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Selected problems of prematurity and prematurely born child care

Wybrane problemy wcześniactwa i opieki nad dzieckiem przedwcześnie urodzonym¹

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Abstract: The evolution of perinatology and the progress of advanced methods of prenatal diagnosis have contributed to the rise of frequency of birth and survival of newborns with very low birth weight, born before 32 weeks of pregnancy. A three-tier perinatology care system in Poland, an increasingly outstanding knowledge of neonatologists, and newer and more advanced equipment for critical care therapy, all provide growingly safer conditions for the life and development of prematurely born children. Prematurity is not only a problem of the preterm baby, but poses a challenge for the family, notably the mother, who must face the challenges of care of the preterm baby. In this article, selected problems of prematurity and care of a preterm baby are presented. The most common causes of preterm birth incidence are reported. The mother's situation after a preterm birth is defined. Based on the current literature, the profile of preterm babies and the EBM (Evidence-Based Medicine) paradigm, the rules for treatment and care for a preterm baby are presented.

Keywords: pregnancy, preterm birth, epidemiology, preterm infant, neonatal care, mothers of preterm infants

Abstrakt: Rozwój perinatologii, postęp nowoczesnych metod diagnostyki prenatalnej, przyczynił się do wzrostu częstości urodzeń i przeżywalności noworodków z bardzo niską masą urodzeniową, urodzonych przed 32. tygodniem ciąży. System trójstopniowej opieki perinatologicznej w Polsce, coraz doskonalsza wiedza lekarzy neonatologów, coraz nowocześniejsza aparatura do diagnostyki i intensywnej terapii, zapewnia bezpieczne warunki życia i rozwoju dzieci przedwcześnie urodzonych. Wcześniactwo to nie tylko problem przedwcześnie urodzonego dziecka, jest to wyzwanie dla rodziny, szczególnie dla matki, która musi się zmierzyć z opieką nad wcześniakiem.

W artykule przedstawiono wybrane problemy wcześniactwa i opieki nad dzieckiem przedwcześnie urodzonym. Przytoczono najczęstsze przyczyny występowania porodów przedwczesnych, scharakteryzowano sytuację matki po porodzie przedwczesnym jej dziecka. Na podstawie aktualnego piśmiennictwa opartego o paradygmat EBM (Evidence-Based Medicine), przedstawiono charakterystykę oraz zasady postępowania i opieki nad dzieckiem przedwcześnie urodzonym.

Słowa kluczowe: ciąża, epidemiologia, matka wcześniaka, opieka neonatologiczna, poród przedwczesny, wcześniak

¹ Polska wersja: <https://stowarzyszeniefidesetratio.pl/Presentations0/2021-3-Puzy.pdf>

Introduction

Preterm birth poses a problem and a challenge afflicting a large part of the society worldwide. It is estimated that roughly 15 million children annually experience developmental disorders linked to prematurity. Prematurity is the main cause of deaths of ca. one million newborns worldwide, and the main cause of later health problems in childhood. In Lower Middle-Income Countries – LMIC more pathologies and problems in childhood development are directly connected with preterm birth (Howson et al., 2012; World Health Organization, 2010).

Owing to advances in modern methods of prenatal diagnosis, as well as development of perinatology, an increase of births and improved survival rate of newborns born before 32 weeks of pregnancy is observed. Due to a three-tier system of perinatal care that is in operation in Poland, as well as increasingly superb medical apparatus, accompanied by the knowledge and experience of neonatologists, the conditions that impact safe development of preterm babies can be much improved (Rutkowska et al., 2010).

Prematurity is not only a problem of the preterm baby, but it poses a challenge for its parents, notably the mother, who must face frequently long-lasting care, rehabilitation and treatment of the preterm baby. Preterm birth interrupts the natural process of intrauterine development of the baby, and at the same time frequently rapidly terminates the period of preparation for the role of a mother. Preterm birth and the prospect of an often non-viable neonate compounds the woman's anxiety about motherhood. Notwithstanding specialist neonatal care, increasingly newer techniques allowing effective treatment and fostering development of preterm babies, the stress and anxiety of parents concerning care and nursing a preterm baby are severe. (Łuczak – Wawrzyniak, 2008; Bączyk, et al., 2011; Helwich, 2002). The mother's anxiety escalates as the mother sees the prematurely born baby, whose appearance stands out from other babies substantially. No possibility of taking full-time care of the preterm baby, fear of touching the baby, holding it in the parent's arms, may result in the mother's attitude of withdrawal from the role of the carer and entering the role of an observer, which directly translates into her post-partum emotional problems (Cescutti-Butler et al., 2019; Lumsden et al., 2012; Romero et. al., 2014; Szczapa, 2015).

