

# Frequency of Newborn Resuscitations and Accompanying Risk Factors: A Prospective Study From an Obstetrics Hospital in Izmir

## *Yenidođanlarda Resüsitasyon Sıklığı ve Etki Eden Risk Faktörleri: İzmir'deki Bir Doğum Hastanesinden Prospektif Bir Çalışma*

Aycan Ünalp\*

Münire Ergüneş\*\*

\* Dr. Behçet Uz Çocuk Hastanesi, İzmir

\*\* Ekrem Hayri Üstündađ Kadın Hastalıkları ve Doğum Hastanesi, İzmir

### SUMMARY

**Aim:** Neonatal mortality rate, which could possibly be reduced by employment of several approved and low-cost treatment approaches, has not been changed in the past several years. Besides, this rate has been increased in some countries. The objectives of this study are to find out the frequency of resuscitations in the delivery room and to investigate the accompanying risk factors.

**Methods:** All infants born in Ekrem Hayri Üstündađ Obstetrics and Gynecology Hospital were investigated in terms of treatment approaches and the need for resuscitation according to risk factors in the delivery room and clinical follow. Noninvasive (via mask) positive-pressure ventilation (NPPV), endotracheal intubation and intravenous drug administration were accepted as resuscitation procedures.

**Results:** Resuscitation was applied to 1.7% (n=31) of 1845 newborns, 383 of whom were prematures. Tactile stimulation and aspiration were adequate treatments in 1690 (91.6%) cases, while NPPV was found to be the most commonly applied method within the resuscitation procedures (45.1%). The frequency of infants having risk factors were 56% (n=1041) and 87% (n=43) in all newborns and resuscitated newborns, respectively. A significant relation between the application of resuscitation and the presence of prematurity, fetal abnormality or multiple risk factors were determined (p<0.05). Eleven (35.5%) of the resuscitated infants died.

**Conclusions:** We conclude that tactile stimulation and aspiration were the most common procedures to stimulate respiration in the delivery room, while the frequency of requirement for resuscitation among all deliveries was 1.7%, it was found increased with the presence of accompanying risk factors.

**Key Words:** Neonatal mortality, resuscitation, risk factors

### ÖZET

**Amaç:** Etkinliği kanıtlanmış düşük maliyetli pek çok girişimle azaltılması olası neonatal mortalite hızlarında son yıllarda hemen hiçbir deđişiklik olmamıştır. Kaldı ki bazı ülkelerde yenidođan ölüm hızında artış bildirilmektedir. Bu çalışmada doğum odasında resüsitasyon uygulama sıklığı ve resüsitasyon için eşlik eden risk faktörlerinin araştırılması amaçlanmıştır.

**Yöntem:** Ekrem Hayri Üstündađ Kadın Hastalıkları ve Doğum Evi'nde yenidođanlar, doğum odasında yapılan müdahale, resüsitasyon işlemi; eşlik eden risk faktörleri ve klinik izlem yönünden araştırıldı. Maske ile pozitif

basınçlı ventilasyon (MPBV), endotrakeal tüp takılması ve damaryolu açılarak ilaçlı müdahale uygulamaları resüsitasyon işlemi olarak kabul edildi.

**Bulgular:** Doğumhanede doğan 383' ü prematüre toplam 1845 yenidoğanın %1.7 (n=31)'sine resüsitasyon işlemi uygulandı. Taktile uyarı ve aspirasyon olguların 1690 (%91.6)'ında yeterli tedaviyi oluştururken, resüsite olanlar içinde MPBV %45.1 (n=14) ile en sık uygulanan resüsitasyon işlemi oldu. Tüm yenidoğanların %56 (n=1041)'sında, resüsite edilen yenidoğanların %87 (n=43)'sinde eşlik eden risk faktörleri saptandı. Prematürite, fetal anomali ve multipl risk faktörü varlığı ile resüsitasyon uygulanması arasında anlamlı ilişki tespit edildi ( $p<0.05$ ). Resüsite edilen infantlardan 11 (%35.5)'i kaybedildi.

