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# Maternal Risk Factors and Outcomes of Premature Neonates Admitted to the Neonatal Care Unit in Al-Elwiya Pediatric Teaching Hospital in Baghdad, Iraq

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## ABSTRACT

***Background:*** Prematurity and its complications are the major causes of neonatal and infant morbidity and mortality. Although the cause of preterm labor is often unknown, numerous etiological risk factors may be implicated. To identify the risk factors that lead to prematurity and assess the neonatal outcomes that preterm neonates may develop.

***Methods:*** This case-control study was conducted at AL-Elwiya Pediatric Teaching Hospital, Baghdad, Iraq, from the 1st of June to the 31st of December 2019. A non-randomized sample of 700 neonates admitted to the neonatal care unit was included in this study and divided into two groups of preterm full-term neonates as the experimental and control groups, respectively (n=350 each). The same questionnaire was applied to all cases. The test of proportion and the Chi-square test were used to determine significant differences between the two groups.

***Results:*** A significant association was found between preterm birth and the factors of older maternal age (more than 35 years), passive smoking, low educational state, and employed mothers. Moreover, cervical incompetence, premature rupture of membrane, number of fetuses, and gestational hypertension showed significant associations with preterm birth. It was also found that preterm birth was highly associated with such complications as respiratory distress syndrome, sepsis, intraventricular hemorrhage, hypothermia, and hypoglycemia.

***Conclusion:*** Prematurity was associated with certain risk factors, such as older maternal age, multiple gestations, premature rupture of membrane, pre-eclampsia, and diabetes mellitus. Preterm neonates were more liable to develop complications, have hospital admission, and have a higher risk of mortality than the control group.

***Keywords:*** Causes, Complications, Newborn, Preterm

## Introduction

Preterm birth (PTB) is defined as the birth of a baby before 37 weeks of gestation (1) and is regarded as the major cause of infant morbidity and mortality despite the great advances in managing preterm babies. It is classified into three main sub-categories, namely extremely preterm (<28 weeks), very preterm (28 to <32 weeks), and moderate to late preterm (32 to <37 weeks) with average frequencies of 5%, 10%, and 85%, respectively (1, 2). The viability limit of a fetus is different in many centers and is based on the facilities and the level of care in each neonatal care unit. With the advances in neonatal care over the last 40 years, the viability limit has improved and reached approximately 24-21 weeks. (3, 4).

The World Health Organization (WHO) has stated that 15 million neonates are born preterm, which is raising, and that 1 million children pass away each ear as a complication of PTB. The incidence of PTB varies greatly worldwide as numerous factors appear to be contributing to the development of PTB; in developed countries, the

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incidence of PTB has been estimated at 9%, while in developing countries, it has been obtained at 12% (5). In Iraq, despite the improvement in the maternal-child health services, an increased rate of delivery by skilled birth attendants to 90-95%, and hospital delivery to 87-97%, the PTB rate was still high as 7 in per 100 live births in 2010 (6). India, China, Nigeria, and Pakistan have the highest rates of PTB. In many cases, PTB occurs spontaneously without obvious causes. Some maternal risk factors include poor nutritional status, young maternal age, smoking, and history of unnecessary C-section deliveries (5). Over the last few years, there has been an increased incidence of cesarean section, and gynecologists sometimes need to deliver a baby early because of concerns for the health of the mother or the baby; therefore, the baby may be delivered preterm. An early delivery should only be considered when there is a medical reason to do so. Other causes may include multiple gestations, hypertension, pre-eclampsia, diabetes, and maternal infection (6-8). Preterm birth may have been associated with certain racial, genetic, and environmental factors (9). It is associated with short- and long-term complications, such as growth problems and learning, physical, mental, and visual disabilities (5). Despite the great advances in the care of sick preterm newborns, PTB is still regarded as the major cause of infant morbidity and mortality and hospital admission in developed and developing countries (1). More than 90% of very preterm babies (below 28 weeks of gestation) pass away after birth in low-income countries, while this rate reaches around 10% in high-income countries (5). To achieve a high survival rate among premature babies, healthcare givers should focus on the reduction of the risk of PTB, provide high-quality care immediately after birth, and prevent complications that sick and small newborns may develop (10). According to the WHO report (2019), 1.9 million neonatal deaths can be prevented by 2030 by providing optimal care and proper interventions to a sick and small newborn in a high-quality intensive care unit (11).

