographic determinants are predominant yet under-reported globally.* ***Objective:*** *To systematically review the published socio-demographic risk factors of preterm birth.* ***Methodology:*** *This systematic review included all original full-length studies and freely available on common search engines and data bases were included in the study. Search Engines and data bases like Google Scholar and PubMed were searched using BOOLEAN search strategy and medical subject headings (MeSH) term related to the title. Studies with irrelevant titles, methods or results, missed author information, paid articles and the ones published in language other than English were excluded from study. A check-list was made for critically analyzing the selected studies and was discussed to make consensus among both authors. Selected studies were analyzed systematically and results were reported.* ***Results:*** *A total of 24 studies were included meeting inclusion criteria, there were 30 risk factors (3 studies reported more than one factor of selected socio-demographic and rests of studies reported single variables as risk factor of PTB). The total sample size was 4242794 of these studies (if studies reported more than one category then its sample size was considered once) with minimum and maximum sample size as 400 and 2334532. The mean odds ratio was 5.46 (95 % CI: 4.50, 6.42) with minimum odds ratio as 1.11 (95 % CI: 1.02, 1.2) for category of age < 18 years and the highest odds ratio was reported as 12.50 (95 % CI: 10.4, 14.6) for low income of mothers.* ***Conclusion:*** *Several socio-demographic risk factors including maternal age, low monthly income, and maternal education are significantly associated with preterm birth. Careful consideration of these factors can help us identify vulnerable pregnant females and improvise modifiable risk factors to minimize risk of preterm birth.*

Keywords: Preterm birth, risk, socio-demographic determinants, review, odds ratio

1. INTRODUCTION

Preterm Birth (PTB) remains to be one of the major health burdens globally, especially in the domain of obstetrics [1]. The World Health Organization (WHO) defines preterm birth as live birth that occurs before completing 37 weeks of gestation [2] Preterm Birth can further be divided into late preterm birth (34 to <37 weeks), moderate preterm birth (32 to < 34 weeks) and very preterm birth (28 to < 32 weeks) respectively depending upon the weeks of gestation completed by fetus at time of birth [3]. The incidence of preterm birth has increased alarmingly over the span of a decade, [4]as reported incidence of PTB went from 9.8% in 2000 to 10.6% in 2014 [5, 6]. Almost 15 million (11%) PTB births are reported annually, with higher prevalence in developing countries. India, China, United States, Pakistan and Indonesia are among top 5 countries that constitute almost half of annual PTB births [7]. A recent study in Riyadh, Saudia Arabia reported 8.4% preterm births and 29.8% early term births in 2022 [8].

Moreover, preterm birth is associated with a number of immediate and long-term complications in the infant and poses risks to maternal health as well [9]. Almost 1 million neonatal deaths per year are attributed to complications related to preterm birth [10]. Due to unprecedented threats for feto-maternal health associated with preterm birth, notable consideration has recently been given to its prevention as part of United Nations Sustainable Development Goal 3, which focuses on avoiding preventable neonatal deaths [11].

A number of risk factors contribute in PTB including maternal, environmental, socio-demographic and biological determinants [12]. However, maternal risk factors are predominant comparatively, that constitute both modifiable and non-modifiable factors such as mother's age, including other socio-demographic factors [13, 14]. In most of the studies, PTB is studied itself as a risk factor due to its causative role in neonatal mortality and morbidity. The literature that reports determinants of PTB, mostly considers only one or few determinants. The socio-demographic risk factors have significant association with PTB, yet are under-reported [15]. Detection of these socio-demographic determinants can help us better understand the extent of threat posed by individual factor in this domain, which subsequently can be improvised to minimize the burden of PTB in our community. This study, hence, is aimed to identify and review significant socio-demographic risk factors reported by different studies that can increase the risk of preterm birth.

2. MATERIALS AND METHODS

Study design: Systematic review

Reporting Criteria: This systematic review targeted all studies that were published online and specifically mentioned risk factors for preterm birth. The results of screened and selected studies were reported following the guidelines of Preferred Reporting Items for Systematic Reviews (PRISMA) and meta-analysis statement guidelines for individual patient's data.

Inclusion and Exclusion Criteria:

Inclusion and Exclusion Criteria: The study included original studies available in full text freely on the internet. Studies following any study design for identification of socio-demographic determinants in their title, abstract, and result section related to preterm birth were taken. whereas studies that fail to meet the inclusion criteria mentioned above were excluded from selection. The papers with incomplete titles, incorrect or irrelevant objectives, methodology, or statistical analysis were excluded. Studies that reported risk factors

without giving a crude or adjusted odds ratio were taken, while studies reporting hazard ratio, risk ratio, or relative risk were also excluded. Moreover, the studies with unclear contents, results, and author information were also not taken. Similarly, studies with only abstracts available, paid articles, or studies in languages other than English were also not taken for this review.

