

Minimizing Risk Of Pre-Term Birth Through Optimal Pregnancy Environment: An overview

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Abstract

Pre term birth is a major public health issue; A baby born is too early, before 37 weeks of pregnancy is known as pre term born. Preterm births may also take an emotional toll and be a financial burden for families. An estimated 15 million babies are born too early every year. That is more than 1 in 10 babies. Approximately 1 million children die each year due to complications of preterm birth. Many survivors face a lifetime of disability, including learning disabilities and visual and hearing problems. Globally, prematurity is the leading cause of death in children under the age of 5 years and in almost all countries with reliable data, preterm birth rates are increasing. This paper examines multiple factors that are leading to pre-term birth these include genetic, epigenetic, nutritional, psychological factors. The physiotherapeutic interventions are suggested to minimize the risk of pre-term birth through optimal pregnancy environment.

Key words:- Pre term birth, Genetic factors, epigenetic factors, physiotherapy in pre-term birth,

Introduction

Preterm Birth

Preterm birth is a major public health issue. It increased risk for neonatal morbidity and mortality; preterm birth is the direct cause of 35% of all neonatal deaths worldwide. [1] Survivors remain at high risk for complications in early childhood, [2–4] adolescence, [5–7] and into adulthood. [5,8–11] Among school aged children, those born preterm show diminished cognitive performance, increased externalizing and internalizing behaviours, and are more likely to develop attention-deficit hypertension disorder. Girls who were delivered preterm have a higher risk of developing anorexia nervosa, and boys who were born small for gestational age (SGA) and preterm are more likely to develop personality and psychotic disorders or be hospitalized for mental illness compared to boys born SGA at term.

Preterm birth is when a baby is born too early, before 37 weeks of pregnancy have been completed. In 2019, preterm birth affected 1 of every 10 infants born in the United States. Preterm birth rates decreased from 2007 to 2014, and CDC research shows that this decline is due, in part, to declines in the number of births to teens and young mothers. However, the preterm birth rate rose for the fifth straight year in 2019. Additionally, racial and ethnic differences in preterm birth rates remain. For example, in 2019, the rate of preterm birth among African-American women (14.4%) was about 50% higher than the rate of preterm birth among white or Hispanic women (9.3% and 10% respectively). [12]

Preterm births may also take an emotional toll and be a financial burden for families. is defined as babies born alive before 37 weeks of pregnancy are completed. There are sub-categories of preterm birth, based on gestational age:

- Extremely preterm (less than 28 weeks)
- Very preterm (28 to 32 weeks)
- Moderate to late preterm (32 to 37 weeks)

Induction or caesarean birth should not be planned before 39 completed weeks unless medically indicated. [13]

Current situation of pre-term birth in world as well as in India:-

An estimated 15 million babies are born too early every year. That is more than 1 in 10 babies. Approximately 1 million children die each year due to complications of preterm birth [14]. Many survivors face a lifetime of disability, including learning disabilities and visual and hearing problems.

A developing baby goes through important growth throughout pregnancy— including in the final months and weeks. For example, the brain, lungs, and liver need the final weeks of pregnancy to fully develop. Babies born too early (especially before 32 weeks) have higher rates of death and disability. In 2018, preterm birth and low birth weight accounted for about 17% of infant deaths (deaths before 1 year of age). Babies who survive may have:

- Breathing problems
- Feeding difficulties
- Cerebral palsy
- Developmental delay
- Vision problems.
- Hearing problems [12]

Globally, prematurity is the leading cause of death in children under the age of 5 years and in almost all countries with reliable data, preterm birth rates are increasing.

Inequalities in survival rates around the world are stark. In low-income settings, half of the babies born at or below 32 weeks (2 months early) die due to a lack of feasible, cost-effective care, such as warmth, breastfeeding support, and basic care for infections and breathing difficulties. In high-income countries, almost all of these babies survive. Suboptimal use of technology in middle-income settings is causing an increased burden of disability among preterm babies who survive the neonatal period. More than 60% of preterm births occur in Africa and South Asia, but preterm birth is truly a global problem. In the lower- income countries, on average, 12% of babies are born too early compared with 9% in higher-income countries. Within countries, poorer families are at higher risk.