This study aimed to identify risk factors of premature birth and assess the neonatal outcomes regarding morbidity and mortality.

## Methods

This case-control study was conducted over 6 months from the 1st of June to the 31st of December 2019 in AL-Elwyia Pediatrics Teaching Hospital in Baghdad, Iraq.

Patients were divided into two groups, including those with a gestational age of 29-37 weeks (preterm neonates) and those with a gestational age of ≥37 weeks (term neonates), based on the last menstrual period.

All premature neonates admitted to the neonatal care unit (n=350) during the study period were involved in the study and followed up until discharge. Moreover, 350 term neonates were included as a control group. The data were collected by a self-structured questionnaire that was based on previous reviews (9, 12) and was validated and evaluated by three consultant physicians (a pediatrician, a community medicine practitioner, and a gynecologist).

The questionnaire included maternal sociodemographic background (maternal age, job, and education), an obstetrical history (obstetrical factors included in this study were cervical incompetence, premature rupture of membrane, uterine malformation, number of gravida, multiple or single gestation, history of abortion, PTB or stillbirth, and vaginal bleeding), any chronic medical problems before or during pregnancy (hypertension, preeclampsia, anemia, diabetes mellitus (DM), genital and urinary tract infections, heart disease, and thyroid and kidney diseases).

The history of diseases during and before pregnancy and most obstetrical history depended on the history obtained from the mothers as their gynecologist told them based on examination and investigations performed for them.

In addition to face-to-face interviews with the mothers, patients' hospital records were also used.

Neonates were also classified into male and female, and the period of hospitalization and final diagnosis and outcome were obtained.

Data analysis was conducted on a personal computer using Microsoft Excel and SPSS V.26.

Frequency distribution, mean, and standard deviation tables and graphs were used for displaying descriptive statistics. The Chi-square test, odds ratios (ORs), relative risk (RR), 95% confidence intervals (CI), and binary logistic regressions were used to calculate the odds and risks of different variables. Accordingly, a p-value of $< 0.05$ was considered significant.

### *Ethical Considerations*

This study was approved by the scientific unit of Al-Kindy College of Medicine, Baghdad, Iraq. An official letter of permission was directed to AL-Elwiya Pediatric Teaching Hospital, Baghdad, to facilitate the performance of this study. Verbal consent was obtained from all the mothers before

starting the interview after explaining briefly the aim of the study and ensuring the confidentiality of the collected information.

## Results

A total of 350 preterm neonates, as the experimental group, and 350 full-term neonates, as the control group, were included in the study. The mean age scores of mothers with preterm delivery and term delivery were estimated at 29.67±6.01 and 26.49±5.43 years, respectively. The mean numbers of gravidas parity were 3.26±1.57 and 2.74±1.32, respectively.

Table 1 presents a significant risk of association between older maternal age (above 35 years), passive smoking, low educational state, employed mothers, and PTB.

Table 2 shows the OR of the possible association between the different risk factors and the outcome of pregnancy in preterm and full-term neonates.

Significant associations were found between PTB and some obstetrical problems, such as cervical incompetence (OR=1.729), premature rupture of membrane (OR=1.416), vaginal bleeding (OR=1.562), hypertension before pregnancy (OR=1.976), DM before pregnancy (OR=2.490), and gestational hypertension (OR=1.978). Furthermore, the history of a previous preterm baby (OR=2.280), multiple gestations (OR=2.37), and being delivered by a cesarean section (OR=1.610) showed significant association with PTB.

**Table 1.** Demographic characteristics of the studied mothers and outcomes of pregnancy

| | | Gestational age | | | | P-value |
|---|---|---|---|---|---|---|
| | | Preterm | | Full-term | | |
| | | n | % | n | % | |
| Maternal age (years) | < 20 | 63 | 18 | 39 | 11.1 | 0.001 |
| | 20-35 | 192 | 54.9 | 254 | 72.6 | |
| | ≥ 35 | 95 | 27.1 | 57 | 16.3 | |
| Maternal education level | Primary school | 198 | 56.6 | 159 | 45.4 | 0.002 |
| | Secondary school | 142 | 40.6 | 167 | 47.7 | |
| | College | 10 | 2.9 | 24 | 6.9 | |
| Maternal job | Employed | 160 | 55.0 | 131 | 45.0 | 0.026 |
| | Not employed | 190 | 46.5 | 219 | 53.5 | |
| Maternal passive smoking | Yes | 191 | 54.7 | 158 | 45.3 | 0.013 |
| | No | 159 | 45.3 | 192 | 54.7 | |

