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Health Issues

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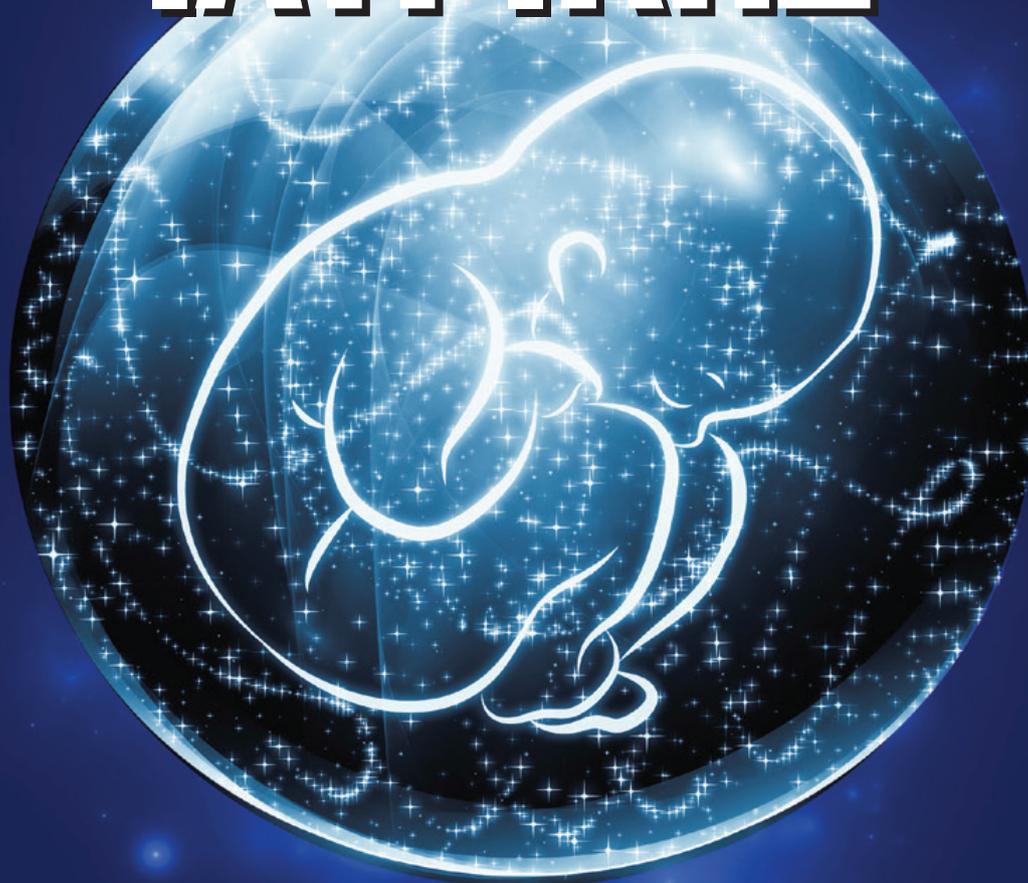


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A concise evaluation of causative factors and consequences of prematurity. Challenges for improving perinatal care.

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Abstract: Prematurity rates worldwide increase annually while striving for several improvements in the perinatal care field. Preterm birth is a stressful event, the mother-preterm infant relationship may become complex and some relational patterns forecast greater psychological risk than others. We will report and evaluate the factors leading to prematurity, the perinatal complications, the short and long term impacts and the role of the NICU.

We aim to a deeper understanding of the impact of family-center care on staff and the medical team. Perceiving prematurity as a multidimensional phenomenon will give useful information on future policies and practices in developing perinatal centers.