In order to assure fair inclusion and exclusion as well as clarity, a checklist containing important information such as authors, year of publication, title, objectives, methods, main findings, and conclusion was maintained. This checklist served as the main component for critical analysis and reporting for the shortlisted studies later.

Search Strategy and Sources of Information: Open web sources, including PubMed and Google Scholar, were considered for searching the studies. The BOOLEAN search strategy was chosen using mesh terms of important components of titles using the "AND" and "OR" operations. The terms included but were not limited to "preterm birth", "early birth", "risk factors", "PTB", "risk factors", "socio-demographic", "determinants", association," etc.

Shortlisting Studies: The initial storage of selected studies was done in a reference management software named "EndNote v. 8." The studies were then thoroughly cleaned to avoid duplication. Both authors then critically assessed all studies to match their attributes with the developed checklist independently. Studies with incomplete and irrelevant contents were excluded. Also, any methodological or statistical discrepancies were individually noted and discussed among both authors to reach consensus about the inclusion or exclusion of those particular studies. The final shortlisting was done after the complete consensus of both authors according to the standard checklist and criteria discussed beforehand.

Data Extraction and Analysis: The above checklist was used to extract the data required for the purpose of analysis. Important information such as the year of study, objectives, main findings with statistics, and mentioned conclusions was drawn in for the purpose of reporting results. Both authors analyzed the content and reviewed the results carefully before reporting. The mean along with the 95% confidence level was used to calculate the mean odds ratio, and a graphical presentation of the odds ratio was also given.

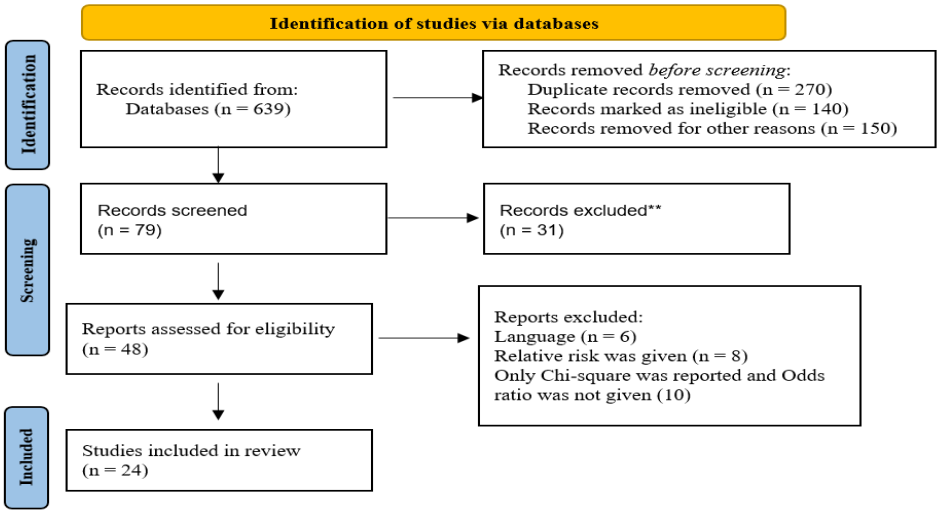

Fig-1: PRISMA 2020 Flow Diagram

3. RESULTS

A total of 24 studies were included meeting inclusion criteria and reporting significant crude or adjusted odds ratio. In these 24 studies there were 30 risk factors (3 studies reported more than one domain of selected socio-demographic and rests of studies reported single variables as risk factor of PTB). In 2 researches study design was not well defined while 6 studies had case control, cross sectional study design was used by 6 articles, 1 study was done under Clustered RCT, observational, Population Based, Prospective, RCT and Survey study design and 2 articles had retrospective and cohort study design each. The total sample size was 4242794 of these studies (if studies reported more than one category then its sample size was considered once) with minimum and maximum sample size as 400 and 2334532.

