Journal of Siberian Medical Sciences 1 (2017) 13–18

Journal of Siberian Medical Sciences

Journal homepage: http://jsms.ngmu.ru

Assessment of preventability of perinatal losses when using the Nordic-Baltic perinatal death classification

Nadeev A.P.[1, 2]*, Karpov M.A.[1, 2], Zhukova V.A.[1], Chernova T.G.[1]

[1]*Novosibirsk State Medical University*

[2]*Research Institute of Experimental and Clinical Medicine, Novosibirsk*

ARTICLE INFO

Article history:
Received 03.11.2016
Accepted 01.12.2016

Keywords:
Preventability of perinatal losses
The Nordic-Baltic perinatal death classification
Novosibirsk

ABSTRACT

We have studied the dynamics of preventability of perinatal losses according to data of Maternity Department of a large versatile hospital using the Nordic-Baltic perinatal death classification taking into account transition to criteria of the World Health Organization to the period from 2010 to 2015.
We investigated 649 protocols of post-mortem examination of fetus and the newborns died in Maternity Department of a large versatile hospital (Novosibirsk) during the period from 2010 to 2015.
Unavoidable losses for the probed period of observation have a clear tendency to decrease, that is connected with the improving of prenatal diagnosis of congenital malformations and termination of pregnancy before 22nd week. In 2012 after transition to criteria of the World Health Organization the indices of perinatal losses increased due to the III category, coming under conditionally preventable losses, and the categories integrating the death of the newborn infants (the VIII–XII categories) coming under preventable losses. After transition to criteria of the World Health Organization the share of preventable losses is reached more than 90%, that represents the considerable reserve for decreasing of a perinatal lethality.

Introduction

At the moment the problem of perinatal death rate is one of the urgent problem in public health of Russia. Level of perinatal death rate in the Russian Federation continues to remain high, constituting in 2011 7.2‰, in 2012 — 10‰, in 2013 — 9.6‰, in 2015 — 6.5‰ including in comparison with a similar indicator in the USA and a number of the European Union countries. So, in the USA the perinatal lethality in 2011 constituted 3.8‰ [1]. The establishment of the reasons of a failure during the perinatal period and search of ways of the prevention of perinatal loss are one of priority tasks of national public health.

Prognostic systems give the chance to determine the groups of gravidae with high risk of perinatal pathology and the level of this risk [2]. One of such systems is the Nordic-Baltic perinatal death classification (NBPDC) [2, 3], which was offered in 1996–1997 and allows to reveal preventable cases of perinatal death during pregnancy in childbearing or in the early neonatal period. NBPDC considers 5 parameters which are provided as priority:

1. Congenital malformations. There are death cases with the malformations taken place during the perinatal period regardless

*Corresponding author. Novosibirsk State Medical University, 52, Krasny Prospect, Novosibirsk, 630091, Russia.
E-mail address: nadeevngma@mail.ru

of time of death. In an absolute majority of these cases the perinatal losses in the presence of congenital malformations are non-preventable. An allowance of decrease in level of perinatal death rate with anomalies of development in most cases can become their identification when carrying out ultrasonic and/or genetic tests and termination of pregnancy in early period.

2. Death time in relation to childbearing. It is necessary the development of priorities in work of health authorities and improvements of quality of the help at stages of the antenatal and intranatal periods or during the early neonatal period. Besides, it is necessary to consider that death in later terms can be in some cases a consequence of inadequate quality of the help at the previous stages of administration to gravidae.

3. Presence or absence of intrauterine growth retardation for the antenatal of losses. It reflects in a certain measure efficiency of the antenatal help, because the identification of intrauterine growth retardation and the necessary control of development of pregnancy on time in these cases can promote prevention of death of a fetus due to increase in frequency of an elective delivery.

4. Gestational age (less than 28 weeks, 28–33 weeks, ≥34 weeks): this parameter is necessary for assessment of the level of the neonatal aid, especially for prematurely newborn infants.