1. Causes of the prevalence of preterm births

The causes of the prevalence of preterm birth are not fully recognised. It is currently assumed that the aetiology of prematurity is multifactorial. In the light of current knowledge, physiologic onset of birth is the result of a number of processes that cascade in a woman's body, initiated by the activation of the maternal axis "hypothalamus-pituitary

gland-ovary", and lead to a major interaction of oestrogen with progesterone, as well as activation of proteins responsible for cervical contractions (CAPs-Contraction-Associated Proteins). At the same time, cervical maturation takes place together with priming of the myometrium for contraction (Beck et al., 2010).

Preterm birth is, on the other hand, a consequence of pathological processes disturbing particular elements of the cascade of physiological transitions (Skoczyła et al., 2011). Among direct causes of the incidence of preterm birth there are: preterm uterine myometrial contractions, 'preterm' prelabour rupture of membranes (PPROM), or iatrogenic induced labour. It is estimated that ca. two-thirds of all preterm births are spontaneous births, with the remaining medically indicated (Kalinka, Bitner, 2012; Vogel et al., 2018).

The causes of preterm birth are classified along one of two subgroups: social and medical.

Among social risk factors there are the age of the pregnant woman (below 16 and above 35); work time (above 40 hours per week); hard manual labour, in harmful conditions; low socio-economic status; lack or incomplete medical prenatal care; lack of support on the part of the father of the child and the family; short inter-pregnancy interval and stress (Mariańczyk, Libera, Rosińska, 2020).

Among medical factors there are: bad obstetric history of preterm birth, bad obstetric history of abortions (two or more, especially in II pregnancy trimester); placental abruption; suspicion of placental dysfunction, or other placental pathologies (e.g. retro placental haematoma). In the risk group of the incidence of preterm birth there are women diagnosed with multiple pregnancy, rhesus disease, premature rupture of membranes (PROM), intrauterine infections, cervical incompetence, uterus malformations, polyhydramnios, post-partum haemorrhage (PPH), infections (e.g. TORCH) and other infections (e.g. diabetes, liver diseases, kidney diseases, hypertension, anaemia, urinary tract infections) (Szczapa, 2015). In the group with an increased risk of preterm birth there are women with low body mass index (BMI < 19,5), low body weight gain during pregnancy, or ones using stimulants (alcohol, cigarettes, drugs (ibid.)).

The most critical risk factor in the incidence of preterm birth is the history of preterm births. Research shows that 17% of pregnant women with proved obstetric history of preterm birth is at risk of another preterm birth, and among women whose two preceding pregnancies finished before the end of week 37, the risk of premature birth increases up to 28% (Węgrzyn et al., 2015; Wielgoś, Węgrzyn, 2009).

2. Prematurity prevention

The choice of adequate methods of preventive treatment is pathogenic-dependent. Unfortunately, given non-specific clinical signs that forecast this complication, the treatment

mechanism is difficult to determine. There are three types of preterm birth prevention: original prevention (addressed to all women, including population with lower or higher risk factors of premature birth), secondary prevention (targeted at the population of women with identified risk factor of prematurity), and tertiary prevention (implementing treatment in the case of preterm birth risk) (Iams et al., 2009).

The aim of original and secondary prevention is the risk determination in a particular pregnant woman. In such situation, besides the woman's education in terms of health-promotion, a broadly understood medical scope of intervention is introduced. Prevention entails pharmacological prevention - progesterone and acetylsalicylic acid supply in individually determined dosing for a particular person, (Roberge, et al., 2014; Saccone, et al., 2017).

One of key factors leading to preterm cervical dilation is progesterone deficit. A team of experts from the Polish Society of Gynaecologists and Obstetricians (formerly Polish Gynaecological Society PTG) recommends preventive vaginal administration of 200mg progesterone every 24 hours in single pregnancy patients before the end of 33 weeks of pregnancy, with short cervix below 25 mm. This procedure does not, however, reduce the risk of preterm birth incidence in multiple pregnancies and in singleton pregnancy with cervical shortening below 10 mm (or cervical dilation), as well as pregnancy before 26 weeks of pregnancy (Rekomendacje Polskiego Towarzystwa Ginekologicznego, 2015).

A number of studies was carried out on the efficiency of preventive application of ASA - Acetylsalicylic Acid in pregnant women. It was proved that when applied in small doses, ASA reduces the risk of early PE - Preeclampsia by 90%, as well as the risk of fetal hypotrophy, placental abruption and preterm births. It was also proved that all women with bad obstetric history of PE, intrauterine growth restriction (IUGR), placental abruption and identified risk factors in the current pregnancy should be entitled to prevention with ASA. (ASA should be taken in 50-100 mg doses, preferably in the evening hours) (Roberge, et al., 2012; Poon, et al., 2009).

