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The Effect of Painless Labor Using Intrathecal Labor Analgesia on Newborn's Performance

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Abstract

The aim of the study is to examine the safety of painless labor using intrathecal labor analgesia in neonatal outcomes. A prospective cohort study of 69 neonates who were born in Bintaro Hospital and ArchaMedika Hospital, Indonesia was performed from February to August 2015. Parturient women chose whether they preferred painless labor using ILA to normal delivery without analgesia (Non ILA). Fentanyl 25ug, bupivacaine 2,5mg, and clonidine 0,045ug were administered as ILA. The neonates were immediately assessed to determine whether they were vigorous or not, followed by Apgar score measurement at one and five minutes after birth, and the changes of oxygen saturation from birth to first ten minutes of life. Results of this study show that a total of 69 neonates were included in the study, of whom 34 babies were born from mothers who received ILA as painless labor, while 35 babies were born from mothers without any analgesia. Maternal characteristics including age in addition to neonatal gender and vigorousity may vary but were homogenously distributed in both groups (ILA and non-ILA groups). Only one baby required resuscitation in vaginal delivery. Fisher's exact test showed no differences between the two groups in vigorousity.

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Further, no significant differences in Apgar score at first and fifth minute after delivery between both groups. Apgar score in ILA's babies was 10 in all neonates at 10th minute while the mean Apgar score of 9.94±0.34 in non ILA's babies. The oxygen saturation is similar while in ILA's babies have slightly higher non ILA's babies, even though all of the results do not have any significant p value. It concludes that Painless labor using intrathechalanalgaesia (ILA) is a safe choice for parturient women with low pain tolerance. Therefore, this will have no effect in neonatal outcomes.

Keywords: painless labor; intrathecal labor analgesia; newborn; oxygen saturation.

1. Introduction

Every woman wants to have a smooth and satisfactory delivery process. But the pain that is felt by the mother can be stressful, which can affect the performance of the newborn. Maternal tolerance to pain is often influential in the decision to grant analgesia during labor and is not uncommon even choose to do caesareansection so actual operation can be avoided. Presently painless labor is more commonly requested. There are several options of delivery by using analgesia to reduce pain during labor, including by spinal anesthesia such as epidural labor analgesia (ELA) and intrathecal labouranalgesia (ILA) [1]. Formerly, labor in many birth mothers affects fetal well-being, but with the development of knowledge, the provision of multiple drug combinations - analgesia medicine is called multimodality analgesia, formulated in such a way with the aim of relieving pain during labor, delivery process is expected to continue to run well with minimal side effects for the mother and fetus. The purpose of this study is to see the impact of labor using intrathecal labor analgesia on performance and oxygenation of newborns judged by vigorousity, Apgar score and oxygen saturation up to the age of the first 10 minutes of life.

2. Materials and Methods

This study is observational with design prospective cohort analysis. It was conducted at the hospital Premier BintaroTangerang and RSIA Archa Medica Bumi Serpong Damai Tangerang. This study was conducted from March to August, 2015. Subjects were babies born to mothers who were delivered painless labour using intrathecallabour analgesia (ILA) and newborns without ILA (Non ILA) in RS Premier Bintaro and RSB ArchaMedicaover the period of the study. Subjectswere taken by consecutive sampling until they reached the required number. Inclusion criteria: infants born from mothers 25-40 years of age, gestational age at term (37-42 weeks), weight 2500-4000 grams, parents agree for their babies to be included in the study and signed a letter of consent. Exclusion criteria: baby born from mother who received anesthesia other than ILA, infants delivered by caesarean section (SC), baby with major congenital abnormality that can affect vigorousity, breathing and O2 saturation such as congenital heart defects, diaphragmatic hernia, pulmonary hypoplasia, and others.

3. Results of Study

Subjects of this study are34 babies which were delivered from mothers with painless labourusing ILA (49.28%) and 35 infants born from mothers without ILA (Non ILA) (52.17%). Table 1 shows that the maternal characteristics (maternal age, parity, maternal, infant birth weight, gender, premature rupture of membranes

(PROM), the length of premature rupture of the membrane (PROM) and duration of labor, distributed equally in both groups (p> 0.05). Thus, the two study groups can be considered homogeneous by maternal age, maternal parity, gender of the baby, birth weight, premature rupture of membrane (PROM),the length of premature rupture of the membrane and duration of labor.