5. Assessment of a condition of a newborn infant at the birth with Apgar score on the fifth minute of life. There are 13 categories in NBPDC. On the basis of these categories the perinatal losses are divided in three groups: impreventable (I category), arbitrarily preventable (II–V categories), preventable (VI–XIII categories).

The offered classification is based on 5 available parameters. It allows to compare perinatal losses in various countries, regions, territories, and to define potentially preventable outcomes [4]. So, with application of NBPDC the analysis of perinatal losses has been carried out in a number of countries of Europe: Sweden, Denmark, Latvia, and also Ukraine and Kyrgyzstan [5–7]. Due to the revealed distinctions it has allowed to recommend concrete measures for improvement of quality of the perinatal aid and to decrease perinatal mortality in these countries. In the Russian Federation NBPDC has been used in a number of territories, in particular, in Chelyabinsk region.

In 2012 in the territory of the Russian Federation perinatal criteria of the World Health Organization began to be used: the registration of babies starting from 22nd week of gestation when reaching 500 g of body weight. It assumed increase in perinatal losses in view of the frequent complications arising during the nursing of newborns with extremaly low body weight.

Aim of the Research

To study dynamics of preventability of perinatal losses from 2010 to 2015 in a large Maternity Department of a versatile hospital by using the Nordic-Baltic perinatal death classification taking into consideration transition to the criteria of the World Health Organisation.

Materials and Methods

As the materials served 649 protocols of pathoanatomical dissections of fetus and tubed newborn infants in Maternity Department of large of versatile hospital (Novosibirsk) during the period from 2010 to 2015. The data were obtained due to the analysis of protocols of pathoanatomical dissecting. They were distributed into 13 categories of NBPDC of perinatal losses [3].

Results and Discussion

In Maternity Department of large versatile hospital the number of childbearing has composed in 2010 — 2642, in 2011 — 1803, in 2012 — 3456, in 2013 — 3323, in 2014 — 3305, in 2015 — 3564. The indicator of perinatal mortality in Maternity Department was above the same indicator in the Novosibirsk region (Table 1). It was increased 1.4 times from 2010 to 2013. The indicator of perinatal mortality in the Novosibirsk region was smaller, than that in the Russian Federation and in the Siberian Federal District (Table 1). At the same time transition to criteria of World Health Organisation in 2012 was accompanied by increase in a perinatal lethality both in the Russian Federation (1.3 times) and in the Novosibirsk region (1.3 times). However next years the indicator of perinatal lethality tended to the steady decrease.

During assessment of risk of perinatal losses according to categories of NBPDC it was established that in 2010 the highest frequency of perinatal death was observed in the I category (coming under impreventable losses) (Tables 2 and 3). Body weight in this category composed 1033.78 ± 125.4 g with the gestation period of 26.5 ± 1.36 weeks. In 2010 among congenital malformations prevailed multiple congenital malformations, congenital malformations of heart and vessels [8, 9]. Besides, the considerable proportion of the dead fell on III, IV categories (cases of antenatal death of fetuses), which were come under conditionally preventable losses — 22.72 and 17.04% respectively. Dead during the prenatal period there were 76.92%. The structure of a prenatal mortality was composed prenatal asphyxia and hemolytic disease. Spontaneous childbearing were in 84.6% of

Table 1

Indicators of perinatal mortality in regions of the Russian Federation in 2010–2015 (‰)[3]

Subjects	2010	2011	2012	2013	2014	2015
Maternity home	6.4	8.3	7.0	9.0	7.56	7.29
Novosibirsk region	5.2	6.2	8.0	6.8	6.9	0
Siberian Federal District	7.1	6.7	9.6	9.3	8.29	0
Russian Federation	7.4	7.2	10.0	9.6	8.81	8.29

Table 2

Distribution of deadborn fetus and the died newborn infants on categories of the Nordic-Baltic perinatal death classification (‰) in 2010–2012