Another risk factor of preterm birth is intra-amniotic infection. Studies conducted among pregnant women with bacterial vaginosis (BV) showed decrease in moderately preterm births (between 34 and 36 weeks of pregnancy) as a result of oral application of clindamycin. Decrease in the number of preterm births in women before 33 weeks has not, however, been proved, Clindamycin, in oral administration, seems more responsive to BV than metronidazole, which does not protect from infections with aerobic bacteria, likely facilitating the risk of preterm birth in this way (Lamont, et al., 2011).

There is also a surgical method applicable in pregnant women in the case of incompetent cervical os diagnosis, namely doing a cervical cerclage, or using a pessary as a less intrusive procedure with comparable function. There is proved efficiency of cervical cerclage in a subgroup of women in singleton pregnancy between 16 and 26 weeks of

pregnancy with the history of prematurity with short cervix (less than 25 mm). There is however no clear evidence of the operation of cervical cerclage in singleton pregnancy without bad obstetric history of preterm birth (Berghella, et al., 2017).

Research results on the success rate of pessary in women with short cervix, less than 25 mm, are inconclusive. It has been reported that the use of pessary in women in singleton pregnancy before 34 weeks of pregnancy with short cervix with no bad obstetric history caused lower frequency of preterm births in comparison to the absence of pessary. International regulations suggest the application of cervical cerclage in high risk pregnant women as a more efficient method (Saccone, et al., 2017).

As a tertiary prevention, in order to prevent preterm birth, substances inhibiting the systolic function of the uterus muscle are used. The aim of tocolytic treatment is to postpone the incidence of preterm birth by at least 48 hours. The pregnant woman needs preventive supplementary treatment with a corticosteroid therapy course in order to stimulate the development of her child's lungs, in the period between 24 and 34 GA. A single corticosteroid therapy course reduces the risk of the incidence of IVH - Intraventricular Hemorrhage, IRDS - Infant Respiratory Distress Syndrome, NEC - Necrotising Enterocolitis, perinatal infant death, and remote neurological complications. Among the most commonly used corticosteroids, there are: betamethasone, administered in two doses 12 mg each every 24 hours, and dexamethasone, administered in four doses 6 mg each every 12 hours. For these drugs, an intramuscular injection is done in the case of pregnant women. Repeating the corticosteroid therapy cycle does not boost obstetrical results, but it may increase the risk of infections in the foetus, therefore the procedure is not recommended (Kimber-Trojnar, 2020; Grzesik-Gąsior, 2017).

3. Preterm birth - epidemiology

According to the World Health Organization (WHO), Preterm Birth - PTB is the birth of a baby before the end of 37 weeks of pregnancy (259 day) counting from the LMP - Last Menstrual Period, or 245 days from the probable day of insemination (Podsiadło, 2014).

Preterm birth can be divided into three subgroups depending on GA-Gestational Age:

- extremely preterm birth - before 28 weeks of pregnancy;
- very preterm birth - between 28 and 32 weeks of pregnancy;
- moderately preterm birth - between 33 and 37 weeks of pregnancy.

In accordance with the World Health Organization, this division represents the most recognized and widely acknowledged definition of preterm birth (Howson, et al., 2012; Bręborowicz, 2015).

The evaluation of GA (Gestational Age) is a key factor determining the time of birth. Early pregnancy ultrasound exam, that is one done before the end of 11 weeks of pregnancy, is considered the “golden standard” in accurate evaluation of gestational age, considering the similar growth and development of the child in this period of pregnancy (World Health Organization, 2010).

The frequency of preterm births increased slightly in recent years despite continuous advancement in midwife care. To date the number amounts to ca. 11% pregnant women worldwide (World Health Organization, 2010; Bręborowicz, 2015; Vogel, et al., 2018). The first global and regional statistics on preterm births were published in 2010 (Beck, 2010). Based on data coming from 92 countries, the author determined the prevalence of preterm births at the level of 9,6% (ibid.). Consecutive calculations were performed in 2012 by H. Blencowe, and data coming from 184 countries afforded the evaluation of the frequency of preterm births at the level of 11.1%. Based on the data, also coefficients of preterm births may be evaluated on the national level, and these vary in the range from ca. 5% in the European countries to 18% in African states. One of clear signals of this analysis is an indication that low financial status of a given country (LMIC – Low and Middle Income Countries) is the cause of the majority of preterm births. It is estimated that the proportion of preterm babies in the states of Sub-Saharan Africa or South Asia reaches as much as 60% (ibid.).

However, also in many developed countries, preterm birth indicators keep growing. Among 65 developed countries, 62 recorded an increase in the number of preterm births in the years 2000-2010 (Blencowe, 2012).

It is worth noticing that three nonaffluent countries (Croatia, Estonia and Ecuador) reported a decrease in the number of preterm births since 2010 (ibid.).