Key words: Care, childbirth, hospitalization, neonate, NICU, parenting, perinatal, prematurity, separation, stress

Περίληψη: Τα ποσοστά προωρότητας παγκοσμίως αυξάνονται ετησίως ενώ η περιγεννητική φροντίδα επιζητεί ολοένα και περισσότερες βελτιώσεις. Η πρόωρη γέννηση είναι ένα στρεσογόνο γεγονός όπου η σχέση μητέρας-πρόωρου βρέφους μπορεί να καταστεί σύνθετη με ορισμένα σχεσιακά μοτίβα να προαναγγέλλουν μεγαλύτερο ψυχολογικό κίνδυνο από άλλα. Θα αναφερθούμε και θα αξιολογήσουμε τους παράγοντες που σχετίζονται με την προωρότητα, τις περιγεννητικές επιπλοκές, τις βραχυπρόθεσμες και μακροπρόθεσμες επιπτώσεις και το ρόλο της MENN.

Στόχος μας είναι η βαθύτερη κατανόηση του αντικτύπου της οικογενειοκεντρικής φροντίδας στο προσωπικό και την ιατρική ομάδα. Αντιλαμβανόμενοι την προωρότητα ως πολυδιάστατο φαινόμενο μπορούμε να δώσουμε χρήσιμες πληροφορίες για τις μελλοντικές πολιτικές και πρακτικές στην ανάπτυξη περιγεννητικών κέντρων.

τοκετός, νοσηλεία, νεογνό, MENN, περιγεννητική φροντίδα, προωρότητα, άγχος

Λέξεις κλειδιά: Τοκετός, νοσηλεία, νεογνό, MENN, περιγεννητική φροντίδα, προωρότητα, άγχος

Introduction

Historical review

The history of neonatology is actually a very old practice. In Effessos, one of the largest centers of Antiquity in Asia Minor, the Greek doctor Soranus (98-138) deeply elaborated in obstetrics, gynecology, human anatomy and infant care.

Where *partus praetemporaneus* or *partus praematurus* - Latin terminology - is the linguistic origin for the formulation and definition of the word prematurity and premature.

It is also astonishing that an act of resuscitation is mentioned in the Old Testament in the book II of Kings, chapter IV.

In the XVII century the legendary figure of the French midwife of the royal court Louise Bourgeois (1563-1636) assisted Marry of Medici to give birth to the future Dauphine Loui XIII. After a tiresome birth that lasted 22 hours the infant was resuscitated by Bourgeois when she poured and blew to the infants' mouth red wine which facilitated and reactivated the lung contractions (1). While Pierre Boudin and Tarnier are undoubtedly the fathers of modern Perinatology. More specifically, Boudin's name is strongly connected with the invention of the first incubator and his famous work "The Nursling" which was published in 1907 (2). Budin emphasizes the significance of the mother's participation in premature nurseries because when they feel separated from their infant they soon lose their interest for their young (3).

Definition and epidemiology of preterm labor.

Our source for the data used for this review is the official nationwide data for Greece on all live births for the reference period, starting at 22 weeks of gestation, provided by the Hellenic Statistical Authority, EL.STAT.

The Greek preterm birth rate PBR (before 37 weeks of gestation increased 2.6-fold exponentially ($R^2=0.956$, $P<0.0001$), from 3.68 in 1996 to 9.63 in 2008, with an average annual percentage change (AAPC) of +8.3% (4).

The duration of a normal pregnancy or gestation is estimated to be 40 (+/-2) weeks or 280 days from the date of conception.

An infant is considered preterm if born before the 37th week of gestational age and very preterm if born before the 32nd week of gestational age (5). It is estimated that premature births account for about 8% of total births in developed countries and up to 25% in developing countries (6). As gestational age decreases, an infant's mortality and health complications risk clearly increase (7, 8).

Preterm delivery and low birth weight are the major causative factors for infant mortality and morbidity (9).

CLASSIFICATION

- Birth at Term: από 37 GA έως 41 GA
- Moderate Prematurity: 32 GA έως 37 GA
- Severe Prematurity: 28 GA έως 32 GA
- Extreme Prematurity: <28 GA

Medical Factors related to prematurity

The following medical conditions, including some that occur only during pregnancy, increase the risk for preterm labor and delivery.