Category	Description of category	2010	2011	2012
I	The death of a fetus or the newborn infant with congenital malformations	42.04	19.35	15.38
II	Antenatal death of a fetus with intrauterine growth retardation without congenital malformations of ≥28 weeks	1.13	3.22	2.56
III	Antenatal death of a fetus without intrauterine growth retardation and without congenital malformations of ≥28 weeks	22.72	16.12	33.33
IV	Antenatal death of a fetus <28 weeks without congenital malformations	17.04	35.48	5.12
V	Antenatal death of a fetus without congenital malformations at multiple pregnancy	0.00	6.45	0.00
VI	Intranatal death of a fetus without congenital malformations of ≥28 weeks	3.40	1.61	7.69
VII	Intranatal death of a fetus without congenital malformations to 28 weeks	0.00	0.00	0.00
VIII	Death of the newborn infant. Childbearing in 28–33 weeks of pregnancy. Assessment on a Apgar score >6 points on the fifth minute. Without congenital malformations	0.00	0.00	5.12
IX	Death of the newborn infant. Childbearing in 28–33 weeks of pregnancy. Assessment on a Apgar score <7 points on the fifth minute. Without congenital malformations	1.13	3.22	0.00
X	Death of the newborn infant. Childbearing >33 weeks of pregnancy. Assessment on a Apgar score >6 points on the fifth minute. Without congenital malformations	1.13	3.22	2.56
XI	Death of the newborn infant. Childbearing >33 weeks of pregnancy. Assessment on a Apgar score <7 points on the fifth minute. Without congenital malformations	0.00	3.22	2.56
XII	Death of the newborn infant. Childbearing to 28 weeks of pregnancy, without congenital malformations	9.09	3.22	12.82
XIII	The not classified cases	2.72	4.83	12.82

cases, operation of caesarean section was in 15.4% of observations. In all cases pathology of an afterbirth was presented by a chronic placental failure, a decompensate form, in combination with inflammation (placentitis, membranitis, villositis with the outcome in a sclerosis). In 15.4% of cases there was an acute placental failure (premature abruption of placenta) in combination with a chronic placental insufficiency and an inflammation. The reasons of prenatal death are connected with a serious preeclampsia, a chronic endometrial infection, a decompressed chronic placental insufficiency, a thrombosis of vessels of a funiculus.

The share of the categories uniting the death of newborn infants (the VIII–XII categories) in 2010 was the smallest and constituted 11.35% (Table 4). The leading place was taken by a intrauterine infection, a generalized form, and congenital pneumonia (75% of all observations). In all observations the pathomorphological study of an afterbirth detected a placentitis, membranitis, a funiculitis in combination with a chronic placental failure. In one case it was found premature abruption of placenta.

However in 2011 the highest frequency of death in the perinatal period was referred to the IV category (antenatal death of a fetus before 28 weeks without congenital malformations), that is to conditionally preventable losses; the body weight of fetuses was 713.86 ± 56.5 g, and duration of gestation — 26.7 ± 2.3 weeks. The frequency of perinatal losses in the I category (congenital malformations) was decreased, but it remained appreciable, constituting 19.35%. During the antenatal period deadborn fetuses constituted 81.82%. The structure of prenatal mortality: antenatal asphyxia (70%), hemolitic illness, multiple congenital malformations. At a morphological examination of an afterbirth was determined a chronic placental failure, its decompensated form, in combination with an inflammation (placentitis, membranitis, villositis with the outcome in a sclerosis) in all cases. In one case it was an acute placental insufficiency (premature abruption of placenta) in

Table 3

Distribution of deadborn fetus and the died newborn infants on categories of the Nordic-Baltic perinatal death classification (%) in 2013–2015