In Poland, the frequency of preterm births shows an upward trend in the last decade. In 1999 prematurity constituted 6,62% of all births in our country (Troszyński, 2010). Currently the proportion of preterm births is ca. 6,8%, including 5,1% of all newborns born prematurely coming from singleton pregnancies, the remaining ones from multiple pregnancies – preterm babies account for 51% of all babies in this group (Wielgoś, 2016). Babies born between 33 and 37 GA constitute the largest group of preterm babies (75%). The proportion of preterm births in this group shows an upward trend (Kalinka, Bitner, 2012).

Approximately 24 000 children with low birthweight (500 – 2500 g) are born in Poland annually, which accounts for ca. 6% all births. The mean rate of preterm births with very low birthweight (below 1500 g) is 1,1% newborns, and with extremely low birthweight (below 1000 g) – ca. 0,5% newborns (Szczapa, 2015).

4. Mother’s situation after preterm birth – experienced emotions

Women after a preterm birth must face numerous problems. Similarly to mothers of full-term babies, they experience body changes connected with postpartum period. Among typical conditions, there are: pain connected with involution of the uterus, weakness, pain of the perineal wound after natural birth or soreness in the incision after caesarean birth. Additionally, breastfeeding challenges may occur: breast milk oversupply or the subjective feeling of undersupply (Gebuza, et al., 2010).

Apart from physiological changes to the woman's body after childbirth, mood disorders linked to hormonal fluctuations are likely to appear in the postpartum period. As many as 80% women in the postpartum period experience "baby blues", which is a state of emotional imbalance featuring sleeplessness, irritability, feeling of social isolation, as well as eating and concentration disorders. Lack of broadly understood physical and emotional support for the mother in the postpartum period may lead to manifestation of mental disorders demanding medical treatment if they exceed a woman's physiological norm (Iwanowicz-Palus, Makara-Studzińska, 2009; Kaźmierczak, et al., 2010; Tataj-Puzyna, 2019).

Additional difficulty that mothers of preterm babies must face is the stress linked to a prolonged stay in hospital as a result of adjustment problems of a preterm baby, who most frequently must be put in an ICU or Neonatal Intensive Care Unit. Mothers must face difficult situation of the newborn who demands special care, stay in an incubator, and the use of medical devices or additional medical procedures. A mother's observation of her own baby demanding intensive care, without being able to hug the baby, may be extremely difficult (Łuczak-Wawrzyniak, 2009). Another challenge is the necessity to part with the baby who demands several months' stay in a hospital, express breast milk and visit the baby in the hospital in place of stay with her.

A woman after a preterm birth is especially exposed to emotional disorders by virtue of her far more difficult situation than that of a mother of a full-term baby. The case of very preterm birth is particularly difficult as the mother must cope with stress stemming from care for the baby, kept alive with the help of specialist medical devices. Given the essential neonatal intensive care of the preterm baby, the mother is frequently not able to experience rooming-in (stay with the baby in one room). The newborn's environment, large number of medical equipment and constant presence of medical personnel performing necessary operations, may trigger extreme reactions in the mother. For mothers it may be difficult to accept that the life of their children lies solely in the hands of medical personnel, medical equipment and drugs, rather than their own care. A woman's stay in an ICU enforces the role of a passive observer, which excludes providing full childcare to a preterm baby (breastfeeding, changing nappies, carrying, hugging). While watching the medical personnel perform medical and childcare activities, she may on the one hand feel jealous, but on the other grateful for not having to perform them on her own. These ambivalent feelings may

give rise the feeling of parental incompetence in the mother's eyes (Łuczak-Wawrzyniak, 2009; Łuczak-Wawrzyniak, et al., 2010).

After preterm births mothers sometimes stay in hospitals longer, which is why also family contact is handicapped. Lack of support from the closest ones hampers the process of adaptation to the role of a mother. Preterm birth imposes reorganisation of the foregoing way of life of the woman who must suddenly leave family, and start her maternity leave earlier than expected, she must leave her job, unfinished duties. The situation may lower her sense of self-esteem and independence, by which the process of adaptation to the role of a mother is longer. Only stable health condition of her preterm baby enables restoring her balance and accelerates the process of the woman's adaptation to new reality. The quality of relationship with hospital employees also affects the mother's process of adaptation to new life conditions (Lasiuk et al., 2013).

A woman watching her child in a Neonatal Unit or Intensive Care Unit may feel anxious, thus medical personnel should take care also of the mother of the preterm baby. One of effective methods of reducing parental stress and anxiety in mothers and fathers of preterm babies is transfer of current detailed information on the baby's health condition, enabling touching the baby and kangaroo care. By including a preterm baby parents into a therapeutic team through teaching them baby care or kangaroo care, their adaptation to a new role and challenges gets naturally facilitated (Łuczak-Wawrzyniak, 2009).