- Urinary tract infections
- Sexually transmitted infections
- Certain vaginal infections, such as bacterial vaginosis and trichomoniasis

- High blood pressure
- Bleeding from the vagina
- Certain developmental abnormalities in the fetus
- Pregnancy resulting from in vitro fertilization
- Being underweight or obese before pregnancy
- Short time period between pregnancies (less than 6 months between a birth and the beginning of the next pregnancy)
- Placenta previa, a condition in which the placenta grows in the lowest part of the uterus and covers all or part of the opening to the cervix.
- Being at risk for rupture of the uterus (when the wall of the uterus rips open). Rupture of the uterus is more likely if one has had a prior cesarean delivery or has had a uterine fibroid removed.
- Diabetes (high blood sugar) and gestational diabetes (which occurs only during pregnancy)
- Blood clotting problems

The following factors are also considered to put women at high risk for preterm labor.

- Multiple gestation or the use of assisted reproductive technology
- Having delivered preterm before
- Certain abnormalities of the reproductive organs, for instance short cervix or cervix that shortens in the second trimester instead of the third.

Other factors that may increase risk for preterm labor include:

- Ethnicity. Prematurity occurs more often among certain racial and ethnic groups. African-American mothers are more likely to have a preterm delivery than Caucasian mothers.
- Age of the mother. Women younger than age 18 or older than age 35 are at risk of having preterm delivery.
- Certain lifestyle and environmental factors such as late or no health care during pregnancy, smoking, drinking alcohol, using drugs, domestic violence, abuse (physical, sexual or emotional), lack of social support, stress, long working hours, exposure to certain environmental pollutants.

Psychosocial factors related to prematurity

A number of studies find non-significant relationship between stressful life events and low birth weight, where others confirm significant association and impact of stressful life events and low birth weight.

Moreover, there is evidence that disparities in education, income, and high stress level may be important contributors to ethnic differences in birth outcome. (Event scale by Coen)

Several studies confirm that anxiety and depression when combined with specific biomedical factors, are associated with spontaneous preterm labor. Dayan's studies on the effect of preterm depression formulate the hypothesis that there is a synergic action of psychological and biomedical factors on the secretion of placenta corticotrophin-releasing mechanism (10). Although post-partum depression was the focus of the majority of studies, depression is prevalent in pregnant women 10-25%. Behaviorally, biochemically and physiologically fetuses and neonates of depressed mothers differ. Fetuses of depressed women show elevated heart rates (11), greater activity levels (12) and increased physiological reactivity (13). Maternal depression as contributing factor to prematurity and low birth weight is the main focus in another study of the team of Field (14). The depressed women had higher prenatal cortisol levels and lower dopamine and serotonin levels.

Based on past researches, socioeconomic, ethnic, racial and age

differences in birth weight or gestational age at delivery might be expected. (15-18) African-American women, poor or uneducated women and women younger than 18 years or older than 35 years have lighter rates of low birth weight in the United States (19).

Morbidity and mortality

Neonatal mortality is one of the most important challenges in the medical science field and great interest is shown worldwide.

We observe that the high rate of neonatal mortality is reduced over time, particularly in the western world.

Significant factors of neonatal mortality beyond those that are related to the health condition and medical history of the mother or the newborn are biological, social, economic, environmental, etc. In particular prematurity and/or low birth weight may account being underlying causes for neonatal mortality. On top of that austerity, lack of access to health care, the use of drugs and direct causes of death.

Parenting and prematurity

A major task for parents of hospitalized infants is to fulfill a meaningful parental role. Many factors influence the parents' ability to accomplish this, including personality styles, previous experience with illness and with health care authority figures, and situational variables related to the infant and other concerns (20).