Category	Description of category	2013	2014	2015
I	The death of a fetus or the newborn infant with congenital malformations	6.45	5.88	22.20
II	Antenatal death of a fetus with intrauterine growth retardation without congenital malformations of ≥28 weeks	6.45	41.18	18.52
III	Antenatal death of a fetus without intrauterine growth retardation and without congenital malformations of ≥28 weeks	41.93	11.76	22.20
IV	Antenatal death of a fetus <28 weeks without congenital malformations	3.22	0.00	7.41
V	Antenatal death of a fetus without congenital malformations at multiple pregnancy	6.45	0.00	3.70
VI	Intranatal death of a fetus without congenital malformations of ≥28 weeks	3.22	0.00	0.00
VII	Intranatal death of a fetus without congenital malformations to 28 weeks	0.00	0.00	0.00
VIII	Death of the newborn infant. Childbearing in 28–33 weeks of pregnancy. Assessment on a Apgar score >6 points on the fifth minute. Without congenital malformations	0.00	11.76	3.70
IX	Death of the newborn infant. Childbearing in 28–33 weeks of pregnancy. Assessment on a Apgar score <7 points on the fifth minute. Without congenital malformations	0.00	11.76	0.00
X	Death of the newborn infant. Childbearing >33 weeks of pregnancy. Assessment on a Apgar score >6 points on the fifth minute. Without congenital malformations	3.22	0.00	0.00
XI	Death of the newborn infant. Childbearing >33 weeks of pregnancy. Assessment on a Apgar score <7 points on the fifth minute. Without congenital malformations	9.67	5.88	3.70
XII	Death of the newborn infant. Childbearing to 28 weeks of pregnancy, without congenital malformations	12.90	11.76	18.52
XIII	The not classified cases	6.45	0.00	0.00

Table 4

Preventability of perinatal losses on the Nordic-Baltic perinatal death classification (%) in 2010–2015

Categories	2010	2011	2012	2013	2014	2015
I category: impreventable losses	42.04	19.35	15.38	6.45	5.88	22.2
II–V categories: conditionally preventable losses	40.89	61.27	41.01	58.05	52.96	51.83
VI–XIII categories: preventable losses	17.47	19.32	43.57	35.46	41.16	25.92
VIII–XII categories: death live-born	11.35	12.88	23.16	25.79	41.16	25.92

combination with chronic placental insufficiency and inflammation, clottage of vessels of funiculus (36.36%). In 36.36% of observations it was shown intrauterine growth retardation of fetus. The reasons of antenatal death are bound up with serious preeclampsia, chronic intrauterine infection, decompensated chronic placental insufficiency, clottage of vessels of funiculus.

The share of the categories uniting the death of newborn infants (the VIII–XII categories) in 2011 constituted 12.88% (Table 4). The leading place was taken by a intrauterine infection and a generalized form — 83.33%. In all cases the microscopic investigation of an afterbirth was conducted. It was observed signs of inflammatory lesion of afterbirth (placentitis, membranitis, a funiculitis) in combination with chronic placental insufficiency, and also abruption of placenta.

Results of the research of perinatal losses in 2012 showed that the leading place was taken by the III category (antenatal death of fetus without intrauterine growth retardation and without congenital malformations after 28 weeks) related to conditionally preventable losses. The body weight of the dead was 2048.46 ± 357.19 g, and the average gestation term was 33.7 ± 2.8 weeks. Dead during the antenatal period there were 77.78% of all cases of the dead birth. The structure of prenatal mortality was constituted by antenatal asphyxia (61.1%) and multiple congenital malformations (16.7%). Pathology of an afterbirth was presented by a chronic placental insufficiency, subcompensated and a decompensated form in combination with inflammation (placentitis, membranitis, villositis with the outcome in sclerosis). In 16.7% of cases it were acute placental inflammation in combination with a chronic placental insufficiency and inflammation. The clottage of vessels of a funiculus and also the knotted funiculus were found in 36.36% of cases. Thus, the reasons of antenatal death were bound up with serious preeclampsia, chronic intrauterine infection, decompensated chronic placental insufficiency, and clottage of vessels of funiculus.

At gestation term more than 28 weeks without intrauterine growth retardation and congenital malformations high frequency of the antenatal losses was a consequence of several of organizational factors, in particular, lack of continuity in observation over the gravida. Therefore the reasons of perinatal losses in this category should be considered potentially controlled.