**Sonuç:** Taktile uyarı ve aspirasyonun doğum odasında solunumu uyarıcı en önemli uygulama olduğu, tüm doğumlarda resüsitasyon gereksiniminin düşük olduğu ancak risk faktörlerinin eşlik etmesi durumunda resüsitasyon gereksiniminin önemli düzeyde arttığı görüldü.

**Anahtar Kelimeler:** Neonatal mortalite, resüsitasyon, risk faktörleri

Başvuru tarihi: 27.07.2006

**İzmir Tepecik Hast Derg 2006;16(3):123-129**

Despite the improvement in many health problems all over the world during the past 15 years, the death rates of mothers and newborns still remain unchanged. A decision to reduce the death rate of children under 5 years of age by two-thirds was made in United Nations Millennium Meeting on September, 2001. This goal can only be achieved in case the death rate of newborns is reduced by 50%, since 40% of the death rate of children under 5 years of age is caused by newborn deaths. Achieving this millennium goal requires low-cost attempts (1).

More than 5 million neonatal deaths occur worldwide each year (1,2). It has been estimated that birth asphyxia accounts for 19% of these deaths, suggesting that the outcome might be improved for more than 1 million infants per year through implementation of simple resuscitative techniques (2). Although the need for resuscitation of the newly born infant often can be predicted, such circumstances may arise suddenly and may occur in facilities that do not routinely provide neonatal intensive care. Thus, it is essential that the knowledge and skills required for resuscitation be taught to all providers of neonatal care.

Two-thirds of newborn deaths occur in the first week of life, two-thirds of which occur in the first 24 hours. An audit of live born infants who died in the first week of life in the public service could help in planning strategies to reduce the early neonatal mortality rate.

Intrapartum hypoxia and preterm delivery are the main causes of death. Common modifiable factors included inadequate staffing and facilities, poor care in labour, poor neonatal resuscitation and basic care, and difficulties for patients in accessing health care (3).

The aim of this study was to investigate the frequency and accompanying risk factors for resuscitations in newborns.

## PATIENTS AND METHODS

The study was conducted in Ekrem Hayri Ustundag Obstetrics and Gynecology Hospital in Izmir, Turkey. All infants born between 01 November 2004 and 31 January 2005 were investigated prospectively in terms of delivery methods, accompanying obstetric risk factors and clinical follow-up.

NPPV, endotracheal intubation and intravenous drug administration were referred to as resuscitation procedures while tactile stimulation and aspiration which are initial steps of resuscitation were excluded from resuscitation criteria. The decision and application of resuscitation, and follow-up of newborns were made by pediatricians. The existence of risk factors such as prematurity, postmaturity, IUGR (intrauterin growth retardation), fetal distress, prolonged or difficult labour, fetal abnormality, multiple pregnancy, umbilical cord tangled around the neck, placenta previa, ablatio placentae, preeclampsia-eclampsia, meconium-stained amniotic fluid and/or MAS

(meconium aspiration syndrome), oligo-polyhydramnios, gestational diabetes and Rh incompatibility were recorded.

Depending on their clinical conditions, the newborns were followed-up either "by-their-mother" or "in-the-incubator" 1-8 hours. In case of respiratory distress, seizure or other life-threatening complications newborns were transferred to newborn and prematurity clinic of our hospital, or neonatal intensive care units in other regional reference centers.

Infants who needed to be resuscitated and others were compared regarding to gestational age, birth weight, delivery type, risk factors, APGAR score and early clinical follow-up. Statistical analyses were performed using  $\chi^2$  test within SPSS 12.0 software. P value less than 0.05 was considered to be statistically significant

## RESULTS

Premature newborns consisted 20.7% of the total number of newborns (n=1845). Nine hundred and nineteen (49.8%) of the cases were girls. Among all newborns 701 (37.9%) were born to caesarean sections (C/S) and 1041 (56.4%) were born after a high-risk pregnancy and 31 (1.7%) infants received resuscitation. Table 1 reviews the characteristics of the newborns in the group.