The 10 countries with the greatest number of preterm births [15]:

- India: 3 519 100
- China: 1 172 300
- Nigeria: 773 600
- Pakistan: 748 100
- Indonesia: 675 700
- United States of America: 517 400
- Bangladesh: 424 100
- Philippines: 348 900
- Democratic Republic of the Congo: 341 400
- Brazil: 279 300

The 10 countries with the highest rates of preterm birth per 100 live births [15]:

- Malawi: 18.1 preterm births per 100 births
- Comoros: 16.7
- Congo: 16.7
- Zimbabwe: 16.6

- Equatorial Guinea: 16.5
- Mozambique: 16.4
- Gabon: 16.3
- Pakistan: 15.8
- Indonesia: 15.5
- Mauritania: 15.4

Of 65 countries with reliable trend data, all but three show an increase in preterm birth rates over the past 20 years. Possible reasons for this include better measurement, increases in maternal age and underlying maternal health problems such as diabetes and high blood pressure, greater use of infertility treatments leading to increased rates of multiple pregnancies, and changes in obstetric practices such as more caesarean births before term.

There is a dramatic difference in survival of premature babies depending on where they are born. For example, more than 90% of extremely preterm babies (less than 28 weeks) born in low-income countries die within the first few days of life; yet less than 10% of extremely preterm babies die in high-income settings. [15]

Causes of Preterm Birth:-

Preterm birth occurs for a variety of reasons. Most preterm births happen spontaneously, but some are due to early induction of labour or caesarean birth, whether for medical or non-medical reasons.

Common causes of preterm birth include multiple pregnancies, infections and chronic conditions such as diabetes and high blood pressure; however, often no cause is identified. But lots of genetic and epigenetic factors may influence in epigenetic factors.

A. Genetic factors:

Several lines of evidence support a genetic predisposition to spontaneous preterm labour and preterm birth. Firstly, a leading risk factor for spontaneous preterm labour and preterm birth is a personal or family history. If a woman previously delivered preterm, her subsequent babies are also more likely to be born preterm. Women who experienced an early preterm birth (<32 completed weeks) in their first pregnancy have the highest rate of recurrent preterm birth in subsequent pregnancies. Spontaneous preterm labour and preterm birth in subsequent pregnancies tend to recur at equivalent gestational ages. If a woman herself was born preterm, she is also at an increased risk of spontaneous preterm labour and preterm birth, with the risks being highest for those women who themselves were born most preterm. This predisposition does not apply to men who were born preterm. Racial predispositions to preterm birth have also been observed. Black women suffer twice the rate of preterm birth compared with Caucasians, even when confounding social and economic variables are controlled. It is well established that upper genital tract infection and/or inflammation is seen in association with spontaneous preterm labour and preterm birth. Previous investigations have focussed primarily on an infectious aetiology for this finding. However, an alternative hypothesis has emerged, which suggests that this finding may represent an abnormal inflammatory response. The frequent association of spontaneous preterm labour and preterm birth with histological infection/inflammation and elevated body fluid concentrations of inflammatory cytokines has focussed investigations on single gene polymorphisms of these cytokines in both mother and foetus. The polymorphisms tumour necrosis factor- α -308 (TNF- α -308), interleukin-1 β (IL-1 β) + 3953/3954 and IL-6-174 have been most consistently associated with spontaneous preterm labour and preterm birth. Toll-like receptors (TLRs) are important components of the innate immune systems, which have also been linked to spontaneous preterm labour and preterm birth. Both maternal and fetal polymorphisms of the TLR-4 gene have been associated with spontaneous preterm labour and preterm birth in certain populations, but in others no apparent link has been observed. These findings confirm a clear genetic predisposition to spontaneous preterm labour and preterm birth. [16]

B. Epigenetic factors:

Nutrition, Psychological & Psychosocial stress, Environment and physical activities have been known to cause epigenetic changes which may be passed down from one generation to next generation. Epigenetic trait as a stably

heritable phenotype resulting from changes in a chromosome without alteration in the DNA sequence. Epigenetics play an important role in fetal development.