**Table 2.** Odds ratio of possible associations between different risk factors and outcomes of pregnancy in premature and full-term delivery

| | | Gestational age | | | | OR | 95% CI | P-value |
|---|---|---|---|---|---|---|---|---|
| | | Preterm | | Full-term | | | | |
| | | n | % | n | % | | | |
| Cervical incompetence | Yes | 99 | 60.4 | 65 | 39.6 | 1.729 | 1.211-2.469 | 0.002 |
| | No | 251 | 46.9 | 284 | 53.1 | | | |
| Premature rupture of membrane | Yes | 170 | 54.8 | 140 | 45.2 | 1.416 | 1.050-1.911 | 0.026 |
| | No | 180 | 46.2 | 210 | 53.8 | | | |
| Gravida | >2.00 | 209 | 45.2 | 253 | 54.8 | 0.568 | 0.414-0.780 | 0.001 |
| | 1.00 | 141 | 59.2 | 97 | 40.8 | | | |
| Abortion | Yes | 113 | 50.2 | 112 | 49.8 | 1 | 0.737-1.391 | 0.935 |
| | No | 237 | 49.9 | 238 | 50.1 | | | |
| Stillbirth | Yes | 58 | 47.2 | 65 | 52.8 | 0.870 | 0.560-1.286 | 0.487 |
| | No | 292 | 50.6 | 285 | 49.4 | | | |
| History of pre-term birth | Yes | 22 | 68.8 | 10 | 31.3 | 2.280 | 1.063-4.889 | 0.030 |
| | No | 328 | 49.1 | 340 | 50.9 | | | |
| No. of fetuses | Multiple | 25 | 69.4 | 11 | 30.6 | 2.37 | 1.147-4.896 | 0.019 |
| | Single | 325 | 48.9 | 339 | 51.1 | | | |
| Vaginal bleeding | Yes | 84 | 58.3 | 60 | 41.7 | 1.526 | 1.015-2.211 | 0.025 |
| | No | 266 | 47.8 | 290 | 52.2 | | | |
| Hypertension before pregnancy | Yes | 79 | 63.7 | 45 | 36.3 | 1.976 | 1.323-2.950 | 0.001 |
| | No | 271 | 47.0 | 305 | 53.0 | | | |
| Diabetes mellitus before pregnancy | Yes | 48 | 69.6 | 21 | 30.4 | 2.490 | 1.457-4.256 | 0.001 |
| | No | 302 | 47.9 | 329 | 52.1 | | | |
| Gestational hypertension | Yes | 41 | 65.1 | 22 | 34.9 | 1.978 | 1.152-3.397 | 0.012 |
| | No | 309 | 48.5 | 328 | 51.5 | | | |
| Gestational diabetes mellitus | Yes | 18 | 69.2 | 8 | 30.8 | 2.317 | 1.004-5.403 | 0.046 |
| | No | 332 | 49.3 | 342 | 50.7 | | | |
| Mode of delivery | C/S | 182 | 52 | 122 | 34.9 | 1.610 | 0.186-0.726 | 0.002 |
| | NVD | 168 | 48 | 228 | 65.1 | | | |

**Table 3.** Association between complications and gestational age

| Complication | | Preterm | | Term | | P-value |
|---|---|---|---|---|---|---|
| | | n | % | n | % | |
| RDS | Yes | 219 | 57.3 | 63 | 18 | 0.000 |
| | No | 131 | 41.2 | 287 | 82 | |
| Sepsis | Yes | 160 | 74.4 | 55 | 25.6 | 0.001 |
| | No | 190 | 39.2 | 295 | 60.8 | |
| Jaundice | Yes | 164 | 51.6 | 154 | 48.4 | 0.448 |
| | No | 186 | 48.7 | 196 | 51.3 | |
| Hypoglycemia | Yes | 183 | 73.2 | 67 | 26.8 | 0.001 |
| | No | 167 | 37.1 | 283 | 62.9 | |
| Poor feeding | Yes | 68 | 68.7 | 31 | 31.3 | 0.001 |
| | No | 282 | 46.9 | 319 | 53.1 | |
| Hypothermia | Yes | 115 | 75.2 | 38 | 24.8 | 0.001 |
| | No | 235 | 43.0 | 312 | 57.0 | |
| IVH | Yes | 97 | 88.2 | 13 | 11.8 | 0.001 |
| | No | 253 | 42.9 | 337 | 57.1 | |

RDS: Respiratory distress syndrome; IVH: Intraventricular hemorrhage

As shown in Table 3, preterm neonates were found to have complications, such as respiratory distress syndrome (RDS), sepsis, hypothermia, hypoglycemia, intraventricular hemorrhage (IVH), and poor feeding.