Only tactile stimulation and aspiration were applied in 1690 (91.6%) of the cases, NPPV was required in 14 (45.1%) of the 31 resuscitated newborns (Table 2).

Total risk factors were determined in 1041 (56.4%) cases and 254 (13.7%) infants had multiple risk factors. Prematurity (19.6%), postmaturity (14.4%), chronic diseases of the mother (6.7%), meconium-stained amniotic fluid and/or MAS (6.7%), and Rh incompatibility (5.6%) were found as the most common risk factors in total group (Table 3).

A significant relationship between the need for of resuscitation and the presence of prematurity, fetal abnormality or multiple risk factors was determined (p<0.05) (Table 4).

**Table 1.** Characteristics of the newborns in the study group.

	n	%
Premature live birth	383	20.7
Female gender	919	49.8
Vaginal delivery	1097	59.4
Caesarean section (C/S)	701	37.9
Vacuum extraction	47	2.5
Resuscitated infants	31	1.7
Intermediate care	176	9.5
Intensive care	101	5.4
Exitus	46	2.4
Total	1845	100

**Table 2.** Characteristics of the resuscitated and nonresuscitated newborns.

	n	%
Nonresuscitated newborns	1814	98.3
Noninvasive (by mask) PPV	14	0.76
Intubation/cardiac massage	13	0.70
Drug administration	4	0.22
Total	1845	100

**Table 3.** Distribution of accompanying risk factors within the newborns.

	n	%
Prematurity	205	11.1
Postmaturity	150	8.1
Chronic illness of mother	70	3.8
MAS*	70	3.8
Rh incompatibility	59	3.2
PPROM**	39	2.1
Oligo-polyhydramnios	27	1.5
Difficult labour	24	1.3
IUGR***	13	0.7
Other	384	20.8
Total	1041	56.4

\* MAS : Meconium aspiration syndrome (total of meconium-stained amniotic fluid and newborns with MAS)

\*\* PPROM: Preterm premature rupture of membranes

\*\*\* IUGR : Intrauterine growth retardation

Resuscitation was applied to 2.9% (n=21) and 6.7% (n=22) of the newborns who had single and multiple risk factors, respectively. A significantly higher rate in multiple-risk group was found when a comparison was made between the single and multiple-risk groups in terms of the rate of resuscitation requirement (p=0.004).

**Table 4.** Perinatal risk factors in resuscitated and non-resuscitated cases.

Risk factors	Resuscitated (n=31)	Non-resuscitated (n=1814)	P
Prematurity	10	195	0.000
Difficult labour	2	22	0.082
Fetal abnormality	1	1	0.000
Kordon dolanması	1	10	0.178
PPROM**	1	38	0.992
MAS*	3	55	0.228
Oligo-polyhydramnios	2	25	0.121
Chronic illness of mother	1	69	0.545
Multiple risk factors	22	305	0.000

\* MAS : Meconium aspiration syndrome (sum of infants born with meconium-stained amniotic fluid and newborns with MAS)

\*\* PPRM : Preterm premature rupture of membranes

There was a statistically significant relation between the need for resuscitation and prematurity, low birth weight and the presence of accompanying risk factors (p=0.000).

Five minutes APGAR scores were 8-10, 4-7 and 1-3 in 44.8% (n=22), 32.6% (n=16) and 22.4% (n=11) of the cases, respectively. Significantly higher number of resuscitations were required in infants who had an APGAR score of 1-3 at five minutes after delivery (p=0.000).