Taking into account difficult situation of the preterm baby, a woman after a preterm birth belongs to a group of increased risk of developing postpartum emotional disorders. In the literature, postpartum mental disorders are divided into three kinds, depending on the severity of symptoms: baby blues, postpartum depression, and postpartum psychosis. Baby blues is a postpartum blues which occurs usually in the 3-4 days after childbirth and stays for 2-4 weeks. It occurs in 50-80% women in the postpartum period. "Baby blues" is one of temporary mood swings characterised with the sense of fatigue, crying spells, sadness, confusion, irritability, and the fear of not being a good mother. The symptoms do not impair proper functioning of a woman, thus normally no pharmacological treatment is necessary, as they usually pass after 2 weeks, after the woman's adaptation to the role of a mother, with broadly understood support from her closest ones (Iwanowicz-Palus, Makara-Studzińska, 2009; Stopikowska, 2013).

Postpartum depression occurs in 10-20% women after birth, more often in women in difficult social situation who already experienced baby blues. The beginnings of depressive symptoms start up to the first 6 months after the childbirth and they stay from a few weeks up to a few months. Among typical symptoms there are: permanent gloominess, feeling of hopelessness, indifference towards the baby's needs or fear of contact with the baby, lack of self-confidence, difficulties in decision-making, isolation from the outside, unfounded self-blame, irritability, inability to relax, physical disorders. A woman experiencing depression

suffers from sleeplessness, and may be reactive, which enforces nervous behaviour (e.g. continuous examination of the baby's breath and sleep), may suffer memory loss, impaired concentration, recurrent thoughts of death or suicide (Stephens, et al., 2016; Logsdon, et al., 2009).

One of recommended means of diagnosis postpartum depression is the application of EDPS - Edinburgh Postnatal Depression Scale. After diagnosis of mental disorder, immediate psychological and psychiatric assistance is necessary, including pharmacological treatment (Programme of preventing depression of the Polish Ministry of Health; Maliszewska, Preis, 2014).

The hardest form of postpartum mental disorder is postpartum psychosis, occurring in 0,1-0,2% women in the period up to 3 months after childbirth. The risk of the incidence of psychotic symptoms is higher in women with the medical history of mental disorders, or the history of mental disorders in the family. The disorder features sudden onset, apparent for the environment, and constitutes a threat for both the mother and the child, on account of which it requires immediate diagnosis and urgent admission to hospital (Iwanowicz-Palus, Makara-Studzińska, 2009). Postpartum psychosis features a woman's inadequate perception, reception, evaluation and experiencing of reality. Common initial symptoms are difficulties falling asleep and sleeplessness (and even sleep deprivation for several consecutive days) and a feeling of anxiety and loss. Other initial symptoms are loss of appetite, agitation, irritability and dysphoria, obsessive thoughts on harming herself or the baby (with the awareness of its irrationality, e.g. suddenly emerging conceptualizations of throwing out her own baby thorough the window or dumping her from the baby-change table), avoiding contact with the baby/ not providing care for the baby. Suspiciousness towards others may appear, as well as strange changes in behaviour and emotional states or other psychotic symptoms (e.g. hallucinations and delusions - most often linked to the baby or childbirth, for example hearing voices that require killing oneself or the baby, or linked to the health of the baby and harmfulness of the mother's milk, paranoid convictions that someone may harm or kill the baby). A women in the state of PP may be not able to accept the newborn, reject it, refuse to take care for her or deny being her mother whatsoever (ibid.).

Women who experienced difficult, traumatic childbirth, illness of the child or preterm birth may suffer from the so called PTSD - Post-Traumatic Stress Disorder. The symptoms of PTSD are: the feeling of exhaustion, helplessness, anxiety tensions, experiences of involuntary recollections of traumatic event, or nightmares. Research has shown that mothers of preterm babies cope with the symptoms of post-traumatic stress disorder far more frequently than mothers of full-term babies, only less than 8% of whom suffer from PTSD. In studies carried out by Feeley et al. (2011) it was indicated that PTSD concerns over 23% mothers of preterm babies (42 ibid.). Based on Impact of Event Scale - Revised (IES-R)

Goutaudier et al. (2011) proved that post-traumatic stress disorder occurs in 77% mothers of preterm babies (ibid.). The level of post traumatic stress in women after preterm birth does not decline with time, and their high level of anxiety in mothers of preterm babies and their over-protective attitude hinders the creation atmosphere conducive to favourable development of their children (Walczak, Chrzan-Dętkoś, 2017).

5. The profile of preterm babies

Preterm babies form a very varied group of newborns, born before the end of 37. weeks of pregnancy, in whom a range of complications stemming from immaturity of body organs may occur. In order to evaluate the rate of a newborn development and maturation of individual organs, we may talk about adjusted age, which pertains to earlier defined date of birth (Kordek, 2010; Rozalska-Walaszek, et al., 2012).