Based on the information in Table 4, 48.6% and 51.9% of the preterm neonates were male and female, respectively, while these percentages accounted for 51.4% and 48.1% of full-term newborns, respectively (P=0.4).

**Table 4.** Association between gender and gestational age

| Gestational Age | | | | |
|---|---|---|---|---|
| | Preterm | | Term | |
| Gender | n | % | n | % |
| Male (n=403) | 196 | 48.6 | 207 | 51.4 |
| Female (n=297) | 154 | 51.9 | 143 | 48.1 |
| Chi-square=0.708; DF=1; P-value=0.400 | | | | |

The mean duration of hospitalization in preterm neonates was 7 days, while term neonates were hospitalized for 5 days (P=0.001) (Table 5).

Figure 1 shows that being preterm is a risk factor for death among delivered neonates (RR=1.423, 95% CI=1.091-1.854, P=0.008).

**Table 5.** Two sample t-tests showing differences in the means of the period of hospitalization according to gestational age

| Period of hospitalization/day | | | | |
|---|---|---|---|---|
| | n | Mean | SD | P-value |
| Term | 350 | 5.4514 | 3.72811 | <0.001 |
| Preterm | 350 | 7.0114 | 5.16489 | |

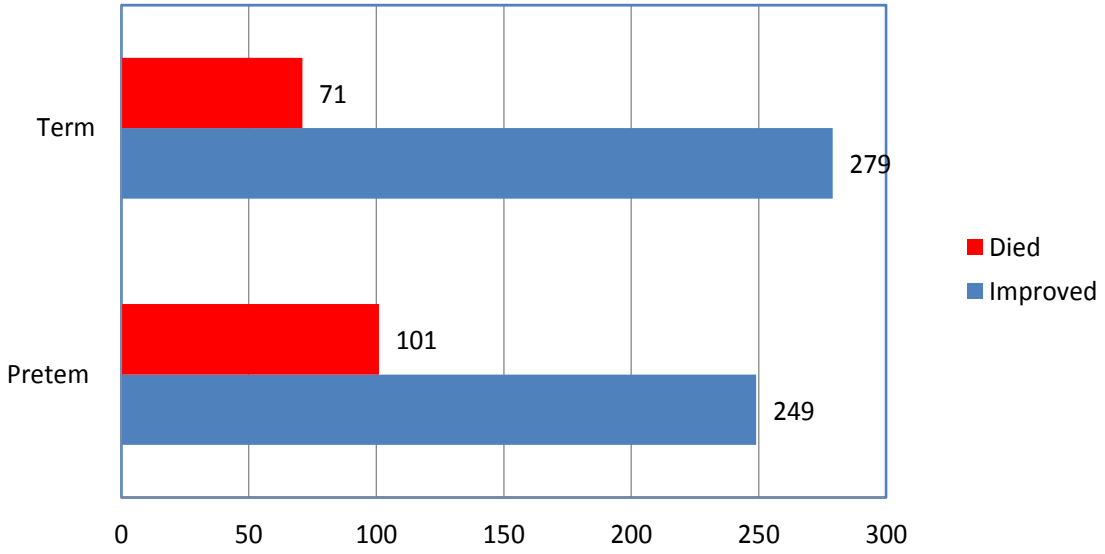


**Figure 1.** Final outcome of neonates admitted to neonatal care unit according to the gestational age

## Discussion

Preterm birth is a common cause of neonatal morbidity, mortality, and childhood disorders all over the world (13). Regarding maternal socio-demographic characteristics, the results of the study showed that there was a significant risk of association between PTB and mothers older than 35 years of age, having a low educational level, and being employed. The findings of another study conducted in Iraq revealed that the maternal ages of < 20 and > 35 years were both associated with the risk of PTB (14). The results of two other Iraqi studies also showed that young maternal age, mother's being employed, and maternal low educational level were greatly associated with PTB (15, 16). The findings of