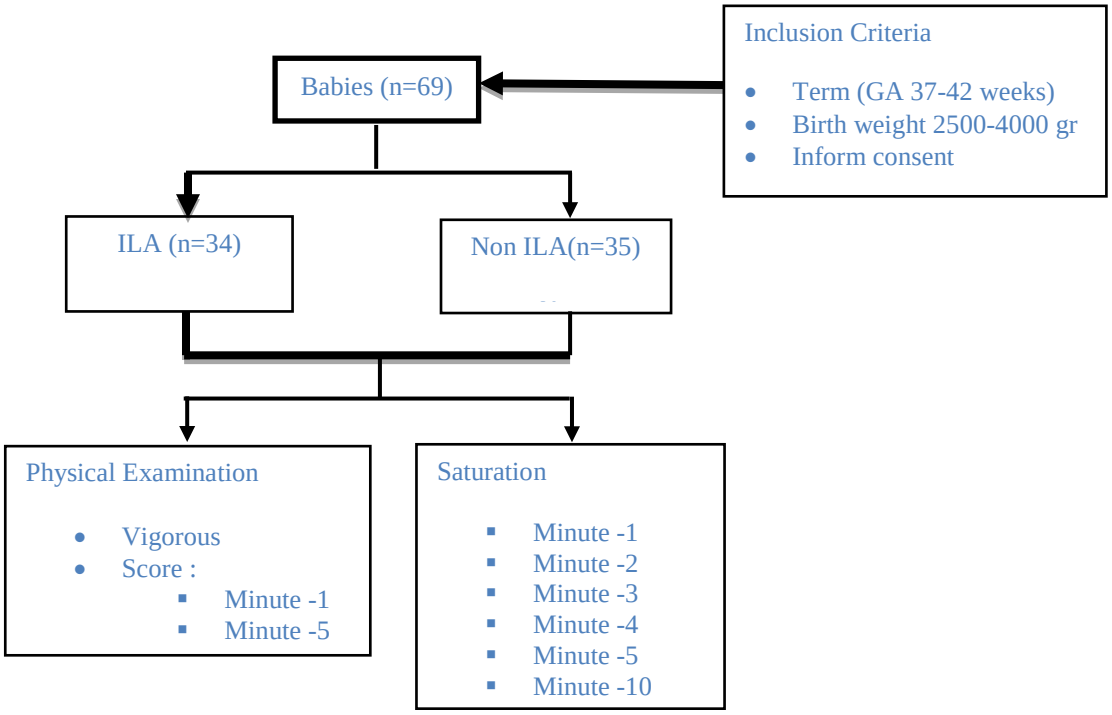

Figure 1: Process of Research

ILA Influence the vigorousity of the newborn baby

Only one baby was born not vigorous is in the labor group Non ILA. While the ILA groups all babies were born healthy. Fisher's Exact test results of a test that analyzes differences in the distribution of babies between the two groups showed p = 1.000. There were no statically differences in the distribution of babies born healthy. Table 3. There were no significant differences (p> 0.05) infant Apgar scores, both on1-minute and 5-minute postnatal between the two labor groups. The mean Apgar score all the babies were 8.

ILA Influence on Oxygen Saturation Changes

ILA impact assessment of the changes in oxygen saturation are conducted regularly from the 1st, 2nd, 3rd, 4th, 5th, and 10th minutes shown by Table 4.

Table 1: Distribution of maternal characteristics, mother's age, parity, gender, birth weight, premature rupture of membranes (PROM), the length of premature rupture, and duration of labor

Variables		Group of subject		P
		ILA	NON ILA	
Mother's age (yr);	<35 (23-34)≥35(35-40)	24 (50,0%)	24 (50,0%)	1,000*
Min-Max		10 (47,6%)	11(52.4%)	
Parity	Primipara	16 (47,06%)	10 (28,57%)	0,756*
	Multipara	18 (52,94%)	25 (71,43%)	
Gender	male	14 (41,18%)	19 (54,29%)	0,396*
	female	20 (58,82%)	16 (45,71%)	
Birth weight (gram)	Mean(SD)	3245.3 (328.2)	3197 (392.5)	0.588**
	Min-Max	2600-3890	2540-3970	
Premature Rupture of the membrane (PROM)	Yes	3(42,9%)	4(57,1%)	0,517***
	No	31(50,0%)	31(50,0%)	
Length of PROM(hour)				
	Mean(SD)	11,67(0,58)	9,38(3,20)	0,285**
	Min-Max	11-12	7-14	
Duration of labour (minute)	Mean(SD)	121,1(33,4)	131,5 (43,7)	0,272**
	Min-Max	44-180	40-205	