Among different age groups, we found 3 well defined age groups considered as risk factors of PTB i.e. <18 years (given by 5 studies), <20 years (by 5 studies) and ≥ 35 years (by 6 studies). The other categories were low income (by 5 studies), no formal or low education (7 studies), heavy work (1 study) and living in rural area (1 study). The mean odds ratio to have PTB for females with age <18 year was 1.89 (95% CI: 0.74, 3.03), for age <20 year was 3.8(95% CI: -0.12, 7.72) and for those who had age ≥35 year the mean odds ratio was 3.02 (95% CI: -0.4, 6.49). The mean odds ratio for females having low income was 3.51 (95% CI: -2.74, 9.75) and for those who had no or low education the mean odds ratio was 1.52(95% CI: 1.28, 1.77). For females who do heavy work and lives in rural area had odds ratio of 1.947 (95% CI: 1.18, 3.21) and respectively 2.13 (95% CI: 1.07, 4.22) to have PTB. The overall mean odds ratio for all risk factors was 5.46 (95 % CI: 4.50, 6.42) with minimum odds ratio was 1.11 (95 % CI: 1.02, 1.2) for category of age < 18 years by Tough et al. [20], and the highest odds ratio was reported as 12.50 (95 % CI: 10.4, 14.6) by (Braveman et al., 2015) for low income of mothers.

Table 2.2: Characteristics of different studies regarding socio-demographic factors of preterm birth

	Studies	n	Study design	Country	OR/ aOR [95% CI]	Ref
<18 years	(van den Broek et al., 2014)	2149	RCT	Malawi	1.31 (1.02 - 1.69)	16
	(Passini Jr et al., 2014)	1146	Cross sectional	Brazil	1.54 (1.31 - 1.79)	17
	(Atjimakul and Liabsuetrakul, 2010)	479	Case control	Thailand	3.4 (1.1 - 11.2)	18
	(Stewart et al., 2007)	1805	Clustered RCT	Nepal	2.07 (1.26 - 3.38)	19
	(Tough et al., 2003)	283956	--	Canada	1.11 (1.02 - 1.2)	20
<20 years	(Adugna, 2022)	482	Cross sectional	Ethiopia	7.8 (2.3 - 26)	21
	(Jiang et al., 2018)	2652	Case control	China	6.63 (2.22 - 19.82)	22
	(Chen et al., 2019)	2334532	Case control	Taiwan	2.00 (1.92 - 2.08)	23
	(Gurung et al., 2020)	60742	Observational	Nepal	1.26 (1.15 - 1.39)	24
	(Zhang et al., 2022)	215254	Cross sectional	China	1.31(1.79 - 2.14)	25
≥ 35 years	(Rouget et al., 2013)	911	Cohort	USA	2.4 (1.3 - 4.5)	26
	(Abu Hamad et al., 2007)	400	Case control	Palestine	1.80 (1.00 - 3)	27
	(Gurung et al., 2020)	60742	Observational	Nepal	1.50 (1.29 - 1.74)	24
	(Abdel Razeq et al., 2017)	21075	Cross sectional	Jordan	1.4 (1.1 - 1.7)	28
	(Soltani et al., 2019)	2463	Case control	Iran	9.72 (3.07 - 30.78)	29
	(Zhang et al., 2022)	215254	Cross sectional	China	1.31(1.25 - 1.39)	25
Low Income	(Coley et al., 2015)	23383	Cross sectional	US	1.38 (1.21 - 1.56)	30
	(Braveman et al., 2015)	10400	Survey	US	12.5 (10.4 - 14.6)	31
	(Joseph et al., 2014)	132714	Retrospective	Canada	1.14 (1.03 - 1.25)	32
	(Shah et al., 2014)	37630	Prospective	Bangladesh	1.37 (1.26 - 1.49)	33
	(Luo et al., 2006)	825349	Population based	Canada	1.14 (1.10 - 1.17)	34
No formal or low education	(Jansen et al., 2009)	3830	Cohort	Netherlands	1.89 (1.28 - 2.80)	35
	(Pusdekar et al., 2020)	272192	--	GNPBR	1.32 (1.23 - 1.41)	36
	(Luo et al., 2006)	825349	Population based	Canada	1.48 (1.44 - 1.52)	34
	(Gurung et al., 2020)	60742	Observational	Nepal	1.41 (1.22 - 1.64)	24
	(Jansen et al., 2009)	3830	Cohort	Netherlands	1.89 (1.28 - 2.80)	35
	(Luo et al., 2006)	825349	Population based	Canada	1.48 (1.44 - 1.52)	34
	(Temu et al., 2016)	1143	Case control	Tanzania	1.2 (3.55 - 4.06)	37
Heavy work	(Di Renzo et al., 2011)	7634	Retrospective	Italy	1.947 (1.18 - 3.21)	38
Rural	(Aregawi et al., 2019)	473	Cross sectional	Ethiopia	2.13 (1.07 - 4.22)	39

OR| Odds ratio, aOR| Adjusted odds ratio, RCT| Randomized controlled / clinical trial, CI | Confidence interval, GNPBR| Global Network's population-based registry