Effect and role of physiotherapy in minimizing the risk of preterm birth

Physiotherapy is also helpful in reduced the risk of pre- term birth although a very less number of researches are present directly in favour of it but researches proved the effect of maternal BMI & obesity is always be there on preterm birth so, indirectly physiotherapy is essential as well as important to reducing risk ofpreterm birth and the management of sedentary life style of a pregnant lady and it’s also effective in the psychological stress management of a pregnant lady which is also one the leading causing factor of preterm birth.

And when we discuss specific for the preterm birth in relation with pelvic floor muscles then the researches are very limited on this association or relation of both but in absence of research work we can’t deny the importance of pelvic floor muscles and their importance. The pelvic floor muscles have an essential role in continence and provide support to the pelvic organs. They also have an impact on labour. The pelvic floor muscles should distend to allow the passage of the foetus during labour. The rotation and flexion of the foetalhead is due to the pelvic floor resistance. The effect of a vaginal birth on the pelvic floor's function is readily understood.

Pelvic floor muscle exercises

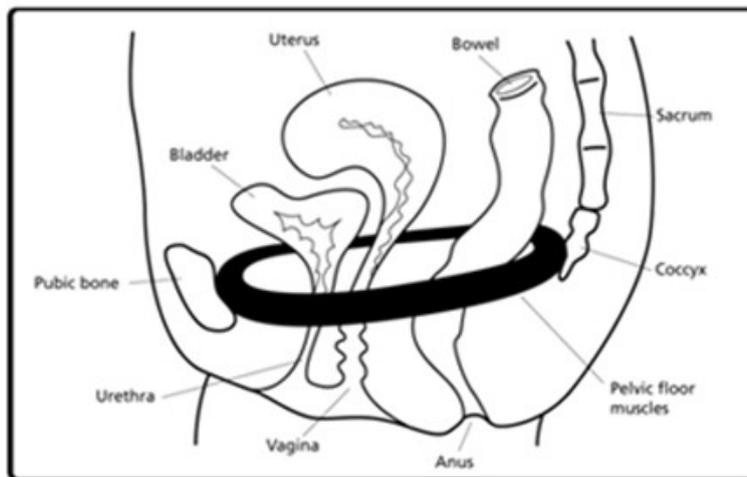


Figure 1. Structure of pelvic floor

The pelvic floor (bladder, rectum, pelvic genital organs and terminal part of the urethra) reside within the pelvic cavity (or the true pelvis). This cavity is located within the lesser part of the pelvis, beneath the pelvic brim.

A number of muscles help make up the walls of the cavity – the lateral walls include the obturator internus and the piriformis muscle, with the latter also forming the posterior wall

Tighten the pelvic floor muscles by squeezing around the birth canal, front and back passages all at once, lifting up and inwards (squeeze and lift). Try to hold each contraction for 2–3 seconds and then release and relax .Repeat (squeeze and lift) and relax, resting for about 5 seconds between each contraction. Repeat as many times as many as possible, up to a maximum of 8–10 squeezes.

Pelvic floor muscle training helps to prevent urinary incontinence during pregnancy and after delivery. Doing pelvic floor muscle exercises (Kegels) from early pregnancy onwards helps strengthen these muscles and prepare them for a smoother birthing. It also reduces post-partum discomfort from perineal swelling and haemorrhoids is lessened.[17]

Psychological Stresses in Relation to Pre-Term Birth

Several researchers and public health experts are now increasingly highlighting the need for new, integrative research and clinical practice agenda, with an emphasis on bio psychological processes, including the impact of maternal stress, to address the problem of pre-term birth.

However, it also is clear that in any individual pregnancy the specificity and sensitivity of maternal stress as a predictor of adverse birth outcomes is, at best, modest.

Although there is no universally accepted definition of psychological stress, it is clear that stress is not a one-dimensional construct, but rather “a person-environment interaction” in which there is a perceived discrepancy between environmental demands and the individual’s psychological or biological resources and so the exposure to maternal cortisol and psychosocial stress exert threatening influence on the developing fetus with consequences for infant stress regulation.