Depending on the duration of pregnancy and the infant maturity, children born prematurely are divided into:

- "moderately preterm infants" - babies born between 34 to 36 (+6) weeks of pregnancy. These babies are ranked in a group of relatively mature babies, comparable to the weight of full-term babies. However, given the immaturity of organs, preterm babies bear a larger risk of health problems than full-term babies. As many as 74% of all preterm babies are born in this period, which accounts for 4 - 5% of all births.

- „very preterm infants”, born before 32 weeks of pregnancy, and the scope of the phenomenon of childbirths in this period can be estimated at ca. 1% of all live childbirths.

- „extremely preterm infants, born before 28 weeks of pregnancy, the frequency of birth of these children is at the level 0,4% of all live childbirths (Kosmala, et al., 2016).

The shorter the time of pregnancy, the more serious the adaptation disorders of the puppy to the life outside the uterus, and the quality of life life expectancy is rather unsure. Among clinical symptoms of prematurity there are: hypotonia (or low muscle tone), undeveloped or inhibited neonatal reflexes, impaired mobility of the newborn, fail chest, food sensitivities, respiratory diseases. The skin of a preterm baby is thin, loose and translucent, with blood vessels visible through it. A preterm baby often features lack of well-developed subcutaneous tissue, often closed eyelids, thick layer of greasy vernix caseosa and lanugo covering most of the baby's body. In male babies, undescended testes happen when one or both of male testes may have not descended into the scrotal sac, and in female babies labia majora (large lips) may not yet be covering labia minora (small lips) of the genitals (Kordek, 2010).

Morphological features of the newborn immaturity as well as neuromuscular maturity can be evaluated with the aid of numerous scales such as: Parkins Score,

Lubchenko growth curve, Amiel-Tison Neurological Assessment, Dubowitza/Ballard scoring, Apgar score (Szczała, 2015).

Preterm babies often struggle with a number of adaptation disorders, which impedes their autonomous life outside their mother's body. Therefore providing them with adequate conditions, reflecting those of foetal life (Kosmala, et al., 2016).

Among the most common complications stemming from prematurity there are: RDS – Respiratory Distress Syndrome, Muscle weakness, the symptoms of which are: muscular tremor or clonic spasms, impaired thermoregulation jaundice higher or lasting longer, metabolic disorders, NEC-Necrotising Enterocolitis, PDA-Patent Ductus Arteriosus)², anaemia or polycythemia, infections (congenital or adaptive), IVH-Intraventricular Hemorrhages, ROP-Retinopathy of Prematurity³ (Kordek, 2010).

6. Treatment of a preterm baby

Immediately after childbirth, adequate steps must be taken to prevent consequences of adaptation disorders of a preterm baby to the life outside the uterus. After childbirth, an experienced NICU medical team should provide adequate protection from heat loss, prevent hypoxia and possible metabolic disorders, prevent or treat infections or hiperbilirubinemia, anaemia or polycythemia, schedule early start of oral feeding with maternal breast milk. Should the baby condition require such actions, the NICU medical team begins and monitors the baby's CPR (Kordek, 2010).

Compliance with the principles of hypothermia prevention is key, as heat loss by a preterm baby may occur fatal. Among fluctuations in external temperature there are differences in skin temperature of the newborn and his environment, namely the influence of physical agents of the environment such as: temperature, humidity and air movement (Jeffery, Klaus, 2016).

Internal temperature depends on the body mass to surface ratio of the newborn. Among the main mechanisms of heat loss after birth there are evaporation and respiration. Full term newborns are able to balance their heat loss by, among others, increased activity of skeletal muscles, peripheral artery contractions, increased metabolism or non-shivering thermogenesis.

²PDA – Patent Ductus Arteriosus is opening, persistent from the foetal life, between blood vessels connecting the aorta and pulmonary artery.

After: <https://www.sercedziecka.org.pl/wady-serca/przetrwaly-przewod-tetniczy-botalla-15/>

³ROP – Retinopathy of Prematurity is an eye disease of immature retina.

It occurs in prematurely born children whose retinal blood vessels are not yet fully developed.

After birth, abnormal vascularity is accompanied by abnormal hypertrophy of the connective tissue, leads to pathological fibrovascular proliferation in the retina and vitreum

These, in turn, lead to detachment of the retina, and subsequently fill the interior of the eyeball.

Such changes may cause serious visual impairment including blindness.

After: <https://www.mp.pl/pacjent/pediatric/choroby/oczy/78860,retinopatia-wczesniakow>

Preterm babies born after 29 weeks of pregnancy have the ability to generate heat in the process of non-shivering thermogenesis, involving mainly burning of brown adipose tissue, which is a source of energy localized between the shoulders, and in the areas of the neck, kidneys and along aorta (Rozalska-Walaszek, et al., 2012; Beck, et al., 2010).