Investigation regarding the impact of prenatal hospitalization, presents that this experience has an influence in the parental behavioral traits as well as to their perception concerning their infants hospitalization. This study provides strong evidence that the duration of prenatal hospitalization alternates parental perception regarding the following hospitalization of their infant in the NICU since they feel advantaged of having prior experience. At the same time there a significant difference was found among the mothers that have been hospitalized for a longer or shorter period and their intensity of expressing post-traumatic stress (21).

Many studies have focused on maternal stress but there is little information about a father's long term adaptation to stress.

Current meta-analysis to determine whether mothers of preterm children behave differently (e.g. less responsive or sensitive) in their interaction with their children after they are discharged from the hospital than mothers of term children. And describing that mothers of preterm children were not found to be less sensitive or responsive toward their children than mothers of full term children (22). Yet, so as to obtain deeper knowledge about a mother's experience of preterm birth it is essential to explore various coping strategies and self-perceived parental competence of mothers admitted in perinatal centers.

For this reason researchers have developed tests and psychometric properties to measure mothers' perception of their ability to understand and care for their hospitalized preterm infant. This critical parental mechanism is fundamental for the infant-mother dyad and the application of parenting efficacy psychometric tool is quite reliable and valid. Initially the perceived maternal parenting self-efficacy was used in the UK but requires further cross-cultural validation. But offers the potential to health care professionals to screen better preterm mothers in need (23).

Separation and bonding in neonatal intensive care

Apart from any other problems, premature labor multiplies the barriers between the infant – mother dyad.

Recent evidence emphasizes that high medical risk infants tend to

be insecurely attached more frequently. There is also a significant correlation between insecure attachment and dyadic play interaction at 4 months (i.e. maternal controlling behavior and infant compulsive compliance) (24).

In order to provide more parent infant closeness skin to skin contact should be encouraged since developmental care and other interventions supporting parenting and parental involvement in infant care have been shown to have the potential to enhance neurological and neurobehavioral outcomes of preterm infants (25).

The organization and importance of NICU

The significant role of the NICU is often underestimated. For most infants hospitalization predefines in a way their emotional development, the attachment with their parents and remains their first experience with the health care system.

The condition under which neonatal unit care is created often does not take into consideration the mother – infant dyad as well as the parental gratification of the unit.

Family support is poor and parental needs are poorly covered and no special care has been taken to fulfill these priorities.(CLIPP RESULTS) Consequently a sense of insecurity often emerges on behalf of the parents.

Equally health care professionals engaged in NICU face their personal strengths and weaknesses or surpass their identity in order to fulfill their duty.

Caregivers should acquire basic transcultural education, since it is essential to incorporate cultural assessment and proficiency into their daily work. When loss occurs in a family, rituals and mourning offer comfort and support to parents, siblings and grandparents. These practices are found in a wide array of ethnic and religious backgrounds. The culturally proficient NICU staff offer refer to the family's beliefs and dignity for the dead.

Ideally, the goal for the intensive care nursery staff is to develop an alliance with parents in which there is a shared sense of working together in the best interest of the infant (20).

After the observation of Heidelise Als, the NIDCAP interventions originally formulated. Based on the Brazelton Neonatal Behavioral Assessment Scale distinguishes normal from abnormal neonatal behavior and trying to obtain some prognostic conclusions about long-term development from the behavior in the newborn period. This observation finally formulated the concept that an optimal development of each premature should be included in the treatment of each premature infant (26).

Pleasant acoustic stimulation in the intensive care is beneficial for better developmental outcome.

Similarly, premature infants are connected to multiple medical devices which limit the interaction between the infant and the mother, parents or caregivers. Thus, interventions for ameliorating hospitalization and neuropsychological development include reduced noise level and low light exposure. On the other hand consistent exposure to their mothers voice and pleasant acoustic stimulation such as music, characterize the modern function of a NICU.

Short term outcomes after preterm birth

The premature neonate's medical complications

The organ systems of the preterm neonate are not prepared to function outside the mother's uterus because there wasn't enough time for full growth and development.