Chi-square test; **Independent t test;*Fisher's Exact test*

Table 2: Comparison the vigorousity of babies between the two groups of subject (ILA and Non ILA)

Variable		Group		p*
		ILA	Without ILA	
Vigorousity	Yes	34 (100,0%)	34 (97,14%)	1,000
	No	0 (0,0%)	1 (2,86%)	

*Fisher's Exact test

Table 3: Comparison of the Apgar score between the two groups of subject (ILA and Non ILA)

		Group		
Apgar Score		**ILA(n=34)**	**Non ILA (n=35)**	**p***
Minute -1	Mean (SD)	8,88 (0.33)	8,94 (0.34)	0,1731
Minute -5		10,0 (0,0)	9.94 (0.34)	0,324

**Mann-Whitney U test*

Table 4: Comparison oxygen saturation between the two groups of subject (ILA and Non ILA)

	Mean (SD) Oxygen saturation (%)		
	ILA (n=34)	Non ILA (n=35)	
Observation			P
Minute -1	71.4 (11.6)	67.5 (15.9)	0.247*
Minute -2	77.6 (10.8)	73.9 (12.6)	0.195*
Minute -3	82.03 (9.9)	78.9 (12.3)	0.258*
Minute -4	85.44 (9,0)	82.5 (10.9)	0.310**
Minute -5	88.5 (7.5)	86.9 (8.8)	0.551**
Minute -10	93.9 (3.7)	90. 7 (7.82)	0.090**

**Independent t test* ***Mann Whitney U test*

Table 4 showed that the oxygen saturation is gradually increased from the first minute to the tenth minute after birth. In the minute-1 after birth the average (mean) of oxygen saturation is only about 71.4% within the group of infants with ILA, while the group Non ILA group was slightly lower (67.5%), but it is not significant (p> 0, 05). In the minute-2 and subsequent oxygen saturation increased gradually and the trend remains higher in the group of ILA.

4. Discussion

Babies will experience a variety of changes during labour, both physically and biochemically. The period of adaptation to life from intrauterine to extra uterine is called the transition period. This period lasted up to 1 month or more after birth for several body systems. The main transition is on the respiratory and circulatory systems. Immediately after birth, the baby must adapt from a state highly dependent to become independent physiologically. After birth the baby should receive oxygen through his own respiratory system, and should also drink to get the nutrients to maintain sufficient levels of sugar, regulate body temperature, and resist disease.

One factor that can play a role in the stimulation of the first breath of newborns is hypoxic condition at the end

of labor. During normal labour, the external environment will stimulate the respiratory center in the brain. There is pressure on the chest cavity due to compression of the lungs during vaginal delivery stimulate the entry of air into the lungs mechanically. The interaction between the respiratory system, cardiovascular and central nervous system causing regular breathing and ongoing heart rate. Newborns will make efforts at taking first their breath to remove fluid in the lungs as well as develop lung alveolar tissue. Vaginal delivery process allows the baby to experience a period of adaptation in advance. While passing through the birth canal, the baby's chest is compressed which causes the discharge of the lungs which also inflicts pain causing cortisol expenditure that serves to prepare the baby's body organs to be better prepared upon birth.