another study carried out in Iran revealed that 88.8% of mothers were 35 years of age, and maternal educational level had no significant correlation with PTB (17). This discrepancy in the finding about the maternal educational level may be explained by the differences in health care access in these two regions. Late marriage and conception at advanced maternal age are increasing in Iraq, which may carry a lot of complications, such as gestational hypertension, gestational diabetes, and restricted growth, all contributing to an increase in the incidence of PTB (18). Young maternal age (below 20 years), on the other hand, carries a risk of PTB, intrauterine growth retardation, and intrauterine death. This may be explained by the fact that low gynecological age is associated with biological immaturity and risk of adolescent pregnancy rather than merely young maternal age (19). Mother's heavy and prolonged working hours have been associated with PTB in many studies, while moderate physical activity may reduce the risk of PTB (20). A lower educational level below secondary school has been associated with lower socioeconomic status and is considered among the risk factors of PTB in numerous countries, including those in the Gulf region (21, 22). According to the findings of a study by Al-Assadi et al., passive maternal smoking was associated with the risk of PTB, while the results of a study by Al-Dabbagh showed no significant correlation between PTB and passive smoking (14, 16). This difference between the two studies may be attributed to the time and amount of exposure to passive smoking in each sample. Maternal smoking, whether active or passive, has been associated with the risk of fetal growth restriction, abruption of the placenta, and PTB (23).

Among the obstetrical risk factors associated with PTB, the results of our study showed a highly significant association of PTB with cervical incompetence, premature rupture of membrane, multiple gestations, multigravida, and vaginal bleeding. The findings of other Iraqi studies also confirmed the existence of a significant association between PTB and cervical incompetence, multiple gestations, and vaginal bleeding (14, 16). This result was in agreement with those of another study conducted in Iran, while those of a study performed in Nepal showed that nulliparity was a risk factor for PTB (22, 24). This can be explained by the differences in the sample chosen in both studies. There was a significant relationship between PTB and a history of previous preterm delivery in our study; however, no significant correlation was found between PTB and a history of abortion or stillbirth. The findings of studies by Al-Dabbagh and Baylon also revealed a significant association between PTB and a history of previous preterm delivery and abortion (15, 16). Based on the results of a study carried out in Iran, a high percentage of mothers with PTB had a history of previous miscarriages and stillbirths (17). This may explain that spontaneous miscarriages have a less significant risk of PTB than surgical abortion (25).

Among the commonest risk factors causing PTB are hypertension and DM (5). The results of this study found that a history of hypertension and DM before pregnancy, gestational DM, and hypertension had a significant association with PTB. This finding was in line with those of a study conducted in Iraq (Babylon governorate) and of a large population-based study in Qatar (12, 15).

The rate of cesarean section is increasing in Iraq, especially in private hospitals, either chosen by the mother to avoid the pain of vaginal delivery or for some obstetrical reasons that lead to an increased incidence of PTB. The results of this study showed a significant association between the mode of delivery by cesarean section and PTB. This was consistent with the findings of other studies indicating the same finding (12, 21). Nevertheless, the results of an Iranian study showed that there was no significant association between PTB and being born by cesarean section (17). These conflicting results may be explained by different rates of cesarean delivery in each community.

Regarding the gender of newborns, no significant association was observed between PTB and gender in our study, which was in agreement with the results of another Iraqi study (15). Nonetheless, there are other conflicting studies about newborn gender. The findings of one study in Nepal showed that male newborns had a higher risk for PTB, and those of another research in Abu Dhabi found that the female gender had a double risk of being preterm and low birth weight (21, 22). This may need a population-based study to find any risk of association between PTB and neonatal gender.

Despite the advances in the management of preterm babies, the developing world still complains about the consequences of PTB as it is the leading cause of infant morbidity and mortality (1). The findings of our study demonstrated that premature neonates were more prone to have complications than the control group, such as RDS, hypoglycemia, poor

feeding, hypothermia, sepsis, and IVH. The risk of developing neonatal jaundice was not significant between preterm newborns and the control group. Respiratory distress syndrome and septicemia were the most prominent causes of preterm admission to the hospital as reported in studies conducted in Basrah and Al-Kadhimiya Hospital (14, 26). Sepsis, RDS, and hyperbilirubinemia were more significantly associated with PTB in India, while IVH was presented in only 2.9% of PTBs (27). The results of a study performed in Ghana showed that hypothermia and RDS were the most common morbidity causes associated with PTB (28). These differences in the comorbidity associated with PTB are due to the wide range of geographical differences in the manifestations of PTB globally.