As a result premature infants most commonly suffer from acute

respiratory distress (ARDS), bronchopulmonary dysplasia (BPD), necrotizing enterocolitis (NEC), or retinopathy of prematurity (retinopathy of prematurity ROP).

In particular, Necrotizing enterocolitis (NEC) an inflammatory gastrointestinal disease characterized by tissue necrosis and is commonly observed in the intensive care unit (NICU) but can also occur in critically ill infants. The precise etiology of NEC remains unclear; however, there is a variety of factors which are strongly related to its development and pathophysiology. Among the preterm infants who develop NEC we meet the high percentage of 90% to 93%. The most recent data suggests that NEC affects 5% to 10% of very low birth weight (VLBW) infants (<1500 grams), with the most susceptible cases being the extremely low birth weight neonates.

Overall NEC occurs in 1%-5% of neonates admitted in NICU (27). Surfactant treatment in preterm infants and term newborn with acute respiratory distress syndrome (ARDS)-like severe respiratory failure has become part of an individualized treatment strategy in many intensive care units around the world. These babies constitute heterogeneous groups of gestational ages, lung maturity as well as the underlying disease processes and postnatal interventions. The pathophysiology of respiratory failure in preterm infants is characterized by a combination of primary surfactant deficiency and surfactant inactivation as a result of plasma proteins leaking into the airways from areas of epithelial disruption and injury. Various pre- and postnatal factors such as exposure to chorioamnionitis, pneumonia, sepsis and asphyxia, induce an injurious inflammatory response in the lungs of preterm infants, which may subsequently affect surfactant function, synthesis and alveolar stability. Surfactant inactivation- and dysfunction- is also a hallmark in newborns with meconium aspiration syndrome (MAS), pneumonia and other disorders affecting the pulmonary function. Although for the majority of suggested indications no data from randomized controlled trials exist, a surfactant replacement that counterbalances surfactant inactivation seems to improve oxygenation and lung function in many babies with ARDS without any apparent negative side effects. Newborns with MAS will definitely benefit from a reduced need for extracorporeal membrane oxygenation (ECMO). Clinical experience seems to justify surfactant treatment in neonates with ARDS (28).

Intraventricular hemorrhages as well as periventricular leukomalacia also occur in premature neonates.

Finally body temperature cannot be easily regulated as well as blood pressure heart rate or breathing (apnea).

The premature infant's nervous system is an extremely sensitive organ system.

The particularly undeveloped fetal brain is very vulnerable and carries the risk of all the infant's organs.

Long term outcomes after preterm birth

The Future of Premature Infants

There is no doubt that it is of great importance who and in which extend we can predict the developmental result of premature infants especially of those being born (<28 weeks) and extremely low birth weight (<1000gr). Most researches focus mainly on children of (<1500gr) and (<32 weeks). Infants being born closer to term or with birth weight closer to normal are usually considered to have lower risk for neurodevelopmental problems, fewer complications during perinatal period and perform normal brain function (29).

Yet, school performance is lower among population of ex- premature infants .The association between birth weight and reading spelling

and arithmetic's disabilities decreases as the birth weight approaches to physiological (<3500) and gestational age to term (39-40 weeks). In return, the percentage of premature born children suffering from the so called "New Morbidity", i.e. cognitive limitations (for example, memory capacity), partial performance disorders (for example, speaking difficulties), learning disabilities and attention difficulties (for example, attention deficit/hyperactivity disorder (ADHD) as well as behavior disorders, has increased significantly (30).

In Saint – Ann hospital in Paris the French neuropsychiatrist and psychoanalyst J. Berges, first defines as the behavioral emotional and developmental difficulties of child being born premature as the syndrome of ancient premature.

Infants and children born prematurely suffer more frequently (up to 50%) than full term babies from different deficits in neurological long-term development, such as minor disorders in the sphere of attention, behavior, motoric control and perceptiveness (31, 32).

