Characteristics of Asphyxiated Newborn Babies in Referral Hospitals of Banten Province, Indonesia

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Every year 1 million babies died on the first day born due to asphyxia. The risk of asphyxia is 8 times higher in the country with high neonatal death. In Indonesia, about 27.000 newborn babies died in the first day of their life due to asphyxia. Asphyxia is the second cause of death in neonatal period in Indonesia (27%), after low birth weight in the first place (29%). The study aimed to obtain characteristic of asphyxiated newborn babies. Secondary data were used from a major research project in two referral hospitals in Banten Province (n=1628) during period of 2003-2004. Asphyxia of newborn babies was defined as recorded in medical record. During the period between years 2003-2004, asphyxia prevalence of the newborn baby with the risk mother in the Serang and Pandeglang hospital is 24.3%. The majority of asphyxiated babies were from rural areas (34.3%) with majority of mothers (79.9%) experienced non-life threatening complications. Younger mothers, multipara, and multigravida showed higher proportion of asphyxiated newborn. Asphyxiated newborn might illustrate health services quality received by mother and baby before and after care in the hospital. Hospitals need to improve their management of mother with complication to lower the risk of birth asphyxia.

Keywords: *asphyxia; newborn*

INTRODUCTION

The majority of neonatal deaths occur in the first week after delivery, especially in the first days of life (Lawn et al. 2005). Neonatal mortality after the first week is usually caused by an infection. Globally, the major causes of neonatal deaths are prematurity (28%), severe infections (36%, including sepsis/pneumonia 26%, tetanus 7%, and diarrhea 3%) and asphyxia (23%) (Lawn et al. 2006). In developing countries, including Indonesia, the main cause of neonatal mortality is 0-6 days of respiratory disorders/asphyxia, prematurity, infection, and hypothermia. Infections and hypothermia may be the result of low birth weight, and prematurity which mostly coupled with low birth weight. Therefore, the role of LBW for death in the first week after delivery is quite large (Lawn et al. 2005). The main causes of neonatal mortality 7-28 days of age were sepsis, congenital malformations, pneumonia, RDS and prematurity (Lawn et al. 2010).

In 2010, Indonesia was one of the 11 countries with the preterm birth rate of more than 15% (WHO 2012). The 2013 Basic Health Research (RISKESDAS) showed that the proportion of under-five children (0-59 months) who experienced low birth weight (LBW) was 10.2%. The highest proportion of LBW was in Central Sulawesi (16.8%), and the lowest was in North Sumatera (7.2%) (Indonesian MOH 2013). Infants with LBW, particularly due to prematurity, have not had completely matured organ system, thus they are more susceptible to infections and complications. The health problems that commonly occur among LBW infants are disorders of the respiratory system, central nervous system, cardiovascular, hematologic, gastrointestinal, renal, and thermoregulation (Bhatt et al. 2007). Hypothermia (i.e. newborn body temperature of less than 36.5ºC) and infection are the major cause of increased mortality in LBW infants (Laptook et al 2007), particularly in infants who were born at home (Kumar et al. 2009). This problem is preventable and manageable, yet there are still several obstacles that lead to neonatal deaths (Laptook et al. 2007), such as poor access to quality health services, lack of knowledge and skills of the health providers, family's socioeconomic, ineffective and inefficient referral system, delay in early detection and lack of family's knowledge in seeking health care (Kumar et al. 2009; Titaley et al. 2008).

METHOD

Cross-sectional study design was employed to examine the characteristics of asphyxiated newborn in two referral hospitals in Banten Province. This study uses secondary data from a parent study conducted in the district hospitals of Serang and Pandeglang Districts, Banten Province by IMMPACT - PUSKA FKM UI (2002 – 2007). Immpact (Initiative for maternal mortality programme assessment) is a global research initiative for the evaluation of maternal and newborn health intervention strategies in developing countries. The population of the parent study were all women lived in the district of Serang and Pandeglang who gave birth in, or were referred to the above mentioned hospitals. The population of this study were infants of mothers admitted to the hospitals during the period of 1 November 2003- October 31, 2004. Descriptive statistics were used to describe the characteristics of newborn with birth asphyxia. Comparisons between asphyxia and non-asphyxia were done using a chi-square test with significance level at 0.05. Ethical approval was obtained by the parent study from the ethic committee of the University of Indonesia prior to field work.