Three (6.1%) cases among all resuscitated newborns were allowed to stay nearby their mothers after receiving solely NPPV, while 13 (26.5%) cases required incubator care, and 10 (20.4%) were hospitalized and 5 (16.1%) were transferred to neonatal intensive care units in other regional reference centers. Of the 1814 newborns who didn't receive resuscitation, 1642 (90.5%) were cared by their mothers, 163 (9%) were followed in incubators up to 8 hours and 9 (0.5%) were hospitalized. There was a statistically significant difference between resuscitated and unresuscitated newborns regarding requirement for intermediate and intensive care (p=0.000).

A total number of 41 (2.2%) deaths were recorded. Thirty (73.1%) infants were stillborn; 7 (17%) cases died in the delivery room and 4 (9.4%) newborns died at the intensive care unit. Eleven (35.5%) of the resuscitated infants were died. Eight (19.5%) newborns who died

had Apgar scores of 1-3 and 11 (26.8%) newborns had multiple obstetric risk factors.

## DISCUSSION

The health of a society is the principle factor that determines the developmental state of that society, basic measure of which is the health conditions of mothers and children. Data collected during the recent years showed that every year approximately 10 million children die before they reach 5 years of age. It is estimated that four million infants die during the first month of life (4). The vast majority of these neonatal deaths occur in poor countries where standards of both maternal and newborn care are low. One of the Millenium Development Goals is to reduce the number of childhood deaths under the age of five years by two thirds from 95 per 1000 to 31 per 1000 by 2015 (5).

In our country, annually 50.000 children die before they are 1 year old (6). A total of 135 mothers and children die every single day, and a baby dies every 10 minutes by reasons that are mostly avoidable by simple and cheap healthcare methods. A reduction in the death rates of mothers and children to 2% was planned by running a national project to prevent death in mothers and children which took place between 2002-2005.

The importance and requirement for new programs on health issues in newborn age must

be of particular consideration since problems occupy a considerable ratio of deaths among babies and children regarding peri- and pre-natal periods still. To date, adequate data relating perinatal deaths and their causes have not been accumulated in Turkey. In order to improve the newborn healthcare policies, adequate quantitative and qualitative data relating peri- and neo-natal deaths must be collected. Since one of the related problems is the lack of preventative approach in high-risk pregnancies and in early newborn period.

Although various information sources about newborn resuscitation procedures in the delivery room are available however the so called Neonatal Resuscitation Program (NRP) which is developed by American Academy of Pediatrics (AAP) and American Heart Association (AHA). All the related personnel is strongly suggested to get a NRP course and certificate is accepted and prompted by Turkish Society of Hematology and Turkish Ministry of Health. Physicians must determine the physiological delays during the transition from intrauterine to extrauterine life, which requires spontaneous respiration, cardio-pulmonary and other changes, in order to reduce the mortality and morbidity rates of newborns. A good knowledge of normal transition physiology helps identify the requirements of the infant and apply more efficient resuscitation (7).

Each year over 5 million newborn deaths occur. Approximately 19% of these deaths are assumed to be caused by asphyxia during birth, which indicates that more than 1 million newborn deaths can be prevented if simple resuscitation methods are applied (8).

Approximately 5-10% of the newborn population requires active resuscitation (e.g. respiratory stimulation) at various degrees during delivery and 1-10% of the newborns that are born in a hospital reportedly need assisted ventilation (9,10). In our study, rate of resuscitation was found as 1.7%. Sutcuoglu et al (11) were investigated resuscitation procedures for the newborn in delivery room and found 5.46% of

the newborns required resuscitation. They determined 77.7% of the resuscitated newborns have had risk factors. The Neonatal Resuscitation Program will continue to evolve with new data obtained from clinical studies and basic physiologic research.

In our study, the distribution in rates of various resuscitation methods was found as follows: NPPV (0.75%); endotracheal intubation and cardiac massage (0.70%); and intravenous drug administration (0.21%), the rate of which is in agreement with the literature (12).

In order to be prepared against the possible high-risk deliveries, there must be a communication between the person who takes care of the mother during her pregnancy and the person who will resuscitate the newborn. This kind of communication must include the exchange of information regarding mother's health condition, her detailed medication history and even specific fetal monitorization (fetal heart monitorization, lung maturation and ultrasound reports).