Premature baby hypothermia may be associated with numerous adverse changes in the body, effecting in life-threatening emergency. Typical implications of hypothermia are: drop in blood glucose level, metabolic acidosis resulting from high aerobic glycolysis, depletion of muscle glycogen reserves, hypoxemia ($\text{PaO}_2 < 50 \text{ mmHg}$), increase in oxygen consumption and metabolic transformations (Szczapa, 2015). Therefore, delivery room or operating theatre must provide adequate room temperature - ca. 25°C , and the body of a preterm baby must be covered immediately after birth, and all essential medical, pharmacological and care operations performed under a heat radiator. A preterm baby must be placed in a closed, heated incubator. In babies born before the end of 28 weeks of pregnancy, occlusive skin wrapping is used in order to prevent hypothermia (Szczapa, 2015; Kosmala, et al., 2016).

After placing a preterm baby in a resuscitation area, SpO_2 sensor must be set on the right upper limb ASAP. Among expected SpO_2 spans, both in full term and preterm babies, there are: 60-65% at 1 minute, 65-70% at 2 minutes of life, 70-75% at 3 minutes of life, 75-80% at 4 minutes of life, 80-85% at 5 minutes of life and 85-95% at 10 minutes of life of a newborn. Reduction of these values obliges the NICU medical team to apply oxygen therapy. Efficient ventilation translates into: movement of the newborn's chest during inhalation, higher SpO_2 value, heart rate rise $> 100 \text{ ud/min}$ (Phillipos, et al., 2017; 73 Cloherty, et al., 2015).

The treatment of preterm babies both immediately after birth and in further care should take into consideration minimising invasive procedures such as arterial blood sampling or capillary blood sampling. Umbilical artery catheterization is desired in the first hour of life as it enables blood sampling in a stressless manner for the newborn. It reduces the stress and pain induced by skin puncture, reduces blood loss and the risk of iatrogenic infection stemming from skin damage (Kosmala, et al., 2016).

Another issue concerning the care of a preterm baby is adequate baby nutrition. The best form of infant nutrition is breastfeeding "on demand". It means feeding the baby anytime they show hunger cues and feeding until they decide to be done. Preterm babies born before 34 weeks of pregnancy lack the coordination necessary for sucking-swallowing-respiration, thus breastfeeding or bottle feeding is impossible and gastric tubes must be used instead. Newborns with very little and extremely little birth weight demand parenteral nutrition and gradual integration of enteral nutrition formula (Embleton, 2013). According to the guidelines of The European Society for Paediatric Gastroenterology Hepatology and Nutrition (ESPGHAN) total energy intake of preterm babies is 110-135 kcal/kg/d regardless

of their gestational age, which accounts for 150-180 ml/kg/d of breast milk of formula (after: Gulczyńska, et al., 2014).

Preterm babies with birth weight below 1500 g. are especially vulnerable to infections. In this group of babies, an increased incidence of sepsis was observed as the most common cause of mortality in preterm babies. The most common pathogens of sepsis in these children include gram-negative bacteria and Group B Streptococci (GBS). Other factors putting them at risk of serious infections are: long-term mechanical ventilation or umbilical vascular catheterization (Cloherty, et al., 2015).

The incidence of infections in preterm newborns is linked to prematurity of their defence mechanisms. The skin and mucous membranes of preterm babies are more permeable and susceptible to damage. Weakened peristalsis and reduced amount of hydrochloric acid increase the risk of growth of pathogenic microorganisms and their overcoming permeable tissue barriers. The symptoms of infection are usually heterologous in a newborn: food clogging, vomiting, difficulties feeding, reduced activity of the newborn, breathing disorders, apnea, hipo- or hipertermia, skin pigmentation disorders (gray, pale, or bluish tint to the skin), increased demand for respiratory support, metabolic disorders, metabolic acidosis, changes in the central and peripheral circulatory system (Kordek, 2010; Kosmala, et al., 2016).

Diagnosis of infectious disease is possible owing to the identification of risk factors, visible clinical symptoms and additional test results (blood culture test, Complete Blood Cell Count (CBC) and Peripheral Blood Film, C-reactive protein concentration (CRP) and procalcitonin. Given the dynamics of the disease process, treatment must start as soon as possible. In order to stabilize the condition of the newborn, causative treatment is applied - antibiotic therapy, based on antibiogram, respiratory support, treatment of coagulation disorders and auxiliary treatment, if necessary, e.g. parenteral nutrition.. Antibiotic treatment must be possibly short. In the case of mild and moderate course infection, it is 7 to 10 days long, and with severe infections or due to specific location (e.g. ostitis, pachyleptomeningitis) the treatment lasts up to 21 days (Kosmala, et al., 2016).