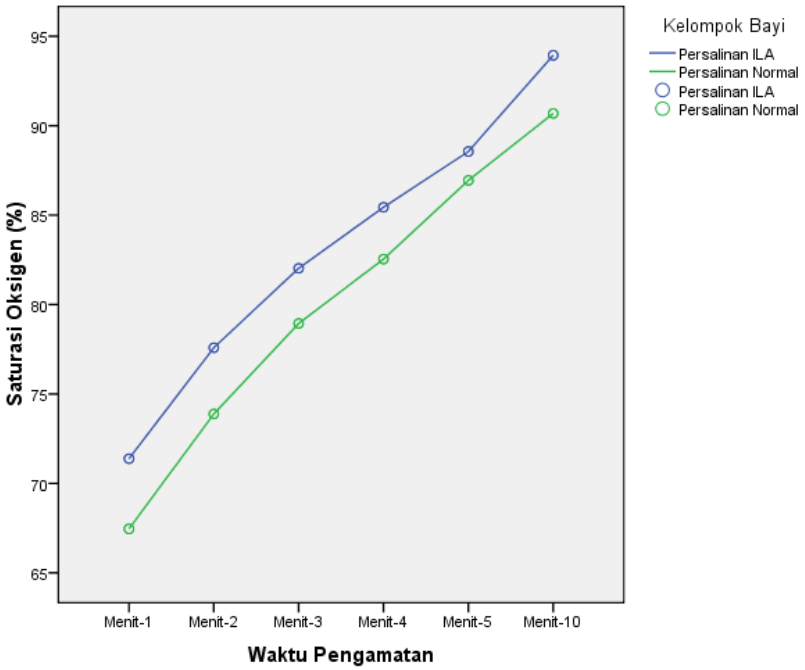

Figure 2: A line graph of oxygen saturation changes during the first ten minutes of life

Figure 2 showed that the average oxygen saturation of the newborns in both groups increased from one minute to ten minutes, and the mean oxygen saturation during labor ILA was slightly higher at each time of observation than the baby's oxygen saturation in the group of Non ILA.

Labor pain would initiate the neuroendocrine stress response that has a large physiological effect on the fetus. This can be seen in chart 1 showing the potential adverse consequences due to the pain that is not resolved. As a result of hyperventilation, stress-related hormone secretion and increased oxygen consumption can be prevented or eliminated by the central neuraxial blockade such as epidural or spinal anesthesia [2]. Stress also can trigger a hormonal response such as increased secretion of epinephrine, norepinephrine [3]. Exposure to stress during early prenatal or during birth would alter the hypothalamic-pituitary adrenal axis and will affect the development of babies later in life [4]. Will the reduction of labor pain affect the performance of the newborn?

The research subjects are grouped into babies who were born with painless labour using ILA labor compared to babies who were born without ILA (Non ILA). The ILA group are babies who was born from vaginal delivery

mothers using pain relief anesthetic bupivacaine and clonidine combination of fentanyl, whereas the group of Non ILA are babies born to women giving birth vaginally and did not use any anesthetic medication to reduce pain.

Characteristics of the subjects viewed from the mother's age either below 35 years of age or above 35 years of age. This division is based on the high risks involved in pregnancy and childbirth at 35 years. Total parity of the mother is also distinguished as primipara and multipara. In multiparas birth canal has been formed so that the delivery process runs more easily and smooth compared to primiparas. Primigravidas also showed severe stress levels more than multigravida, [5,6]. Premature rupture of membranes (PROM) and the length of PROM are seen as a risk factor for neonatal infection that can affect the performance of neonatal and lactate levels.

Maternal characteristics (age and parity)are varied but evenly distributed in both groups ($p > 0.05$), neither the baby's gender and vigorousity. Thus, both groups can be considered homogeneous labor based on age, the gender of the baby, and also in birth weight. There were no significant differences in birth weight were significant ($p > 0.05$) between the two groups. In addition premature rupture of membranes rupture and the duration of labour also showed no significant differences between the two groups.

Performance Parameters Neonates

1. Vigorousity and Apgar score

All babies from birth are more vigorous in the ILA group (100%). While in the Without-ILA group almost all babies born are vigorous (98.55%) except for one infant. This baby immediately received first step of resuscitation of drying, suction mucus, tactile stimuli and oxygen low flow nasal canule. After the resuscitation the baby became to be vigorous and normal. With Fisher's Exact test to distribution analyze the differences between the two groups of vigorous babies apparently showing $p = 1.000$. Thus there is no significant difference in terms of vigorous babies, among babies born from with-ILA compared to without-ILA labor.

Comparison of Apgar score in both groups is indicated by table 3. Apgar score in the two groups in this study were almost the same value, as seen in the first minute of the baby ILA group had an Apgar score 8.88 ± 0:33 and infants from Non ILA group had a mean Apgar score 8.94 ± 0:34. All babies from ILA labor groups reached a value of 10 at the age of 10 minutes, while the average mean of Apgar score babies from without ILA group is 9.94 ± 0:34. There were no significant differences in these two groups.