There was a significant difference in the duration of hospitalization between preterm and term neonates (P<0.001), which was in agreement with the findings of a study performed in Iraq showing that prematurity represented in more than one-third of neonatal admissions (29). This finding was also in line with that of another population-based study in Qatar revealing that preterm neonates had more hospital admissions to neonatal intensive care units (12). Premature babies may have more health problems and may need to stay in the hospital longer than babies born later.

Being preterm has been found to be a risk factor for death, and as the number of premature births is increasing, there is an increased rate of morbidity and mortality (5). The findings of this study showed a significant association between death and premature birth (mortality rate of 28.8%), which was in line with those of two studies in Basrah, showing a mortality rate of 34.7% among preterm neonates, and in Qatar (12, 14). Another study in Nepal showed that the rate of overall mortality among preterm neonates was 24.7% (30).

### *Limitations*

Since this was a single-center study, further studies are needed to be performed as multicenter studies and with a larger sample size.

## Conclusion

Many risk factors, such as older maternal age, low maternal educational level, prenatal factors, maternal DM, and PET were found to be associated with PTB. Multiple gestations and premature rupture of the membrane were the other contributory factors to PTB. It was revealed that preterm newborns were more liable for complications, longer hospitalization stays, and mortality risk than the control group.

### *Recommendations*

Many of the abovementioned risk factors of PTB are preventable and every effort should be made to reduce the prevalence of PTB, which will lead to the reduction of perinatal and infant mortality and morbidity. The improvement of healthcare facilities dealing with pregnant mothers is possible through the promotion of health programs and health education about the risk factors of PTB.

Moreover, early recognition and prevention of the common maternal and fetal risk factors leading to PTB are recommended. It is also suggested to improve neonatal care facilities in dealing with preterm neonates to improve outcomes and reduce the rate of infant morbidity and mortality.

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## Conflicts of interest

The authors declare that there is no conflict of interest.

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## References

1. World Health Organization. "Preterm birth Fact Sheet N°363" 2014. http://www.who.int/mediacentre/factsheets/fs363/en. Accessed on 6/7/2021
2. Lawn JE, Gravett MG, Nunes TM, Rubens CE, Stanton C. Global report on preterm birth and stillbirth (1 of 7): definitions, description of the burden and opportunities to improve data. BMC pregnancy and childbirth. 2010; 10(1):1-22.
3. Brumbaugh JE, Hansen NI, Bell EF, Sridhar A, Carlo WA, Hintz SR, et al. Outcomes of extremely preterm infants with birth weight less than 400g. JAMA Pediatr. 2019; 173(5):434-45.
4. Di Stefano LM, Wood K, Mactier H, Bates SE, Wilkinson D. Viability and thresholds for treatment of extremely preterm infants: survey of UK neonatal professionals. Arch Dis Child Fetal Neonatal Ed. 2021; 106(6):596-602.
5. WHO. Preterm Birth 2018. http://www.who.int/news-room/fact-sheet/detail/preterm-birth.
6. WHO report. 2010. http://data.un.org/Data.aspx?d=WHO&f=MEASURE_CODE%3aWHS_PBR.
7. Beck S, Wojdyla D, Say L, Betran AP, Merialdi M, Requejo JH, et al. The worldwide incidence of