Perinatal asphyxia and extreme prematurity are the two important complications of pregnancy that require trained personnel to apply complicated resuscitation procedures. Nevertheless, only 60% of the newborns can be estimated to be born with asphyxia before birth, leaving the remaining unpredictable. Moreover, 80% of the small for gestational age (SGA) infants need resuscitation and stabilization after birth. Approximately half of the newborn deaths, in which case mostly extreme premature infants are affected, occur in the first 24 hours of life. These early deaths also have asphyxia and/or respiratory depression components as etiological factors. Management of asphyxia in the first minutes of life may affect long-term outcomes in surviving infants.

Mbweza (13) investigated maternal risk factors that caused perinatal asphyxia and found the existence of risk factors in 65% of the cases, 18.5% of which were multiple. The most common risks were premature birth, preeclampsia, cephalopelvic disproportion and difficult labour

and 46% of all labours required medical intervention. In our study, the existence of risk factors was detected in 56.4% of the cases and multiple risk factor rate was 13.7%. Most common risk factors were prematurity, post-maturity, chronic diseases of the mother, meconium-stained amniotic fluid and/or MAS and Rh incompatibility.

Among preterm newborns the incidence of perinatal depression is considerably high because of the complications related to preterm birth and physiological immaturity and lability of the premature infant (14). In our study, a significant relation between the application of resuscitation and the presence of prematurity or fetal abnormality was determined, which is in good agreement with a previous report that stated the relation between prematurity and resuscitation application (15).

In our study, a requirement for resuscitation was detected in 3 out of total 58 cases that had MAS or meconium stained amniotic fluid; however no significant relation was found regarding the need for resuscitation between the cases with or without MAS, which is also in good agreement with previous reports (16). Depressed infants intubated and direct tracheal suctioning is performed and all of the resuscitated 3 infants had MAS.

A single risk factor was identified in 77.75% of the newborns who needed resuscitation. A significantly higher rate in multiple-risk group was found when a comparison was made between the single- and multiple-risk groups in terms of the rate of resuscitation requirement, consistent with the literature (17).

A statistically significant relation between the need for resuscitation and the prematurity and low birth weight (< 2500 g) was found. Previous reports also indicated a significant relation between low birth weight, prematurity and the requirement for resuscitation (18). However, caesarean section (C/S), in agreement with the literature (19), was not found to increase the need for resuscitation in our study.

Reliable documentation of the procedures during clinical examination and resuscitation of the newborn is essential for such reasons as good clinical care, communication and medicolegal requirements. APGAR scores must be recorded 1 and 5 minutes after birth and then, every 5 minutes until the vital findings of the newborn are stabilized. In our study, among all newborns, significantly higher rate of requirement for resuscitation was observed to newborns who had APGAR score of 1-3 five minutes after birth. APGAR scores of half of the newborns that died were 1-3 and 11 of the died newborns were between 4-7, which is in agreement with a report that indicates a high death rate for the newborns with an APGAR score less than 3 (20).

Vakrilova et al (21) reported the reduction of neonatal mortality from 7.8% to 6.8% and asphyxia incidence from 9% to 8% by a program that was initiated for lowering the mortality rate caused by peri- and intra-natal asphyxia, and additionally stated the importance of the augmentation in resuscitation quality by continuation of labour room personnel education and the necessity for being prepared for such situations in advance.

As a conclusion, in order to reduce neonatal mortality and asphyxia rates, high-risk pregnancies (premature birth, obstetrical causes) must be detected in advance by improvement of prenatal healthcare conditions and all personnel who attend the deliveries must be trained and equipped applying to NRP rules to achieve, a higher neonatal resuscitation quality.