It can be concluded that infants delivered from painless labour using ILA had an Apgar score as well as babies who are delivered without ILA. This shows that despite the observations of this study found the existence of fetal bradycardia resulting in 6-7 minutes after the administration of a combination of fentanyl analgesia, bupivacaine and clonidine as a pain reliever in the mother, but after the mother tilted to the left and given oxygen at minute 15 was getting better. Fetal bradycardia occurrence is found in 1 to 3 times in the ILA compared to non ILA group. However, at the time of birth is not found Apgar score differently. These results are consistent with research by Bonnardot et al have shown that administration of an effective intrathecal morphine and is an alternative option for the treatment of pain in labor. Although the data show that the

decelerations of the fetal heart rhythm at 10 to 15 minutes after administration of intrathecal morphine [7], and has no effect on vigorousity and Apgar score

2. Oxygen Saturation

Oxygen is essential for humans even intrauterine or extrauterine. At intrauterine the fetus obtains oxygen from the mother's blood diffusion with fetal blood passing through the membrane of the placenta. At birth, the baby will breathe using his own lungs to deliver oxygen to the blood. Cries and deep breaths will help push fluid out of her airway. To determine whether the normal oxygenation of the baby or not, it would require examination oxymeter oxygen saturation. Oxymeter measures the color of blood flowing through the capillaries of the skin and comparing it with various colors of blood oxygen levels were already known. Oxymeter will analyze and record in color monitor with a value between 0% (no oxygen) and 100% (full oxygen saturation). Oxymeter is considered the most accurate when SpO2 is between 60% and 90% [8,9].

Normally, a term baby will take about 10 minutes to reach the levels of oxygen saturation of 90% or more. Neonatal resuscitation guidelines of the 6th edition in 2011 by the American Academy of Pediatrics, the target oxygen saturation product on 1stminute after birth at around 60-65%, minute 2 ranges from 65-70%, minute 3 ranging from 70-75%, then minute 4 range 75-80%, minute 5 ranging from 80-85% and minute 10 and will reach 85-95% [10,11]. Newborns will require a transition period after birth of about 10 minutes to improve oxygen saturation (SpO2) of 60% in utero to 90%, [12,13]. This indicates that infants with vaginal delivery would more quickly each the levels of SpO2 ≥ 90% compared to the children with caesarean section [13].

The results of this study are shown in Table 6, and imply that the oxygen saturation gradually increases from minute to the next minute following birth. In minute-1 after birth the average (mean) of oxygen saturation is only about 71.4% of the group of infants with painless labour (ILA).While with the infants born from the group of Non ILA it was slightly lower (67.5%), but not significant (p> 0, 05). In minute-2 and subsequent minutes the oxygen saturation increased gradually with the trend remaining higher in the group of infants from ILA labor.

Figure 1 shows the average oxygen saturation in babies from both groups to be constantly increasing, and indicates that accelerated increase oxygen saturation in both groups are comparable. The mean oxygen saturation is slightly higher at each time of observation in ILA group babies than within the non ILA group, but this condition was not statistically significant. It can be said that the oxygen saturation in infants from ILA is as good, even slightly higher, than in infants from the non ILA group. This illustrates that the oxygenation in infants from painless labour using ILA as well as childbirth without ILA has a tendency toward even higher oxygen levels. This condition is likely due to the stress of the mother during the birth process being controlled. Mothers with painless labour using ILA are more calm and not agitated, and experience minimal pain of labour so that oxygenation to the fetus is also more smooth and that mothers become more cooperative when through the process stage 2, thus the process of delivering the baby becomes more smooth. Research supporting this condition includes Kokovic et al who reported that significantly increased neonatal oxygenation in neonates with caesarean section using the techniques of spinal anesthesia compared to general anesthesia [14]. In vaginal delivery, Konefa et al showed that there was no difference in oxygen saturation and pulse per minute, which is

significant in the first days of life among infants with vaginal delivery using remifentanil analgesia and those who do not use any analgesia [15].

4. Conclusion

Based on the results of this research and discussion that has been described, it is concluded that babies born from painless labour using ILA have the same performance as good as that of babies born without ILA, based upon the vigorousity. Apgar score and oxygen saturation. Therefore, painless labour using ILA can be a safe option for women who have a low pain sensitivity. There should be no doubt by obstetricians and pediatricians against the risk of babies born from painless labour using ILA.