Preterm birth and nursing care

Nurses play vital roles from antenatal care of preterm labor itself for safety of the mother and preterm baby. The WHO Technical Consultation led to the adoption of 10 main recommendations (and 17 additional sub- recommendations) covering antenatal corticosteroids, tocolysis, magnesium sulfate, antibiotic prophylaxis, mode of preterm birth (for the mother) and Kangaroo mother care, plastic wraps, continuous positive airway pressure therapy, surfactant and oxygen therapy (for the newborn). For each recommendation, the quality of evidence was graded as “very low”, “low”, “moderate” or high. (18)

Regarding various nursing aspects to care the preterm babies, nurse researchers has explored different topic of interest. In a study, researcher interviewed 36 mothers to explore experience of preterm birth and neonatal intensive care where they enquired on between 4 and 9 days following birth focusing on: interactions with professional caregivers, maternal feelings, perceptions and sensitivities and psychological adaptation to preterm birth and events around the early newborn period. Findings highlight the crisis nature of the event for mothers and provide insight into their adaptive processes. There are indications of how practitioners might best support families in their efforts to develop their parental role.(19)

Another study among 71 medically high risk preterm, where the relationship between nursing care and development of sleep awake behaviors showed that development of sleeping and waking in preterm infants appears to depend not only on biological maturation but also nursing stimulation. As long-term developmental effects of nurse caregiving are unknown, showing evidence for research gap.(20)

A study among student nurses who were providing holistic care to children, the application of SBCS(Scenario-based clinical, simulation) in NICU resulted less anxiety during holistic care provision for preterm neonates. (21)

Influence of in-home nursing care on the weight of the early discharged preterm newborn was conducted where 65 cases and 65 controls (matched by weight, age and sex) demonstrate that In-home care was associated with a greater weight gain of the newborn at home than during their stay in the hospital, and canbe considered safe because neonatal morbidity was not increased.(22)

Nurse researchers among Thirty-one VLBW neonates (mean gestational age: 28.7 +/- 0.3 weeks of gestation)found that neonates nursed in skin temperature servo-control incubators abdominal temperature is found decreased and correlated with the type of procedure, incubator opening modalities and procedure duration. These parameters should be considered to optimize the thermal management of VLBW neonates. (23)

Meta analysis on the topic “Cot-nursing versus incubator care for preterm infants” where, Nine potential studies were identified of which four, involving 173 babies reviewers concluded that due to the small numbers of trials included and infants studied, and the resulting imprecision in the measures of effect for all outcomes, the review does not give a clear indication for the role of cot-nursing for preterm infants. Further assessment of the role of cot nursing for preterm infants using randomized controlled trials is necessary.(24)

To improve the quality of nursing care for Late Preterm Infants leading to standardization of care, needs quality improvement process including planning, teaching, performance application, and evaluation of evidence-based practice guidelines for care of the late preterm infant. Further it also needs Ongoing quality improvement monitoring for sustainability.(25)

Conclusion

There are lots of known and unknown genetic and epigenetic causes of preterm birth are present and so manyresearch work is still going on but unfortunately very less research work was conducted on preterm birth with special

reference to physiotherapy. But many of research works directly proved that sedentary life style, maternal obesity, socioeconomic and psychological stress, rupture of membrane, weakness in pelvic floor musculature are the leading causing factors of preterm birth hence with the help of physiotherapy exercise we can address all these issue to maintain a risk free optimal health environment. The great thing is that the role and effect of physiotherapy is also priorly approved and witnessed by many of the leading health care organizations like world health organization. The WHO already issued guideline for the exercises of the pregnant ladies. Physiotherapy is almost safe and very effective treatment to treat all these problems. One of the leading causes of pre-term birth is the weak uterine muscles thus, we can strengthen these muscles with the help of physiotherapy exercises and it will help to secure uterus during the pregnancy and to hold the weight of the uterus by using physiotherapy techniques. These above mentioned exercises are all about knowing your body and feeling your uterine muscle. Once you are able to identify the uterine muscles, it is very easy to strengthen them. So, we can conclude that in minimizing the risk of preterm birth physiotherapy is can be the best tool and still it's have lots of scope for the new researches in this area to develop new safe and effective medicine free treatment approaches.

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