A meta-analysis of cognitive and behavioral outcome of school-aged children who were born preterm (33), performed on cognitive data from 15 studies and behavioral data from 16 studies selected from 227 reviewed studies, showed that children who are born preterm are at risk for reduced cognitive test scores and their immaturity is directly proportional to the mean cognitive scores at school age. This meta-analysis showed also that children born preterm have an increased incidence of attention-deficit/hyperactivity disorder (ADHD).

Feeding difficulties in preterm infants

One of the major key points of a fragile and/or preterm infant is the feeding readiness, a unique interactive process that requires sensitive ongoing assessment of an infant's physiology and behavior. The limitations that preterm infants experience are due to their undeveloped oral motor skills and lack of coordination of sucking swallowing and respiration (34, 35).

The complex nature of feeding premature infants creates the need for the caregivers –parents to acquire special skills.

Feeding readiness is a major topic for many researchers (36).

Concerning maternal psychological responses, mothers of VLBW infants had higher anxiety and depression levels until 2 months adjusted gestational age, while mothers of LBW infants present depression and anxiety even further at 3 and 4 months. (37).

Accordingly maternal characteristics in a way predispose the pace of progression from the first oral feeding to complete oral feeding (38). In general, feeding practices and most conventional criteria indicate the age of 34 weeks of gestation age and weight of 1500g for oral feeding (Howe, 2014).

Research groups assessed new interventions to improve and stimulate infant's motor skills in order to facilitate oral feeding and consequently hospital discharge. This type of interventions aims to shorten hospitalization in NICU and at the same time reduce the cost (34).

Mother's own milk is the first choice for feeding preterm infants. However, many mothers are not able to supply sufficient amounts of milk for their preterm.

Ethical issues

The evolution and establishment of perinatal centers have considerably increased the chances of survival of extremely premature infants or of very low birth weight infants. Equally, infants with congenital abnormalities that could be considered dead after an immediate resuscitation or surgical intervention, survive.

Yet for some infants, intensive care turns out to be unsuccessful.

For neonates surviving having a severe congenital abnormality the future for them and their family is difficult.

Initially large pediatric centers covered neonatal cases as Neonatal care units and reduced significantly neonatal mortality rates. Equally obstetricians start following analogous perspectives taking into account the care of high –risk pregnancies as well as the embryo monitoring.

The past decades perinatal centers were enlarged in N America, combining obstetrics and neonatologists specialist under the same roof. These centers greatly improved the survival rates of neonates with extremely low birth weight. However the creation of such centers should overcome the high cost of the specialized treatments and the hospitalization. Hence, the creation and maintenance of such centers in very small medical units has been proved to be even prohibited.

Conclusion

Unfortunately in recent years, Greece has had the most rapidly worsening rates of PTBs among 19 European and 39 most developed countries, a phenomenon which has become the severest public health concern in Greek perinatal issues (4).

Initially, large pediatric centers covered neonatal cases as Neonatal care units and managed to reduce significantly neonatal mortality rates. Equally obstetricians start following analogous perspectives taking into account the care of high –risk pregnancies as well as the embryo monitoring.

Cultural sensitive care practices, procedures and the physical environment need to be considered to facilitate parent-infant closeness, such as through early and prolonged skin-to-skin contact, family – centered care, increased visiting hours, family rooms and optimization of the space on the units. Further research is required to explore factors that facilitate both physical and emotional closeness to ensure that parent-infant closeness is a priority within neonatal care.

These past decades perinatal centers were enlarged worldwide while combining obstetrics and neonatology specialists under the same roof. These centers greatly improved the survival rates of extremely low birth weight neonates. However the creation of such centers should overcome the high cost of the specialized treatments and the hospitalization. Hence, the creation and maintenance of such centers in very small medical units has been proved to be non-affordable or even prohibited (33).

Yet any further implementation in this field should take into account and be based on recent reviews and researches considering prematurity as a multi-dimensional phenomenon.

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