The share of the categories uniting the death of newborn infants (the VIII–XII category) in 2012 was doubled, in comparison with 2011, and constituted 23.16%. This is caused by transition to new the criteria of nursing of low-weight newborn infants. These losses are bound up mainly with childbearing before 28 weeks, premature newborn infants with extremely low body weight. In the structure of perinatal mortality the leading place was taken by a intrauterine infection, the generalized form — 92.3%.

In 2013 the most often perinatal losses were fallen into the III category (the body weight constituted 2087.7 ± 276.86 g, gestation term 33.8 ± 3.51 weeks). In 2013 in comparison with 2012 the share of the perinatal losses belonging to the III category was increased by 1.3 times. 95.8% of all the cases of stillbirth were during the antenatal period. The structure of prenatal mortality was composed by the following nosological forms: antenatal asphyxia — of 87.5%, multiple congenital malformations — 4.2%, fetal syphilis — 4.2%. The reasons of antenatal death are bound up with severe preeclampsia, chronic intrauterine infection, subcompensated and decompensated chronic placental insufficiency (100%), clottage of vessels of a funiculus (36.6%).

On the second place there were indicators of the XII category (the death of the newborn infant who was born before 28 weeks of pregnancy) — 12.9% constituting to preventable perinatal lethality. At the same time the share of the categories uniting the death of newborn infants (the VIII—XII categories) in our research reached 25.79%. The structure of a perinatal lethality consisted of intrauterine infection, generalized form — 57.1%. In all cases the histological research revealed the signs of inflammatory lesion of afterbirth (placentitis, membranitis, funiculitis) in combination with chronic placental insufficiency. In one case it was noted the placental abruption. In this category the death rate depends on quality of medical care during gestational period, and on intensive administration to newborn infants.

Results of the study showed that in 2014 the most often perinatal losses were noted in II and III categories. In 2014 the share of the perinatal losses referred to the II category was 7 times higher than in 2013. 100% of all cases of dead birth were during antenatal period. The structure of antenatal mortality consisted of antenatal asphyxia. The reasons of antenatal death are bound up to placental abruption, severe preeclampsia, subcompensated and decompensated chronic placental insufficiency (100%), clottage of vessels of funiculus, and inflammatory changes.

The second place took indicators of the VIII–XII categories (the category uniting the death of the newborn — 41.6% coming under a preventable perinatal lethality). At the same time the share of the categories uniting the death of a newborn infants (the VIII–XII categories) exceeded twice the same indicator in 2013. The structure of perinatal lethality was constituted by intrauterine infection, generalized form. In all cases the histological research revealed signs of inflammatory lesion of afterbirth (placentitis, membranitis, funiculitis) in combination with chronic placental insufficiency. In one case it was noted placental abruption. Death rate in this category depends on quality of medical care during period, and on intensive administration to newborn infants.

In 2015 it was revealed that perinatal losses were met most often in I and III categories. In 2015 in comparison with 2014 the share of the perinatal losses come under I and III categories was 2 and 4 times higher respectively. The I category includes the impreventable perinatal losses bound up with congenital malformations. The structure of this category was constituted by congenital heart diseases (the general arterial trunk, defect of interventricular septum), multiple congenital malformations. 100% of all cases of dead birth were during antenatal period. The structure of a prenatal mortality included the following nosological forms: antenatal asphyxia — 51.8%, multiple congenital malformations — 22.2%. The reasons of antenatal death were bound up with severe preeclampsia, chronic intrauterine infection, subcompensated and decompensated chronic placental insufficiency (100%).

On the second place there were indicators from II and XII categories (antenatal death of fetus with intrauterine growth retardation after 28 weeks and death after 28 weeks of pregnancy) — 18.52% in both cases. They can be classified as the conditionally preventable and preventable perinatal lethality. In 2015 the share of the categories uniting the death of newborn infants (the VIII–XII categories) reached 25,92%. The structure of a perinatal lethality had included intrauterine infection, generalized form — 57.1%. In all cases the histologic research revealed the signs of inflammatory affection of afterbirth (placentitis, membranitis, funiculitis) in combination with chronic placentary insufficiency. Death rate in this category depends on quality of medical care during gestational period, and on intensive administration to newborn infants.