7. Parental care for a preterm baby

The situations of mothers of preterm babies hospitalized at Neonatal ICUs is much more difficult than mothers of full term babies, who are strong and autonomously adapting to the world outside the uterus. Given the health condition of a preterm baby, who must stay put in an incubator, her mother does not have the chance for rooming-in with the baby, taking spontaneous care for her, or nursing the baby (Feeley, et al., 2011).

In order to cope with such situations, NICU medical team enables the parent's early contact with the preterm baby, mothers and fathers are allowed to visit the babies at the

NICU any time they can. Before the first contact with the baby, parents are instructed to wash their hands thoroughly and, depending on the baby's medical condition, wear a face mask (given the reduced immunity of the preterm baby).

A team of doctors, nurses and midwives help women in breastfeeding if the baby's medical condition is good. It is worth trying to breastfeed preterm babies with developed sucking reflex and a coordinated suck-swallow-breathe reflex formed, with lack of additional factors affecting breastfeeding.

It has been proved that a mother's breast milk reduces the risk of infections, NEC - Necrotising Enterocolitis and the incidence of ROP - Retinopathy of Prematurity. There are reports on positive influence of woman breast milk on neurological development of preterm babies. Unfortunately, given the lack or delayed first contact of the baby with the mother (preterm baby's stay in the ICU), or the absence of mother in the same room with the baby, breastfeeding trials or expressing milk may be difficult (Fontana, et al., 2018).

Kangaroo care (skin-to-skin contact) is a positive alternative helping the mother build adequate bond with the baby, and influence lactation positively. If a newborn's respiratory and circulatory systems are stable, the NICU team teaches the mother how to start the kangaroo care (KC) (Rozalska-Walaszek, et al., 2012). This is a method of holding a baby against a parent's bare chest and a blanket covering its back to prevent hypothermia. Such close contact with the baby benefits both the parent and the baby. Kangaroo care accelerates the process of parent's bonding with the baby and reduces the mother's level of stress, which also facilitates her process of puerperium. Kangaroo care influences the development and quicker recovery for preterm babies through, i.a., stress reduction, and minimizing problems with respiratory, immunological or circulatory systems. Preterm babies who experienced skin-to-skin contact colonize their skin with physiological flora from their parent, acquiring immunity in this way. A faster body weight gain is observed owing to easier access to natural food. Heating a newborn through a skin-to-skin contact with her parent facilitates bonding between the mother or father and their child. Shorter time of hospitalization is observed in the kangaroo children. Hearing a heartbeat of the parent, and feeling the warmth and scent and stroking of her mother or father, a newborn reacts to external stimuli better (Bajek, i in., 2014; Stodolak, Fuglewicz, 2012; Niemyjska-Matulka, 2019; Pilewska-Kozak, 2009).

Preterm babies are often over-sensitive and agitated, so the presence of the mother or father with the baby cannot be reduced to the role of an observer. Such limited contact often ends with a failure to soothe the baby. Such situations may evoke feelings of anxiety and helplessness in the parent. They may influence the perception of the child as a difficult and incomprehensible, disturbing proper relations.

Education of the parents and encouraging them to close contact with the baby allows for developing confidence in their own parental expertise and gradual independence in

terms of care for the baby. The time of the preterm baby's stay in hospital is also the time for the parents of acquiring skills in care for the baby, time of getting confidence in contact with the baby, learning kangaroo care, time of learning how to care for the preterm baby skin or change the baby's nappy, and for the mother it is the time of learning how to breast feed the baby. These skills efficiently lower the parents' stress level after the baby's return home (Rozalska-Walaszek, et al., 2012).

Summary

Prematurity is a challenge of a large part of society worldwide. Particularly disturbing statistics are observed in countries with very low economic status. On one hand, every year an increase in the number of preterm births is observed, and on the other owing to increasingly improving techniques and perinatal care we are witnessing an increase in survival of ever-decreasing birth weight.

An increasingly improving specialist neonatal care allows for an effective treatment and fostering development of preterm babies. It must be however stressed that remote consequences of prematurity, especially the ones linked to the nervous and respiratory systems, may influence the quality of life in further development. Prematurity is a challenge for parents. There is thus urgent need to promote educational classes (birth schools) for parents expecting their babies. Education of both parents on the risk factors of preterm birth, increased level of knowledge and awareness pertaining good physical and mental hygiene during pregnancy, keeping work-life balance in women's lives may contribute to lifestyle modification of a mother. The father's active presence in the period of expecting the baby may, in turn, benefit with his engagement in care for the baby after birth.

All efforts thus need to be made in order to prevent preterm births through health promotion, implementation of prevention methods not only during pregnancy, but also in the period before it. Interdisciplinary health care staff should make every effort in order to enable early "skin to skin" contact in order to help parents read subtle signals sent by the baby and make close contact which will allow the mother reduce her stress after birth, and develop parental competences in both parents.

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