References

[1] FG, Cunningham. 2001. Maternal adaptation in pregnancy (McGraw Hill New York).

[2] J, Littleford. 2005. Avery's Neonatology - Pathophysiology & Management of the Newborn (Lippincott Williams &Wilkins Philadelphia).

[3] Banks, B. A., N. Stouffer, A. Cnaan, Y. Ning, J. D. Merrill, R. A. Ballard, P. L. Ballard, and Collaborators North American Thyrotropin-Releasing Hormone Trial. 2001. 'Association of plasma cortisol and chronic lung disease in preterm infants', Pediatrics, 107: 494-8.

[4] Ochedalski, T., and A. Lachowicz. 2004. 'Maternal and fetal hypothalamo-pituitary-adrenal axis: different response depends upon the mode of parturition', NeuroEndocrinolLett, 25: 278-82.

[5] Mears, K., F. McAuliffe, H. Grimes, and J. J. Morrison. 2004. 'Fetal cortisol in relation to labour, intrapartum events and mode of delivery', J ObstetGynaecol, 24: 129-32.

[6] Smith, A. K., D. J. Newport, M. P. Ashe, P. A. Brennan, J. L. Laprairie, M. Calamaras, C. B. Nemeroff, J. C. Ritchie, J. F. Cubells, and Z. N. Stowe. 2011. 'Predictors of neonatal hypothalamic-pituitary-adrenal axis activity at delivery', ClinEndocrinol (Oxf), 75: 90-5.

[7] Bonnardot, J. P., M. Maillet, J. C. Colau, F. Millot, and P. Deligne. 1982. 'Maternal and fetal concentration of morphine after intrathecal administration during labour', Br J Anaesth, 54: 487-9.

[8] Phillipos, E., A. L. Solevag, G. Pichler, K. Aziz, S. van Os, M. O'Reilly, P. Y. Cheung, and G. M. Schmolzer. 2016. 'Heart Rate Assessment Immediately after Birth', Neonatology, 109: 130-8.

[9] Sivarajan, V. B., and D. Bohn. 2011. 'Monitoring of standard hemodynamic parameters: heart rate, systemic blood pressure, atrial pressure, pulse oximetry, and end-tidal CO2', PediatrCrit Care Med, 12: S2-S11.

[10] Gajdanowicz, P., E. Michard, M. Sandmann, M. Rocha, L. G. Correa, S. J. Ramirez-Aguilar, J. L. Gomez-Porras, W. Gonzalez, J. B. Thibaud, J. T. van Dongen, and I. Dreyer. 2011. 'Potassium (K+) gradients serve as a

mobile energy source in plant vascular tissues', ProcNatlAcadSci U S A, 108: 864-9.

[11] Wiswell TE. 2011. Resuscitation in the delivery room: lung protection from the first breath., Sep;56(9):1360-7; discussion 1367-8. doi: 10.4187/respcare.01433. Review.

[12] Lu, Y. C., C. C. Wang, C. M. Lee, K. S. Hwang, Y. M. Hua, Y. S. Yuh, Y. L. Chiu, W. F. Hsu, Y. L. Chou, S. W. Huang, Y. J. Lee, and H. C. Fan. 2014. 'Reevaluating reference ranges of oxygen saturation for healthy full-term neonates using pulse oximetry', PediatrNeonatol, 55: 459-65.

[13] Suwattanaphim, S., S. Yodavuhd, and S. Puangsa-art. 2015. 'Time Duration of Oxygen Adaptation Immediately after Birth; Monitoring by Pulse Oximeter in Perinatal Period of the Infants at CharoenkrungPracharak Hospital', J Med Assoc Thai, 98: 656-63.

[14] Kokovic, J. T., N. Radunovic, D. Filimonovic, L. Nejkovic, L. Arsenijevic, L. J. Mirkovic, and V. Kokovic. 2015. 'Maternal hemodynamic influence on uteroplacental oxygen distribution during cesarean section', ClinExpObstetGynecol, 42: 610-3.

[15] Koneva, OIu. 2013. '[Interpopulationdefferences in parameters of hemocyte DNA-comets of snail Lymnaeastagnalis from regions with the different environmental load]', Tsitologia, 55: 475-81.