preterm birth: a systematic review of maternal mortality and morbidity. Bull World Health Organ. 2010; 88(1):31–8.
8. Hannah B, Julia K, Mercedes de O, Robert E, Xiaoyi A, Gretchen A, et al. National, regional, and worldwide estimates of low birthweight in 2015, with trends from 2000: a systematic analysis. The Lancet. 2019; 7(7):849-60.
9. Klidea SV, Gao Y, Rolfe M, Boyle J, Tracy S, Barclay LM. Risk factors for preterm, low birthweight and small for gestational age births among Aboriginal women from remote communities in Northern Australia. Women Birth. 2017; 30(5):398-405.
10. Noritz ER, Caughey AB. Progesterone supplementation and the prevention of preterm birth. Rev Obstet Gynecol. 2011; 4(2):60-72.
11. WHO and UNICEF. 2019 report, SURVIVE and THRIVE. 2021. http://www.unicef.org.
12. Younes S, Samara M, Al Jurf R, Nasrallah G, AL Obaidly S, Salama H, et al. Incidence, risk factors, and outcomes of preterm and early term births: a population-based register study. Int J Environ Res Public Health. 2021; 18(11):1-14.
13. Liu L, Oza S, Hogan D, Chu Y, Perin J, Zhu J, et al. Global, regional, and national causes of under-5 mortality in 2000–15: an updated systematic analysis with implications for the sustainable development goals. Lancet. 2016; 388(10063): 3027–35.
14. Al Assadi AF, Al Harron DS, Al Rubaye A, Abdul Rahman BA. Risk factors and neonatal outcome among preterm birth at Basrah central hospitals. Med j Basrah Univ. 2018; 36(2):87-96.
15. Farhood AL Joborae SF, Alwan FW. Sociodemographic and medical factors of preterm delivery according to the clinical subtypes of prematurity. Med j Babylon. 2018; 15(4):341-8.
16. Al Dabbagh SA, Al Taee WY. Risk factors for pre-term birth in Iraq: a case-control study. BMC Pregnancy and Childbirth. 2006; 6:1-7.
17. Soltani M, Tabatabaee HR, Saeidinejat S, Eslahi M, Yaghoobi H, Mazloumiu E, et al. Assessing the risk factors before pregnancy of preterm births in Iran: a population-based case-control study. BMC Pregnancy Childbirth. 2019; 19:1-8.
18. Fuchs F, Monet B, Ducruet T, Chaillet N, Audibert F. Effect of maternal age on the risk of preterm birth: A large cohort study. PLoS One. 2018; 13(1):1-10.
19. Hediger ML, Scholl TO, Schall JI, Krueger PM. Young maternal age and preterm labor. Ann Epidemiol. 1997; 7(6):400-6.
20. Cai C, Vandermeer B, Khurana R, Nerenberg K, Featherstone R, Sebastianski M, et al. The impact of occupational shift work and working hours during pregnancy on health outcomes: a systematic review and meta-analysis. Am J Obstet Gynecol. 2019; 221(6): 563-76.
21. Taha Z, Hassan AA, Wikkeling Scott L, Papandreou D. Factors associated with preterm birth and low birth weight in abu dhabi, the united arab emirates. Int J Environ Res Public Health. 2020; 17(4):1-10.
22. Gurung A, Wrammert J, Sunny AK, Gurung R, Rana N, Basaula YN, et al. Incidence, risk factors and consequences of preterm birth-findings from multicentric observational study for 14 months in Nepal. Archives of public health. 2020; 78:1-9.
23. Liu B, Xu G, Sun Y, Qiu X, Ryckman KK, Yu Y, et al. Maternal cigarette use before and during pregnancy and the risk of preterm birth: a dose-response analysis of 25 million mother-infant pairs. PLoS Med. 2020;17(8):1-17.
24. Vakilian K, Ranjbaran M, Khorsandi M, Sharafkhani N, Khodadost M. Prevalence of preterm labor in Iran: a systematic review and meta-analysis. Int J Reprod Biomed. 2015; 13(12):743-8.
25. Oliver Williams C, Fleming M, Monteath K, Wood AM, Smith GCS. Changes in association between previous therapeutic abortion and preterm birth in scotland, 1980 to 2008: a historical cohort study. PLoS Med. 2013; 10(7):1-11.
26. Al Saady LAK, Al Musawi HH. Clinical study of respiratory distress syndrome in AL-Kadhimiya teaching hospital. Iraqi J Med Sci. 2012; 10(4):396-401.
27. Patil S, Patil KP. Analysis of risk factors of late preterm birth: a case-control study. Indian J Med Res.2017; 10(3):283-7.
28. Abdul Mumin A, Owusu SA, Abubakari A. Factors associated with treatment outcome of preterm babies at discharge from the neonatal intensive care unit (NICU) of the tamale teaching hospital, Ghana. Int J Pediatr. 2020; 2020:1-7.
29. Aljawadi HF, Ali EA, Kareem SH. Preterm incidence with analytical assessment of causes and risk factors of mortality. J Babol Univ Med Sci. 2020; 22(1):101-9.
30. Paudel L, Kalakheti B, Sharma K. Prevalence and outcomes of preterm neonates admitted to neonatal unit of a tertiary center in western nepal. J Lumbini Med Coll. 2018; 6(2):1-5.