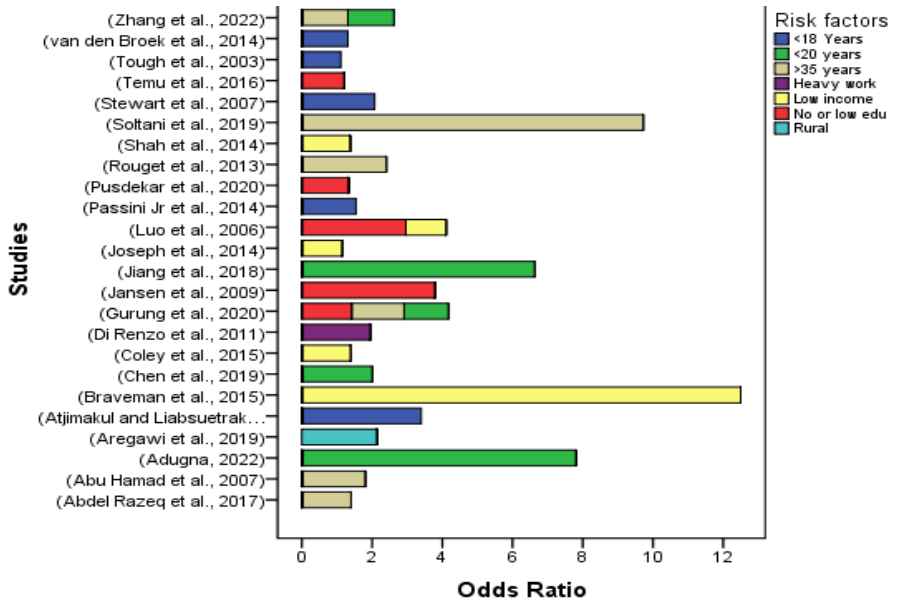

Fig-2: Odds ratio of different socio-demographic factors of preterm birth in different studies.

4. DISCUSSION

Preterm birth remains a considerable health burden worldwide, with a number of associated complications and risk of neonatal mortality [40]. The PTB infants are already vulnerable and need more hospital care as they are less susceptible to survive such complications [41]. Although, many studies have reported a steady decline in the incidence of PTB, however, the current prevalence is alarmingly high [5]. Different studies have reported the prevalence of PTB in a varying range of 5%- 22% in different regions of the world [1, 42]. Socio-demographic risk factors of PTB are among the most dominant determinants associated with increased risk of PTB [43]. Hence, identification of such variables can help devise strategy to reduce the incidence of PTB in future.

We reviewed studies to enlist most important socio-demographic risk factor that could aggravate the risk of preterm birth including maternal age, residential area and income status of the household. Maternal age has been reported to increase the risk of preterm birth dramatically, as literature shows that both extremes of maternal age (younger and older) have their own association with preterm birth [44]. One study reported that teen mothers (younger than 18 years) have significantly higher odds of delivering a preterm baby compared to mothers in age range of 20-39 years [45]. Another study reported that median age of mothers who have birth to PTB babies was <30 years compared to one who birthed FTB babies whose median age was 30 years with significant association (p-value<0.05) [46].

Similarly, maternal weight is another frequently reported determinant of PTB and so is weight gain during the course of pregnancy. The study mentioned above also reported a high association of worse pregnancy outcomes including Low Birth Weight (LBW) and PTB with weight gain during pregnancy (p-value< 0.0001) [46, 47] The economic situation of the household is yet another risk factor that has widely been reported in literature [48]. One study conducted in US reported almost 10 folds higher risk of PTB in low-income families, compared to high income families [49]. Similarly, studies conducted in Pakistan, India and Bangladesh have also reported a higher OR of PTB in low-income families [50].

Other socio-demographic factors including antenatal care, choice of mode of delivery, available type of healthcare provider, booking status at hospital and social support are all established determinants of PTB [51]. The studies reviewed in current study have also highlighted similar risk factors as published in other literature globally. In a nutshell, hence, it is established that socio-demographic risk factors constitute both modifiable and non-modifiable determinants that have pivotal role in aggravating the risk of PTB. Hence, targeting these determinants, especially the modifiable ones may help us minimize the risk of PTB. Even, identifying non-modifiable risk factors can highlight the vulnerable pregnant females that can be dealt with sensitivity at an earlier stage. It is, therefore, important for researchers to elaborate further in future researches in this regard and utilize available literature to devise health strategies accordingly.

5 CONCLUSION:

Several socio-demographic risk factors including maternal age, monthly income, and maternal education are significantly associated with preterm birth. Careful consideration of these factors can help us identify vulnerable pregnant females and improvise modifiable risk factors to minimize risk of preterm birth.

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