## REFERENCES

1. Bhutta ZA, Darmstadt GL, Ransom EL, Sstarr AM, Tinker A. Basing Newborn and Maternal Health Policies on Evidence. In: Shaping Policy for Maternal and Newborn Health, JHPIEGO Corporation. USA. October 2003.
2. World Health Report. Geneva, Switzerland: World Health Organization; 1995.
3. Pattinson R, Woods D, Greenfield D, Velaphi S. Improving survival rates of newborn infants in South Africa. *Reprod Health* 2005;2:4.
4. Saving Newborn Lives. The state of the world's newborns: a report from Saving Newborn Lives. Washington DC: Save the Children; 2001. p. 14.

5. United Nations, General Assembly, 56th session. Road map towards the implementation of the United Nations Millenium Declaration: report of the Secretary-General. New York: United Nations; 2001.
6. Köse MR. Ana ve Çocuk Ölümelerini Önleme Projesi. *Türk Neonatoloji Derneği Bülteni* 2002;5:2-4.
7. Bissinger R.L. Neonatal Resuscitation. August 22, 2006. [www.emedicine.com/ped/topic2598.htm](http://www.emedicine.com/ped/topic2598.htm).
8. World Health Report. Geneva, Switzerland: World Health Organization; 1995.
9. Saugstad OD Practical aspects of resuscitating asphyxiated newborn infants. *Eur J Pediatr* 1998; 157:11-5.
10. Palme-Kilander C. Methods of resuscitation in low-Apgar-score newborn infants: a national survey. *Acta Paediatr* 1992; 81:739-44
11. Sütçüoğlu S, Tümer M, Meydan E, Tellioğlu M, Dilek M ve ark. Yenidoğanlarda Doğum Odası Resüsitasyon Uygulamaları ve Etkileyen Risk Faktörleri. *SSK Tepecik Eğitim Hastanesi Dergisi* 2003;13:163-9.
12. O'donnell AI, Gray PH, Rogers YM. Mortality and neurodevelopmental outcome for infants receiving adrenaline in neonatal resuscitation. *J Paediatr Child Health* 1998;6:551-6.
13. Mbweza E. Risk factors for perinatal asphyxia at Queen Elizabeth Central Hospital, Malawi. *Clin Excell Nurse Pract* 2000;4:158-62.
14. MacDonald HM, Mulligan JC, Allen AC, Taylor PM Neonatal asphyxia, I: relationship of obstetric and neonatal complications to neonatal mortality in 38,405 consecutive deliveries. *J Pediatr* 1980; 96: 898-902.
15. Chabernaud JL. Neonatal resuscitation in delivery room: new advances. *Arch Pediatr* 2005;12:477-90.
16. Kresch MJ, Brion LP, Fleischman AR. Delivery room management of meconium-stained neonates. *J Perinatol* 1991;11:46-7.
17. Saugstad OD. Resuscitation of newborn infants; do we need new guidelines? *Prenat Neonatal Med* 1996;1:26-8.
18. Kinoti SN. Asphyxia of the newborn in East, Central and Southern Africa. *East Afr Med J* 1993;7:422-33.
19. Drew J. Immediate intubation at birth of very low birth weight infants: effect on survival. *Am J Dis Child* 1982;136:207-10.
20. Casey BM, McIntire DD, Levono KJ. The continuing value of the Apgar score for the assesment of newborn infants. *N Engl Med* 2001;344:467-71.
21. Vakrilova L, Elleau Ch, Sluncheva B. French-Bulgarian program "Resuscitation of the newborn in a delivery room"-results and perspectives. *Akush Ginekol (Sofia)* 2005;44:35-40.

---

**Yazışma adresi:**

Ayca ÜNALP

Dr. Behçet Uz Çocuk Hastalıkları ve Cerrahisi  
Eğitim ve Araştırma Hastanesi

Çocuk Nörolojisi Polikliniği-3, Monrö / İZMİR

Tel : 0 232 238 70 97

GSM: 0 505 221 16 93

e-posta: [aycanunalp@mynet.com](mailto:aycanunalp@mynet.com)

---