Indices of preventability of perinatal losses (Table 4) show increase in frequency of conditionally preventable and preventable losses, and decrease (6 times) of impreventable losses except of 2015. After 2012 the share of conditionally preventable and preventable losses reached more than 90% in total. The marked results associated by a number of factors. On the one hand the prenatal diagnostics of congenital malformation allows to reveal them in early stages and to terminate pregnancy before 22 weeks. On the other hand the nursing of infants with body weight more than 500 g is followed by higher frequency of the lethal outcomes connected to the great risk of perinatal complications in newborn infants with extremely low body weight (perinatal injury of the central nervous system, intrauterine infections, etc.) [9, 10]. According to the literature the share of the categories integrating the death of newborn infants (the VIII–XII categories) in Bishkek town reached 38%, and in Chelyabinsk region — 24.6%, while in our research — 25.8–41.6%.

In dynamics of observation after 2013 the unclassified perinatal losses were not revealed. Each lethal outcome in the perinatal period requires the detail analysis on the basis of clinical and morphological data for establishing the initial cause of death.

Conclusion

The increase in frequency of conditionally preventable and preventable losses led to growth of indices of a perinatal lethality after 2012 both in the Novosibirsk region and in the Russian Federation in total.

Application of the Nordic-Baltic perinatal death classification and the detail clinical morphological analysis of perinatal losses — taking into account pathology of mother, afterbirth, fetus and the newborn infant is a reserve for considerable decrease of perinatal losses.

References

1. Prince C.B., Young M.B., Sappenfield W., Parrish J.W.(2016). Investigating the decline of fetal and infant mortality rates in Alaska during 2010 and 2011. *Matern. Child Health J., 20(4),* 754-754. doi: 10.1007/s10995-015-1906-8.
2. Gordijn S.J., Korteweg F.J., Erwich J.J., Holm J.P., van Diem M.T., Bergman K.A., Timmer A. (2009). A multilayered approach for the analysis of perinatal mortality using different classification systems. *Eur. J. Obstet. Gynecol. Reprod. Biol., 144(2),* 99–104.
3. Borch-Cristensen H., Langhoff J., Larsen S., Lindberg B., Wennergren M. (1997). The Nordic/Baltic perinatal death classification. *Acta Obstet. Gynecol. Scand.,164,* 40–42.
4. Elamin S., Langhoff-Roos J., Boedker B., Ibrahim S.A., Ashmeig A.L., Lindmark G. (2003). Classification of perinatal death in a developing country. *Int. J. Gynaecol. Obstet., 80(3),* 327–333.
5. Janson M., Lazdane G. (1996). Perinatal problems and quality assurance in Latvia — a country in economic transition. *Acta Obstet. Gynecol. Scand., 75*, 820–825.
6. Janson M., Lindmark G., Langhoff-Roos J. (2005). Perinatal deaths and insufficient antenatal care in Latvia. *Acta Obstet. Gynecol. Scand., 80,* 1091–1095.
7. Mogilevkina I.A., Bodker B., Langhoff-Roos J., Orda A., Lindmark G. (2002). Using the Nordic-Baltic perinatal death classification to assess perinatal care in Ukraine. *Europ. Journ. Obstet. Gynecol. Reprod. Boil., 100*, 152–157.
8. Khoshnood Shariati M., Karimi Z., Rezaienejad M. (2015). Perinatal complications associated with preterm deliveries at 24 to 33 weeks and 6 days gestation (2011–2012): A hospital-based retrospective study. *Iran J. Reprod Med., 13(11),* 697–702.
9. Nadeev A.P., Karpov M.A., Zhukova V.A., Chernova T.G. (2014). Frequency and nosological forms of congenital malformations in structure of a lethality of foetus and newborn infants in Novosibirsk. *Surgery, Morphology, Lymphology, 11(21),* 111–113.
10. Marinkin I.O., Nadeev A.P., Shkurupy V.A. (2014). *A Liver and a placenta are in perinatal and the postnatal periods in case of pathology*. Novosibirsk: Science, 244.