RESULTS

A total of 2,599 babies delivered in hospitals during the period and there were 1,628 eligible sample identified for this study. Most newborn with asphyxia born to mothers from the age group of less than 20 years (40.8%) followed by the mother of the age group 20-35 years (29.0%) and 23.1% by mothers aged over 35 years old.

Women with parity ≥ 4 have higher proportion of asphyxiated newborn (38.4%), followed by mothers with nullipara (24.8%) and those with 1-3 parities (21.1%). A similar pattern can be seen from gravidity, where mother with ≥ 5 gravidity had the largest proportion of infants suffered from asphyxia (37.2%). A higher proportion of the infants with asphyxia were born from mother aged younger than 20 years compared to non-asphyxia cases, and those with 4 parities or more compared to mothers with parity of 3 or less (5.1% versus 2.4%, and 14.3% versus 7.4%, respectively); both differences were statistically significant.

Socio-economic conditions of mothers were measured based on the educational level and method of payment variables. There were significant missing data for educational attainment among the mothers (almost 79% among mothers of infant with asphyxia versus 70% with no asphyxia). Hence, interpretation should be cautiously made for this variable. Among mothers whose data were not missing, a substantial difference in proportions of mothers with senior high school education background was seen among infants who had asphyxia (6.8%) compared to those without (23.3%). While considerable differences in proportion of maternal education on other level of educational attainment were not found based on asphyxia status. Among infants with asphyxia, the majority of them were born to mothers who never attended school or attended school but only up to junior high-school level. There was also a notable difference in proportions of use of insurance scheme for the poor to pay for hospital bill according to asphyxia status (18.5% among infants with asphyxia versus 12.1% among those without). No markedly difference in use of other methods of payment seen among the two groups of asphyxia status.

Table 1. Demographic characteristics of mothers giving birth in Pandeglang and Serang district hospitals (1 November 2003- October 31, 2004) by asphyxia status among newborn

Variable	Total N=1628	Asphyxia N=396	Non-asphyxia N=1232	P value
Women's age at delivery				
< 20 years	49	20 (5.1)	29 (2.4)	0.008
20-35 years	190	55 (13.9)	135 (11.0)	
> 35 years	1387	320 (81)	1067 (86.7)	
Parity				
Nulliparous	718	178 (45.4)	540 (44.2)	
Parity 1-3	749	158 (40.3)	591 (48.4)	<0.001
Grand multipara (≥ 4)	146	56 (14.3)	90 (7.4)	
Gravida				
Primigravida	687	167 (42.3)	511 (41.5)	
Gravida 2 -4	773	163 (41.3)	610 (49.6)	<0.001
Gravida ≥ 5	175	65 (16.5)	110 (8.9)	
Education attained				
College/university	67	16 (4.0)	51 (4.1)	<0.001
Senior high school	314	27 (6.8)	287 (23.3)	
Junior high school	72	19 (4.8)	53 (4.3)	
Elementary school	66	21 (5.3)	45 (3.7)	
No schooling	3	1 (0.3)	2 (0.2)	
Not recorded	1106	312 (78.8)	794 (64.4)	
Method of payment				

Variable	Total N=1628	Asphyxia N=396	Non-asphyxia N=1232	P value
Insurance for government employees	67	20 (5.8)	47 (5.1)	<0.001
Insurance for the poor	176	64 (18.5)	112 (12.1)	
Private insurance	59	11 (3.2)	48 (5.2)	
Self-pay	924	248 (71.7)	676 (72.9)	
Free of charge	47	3 (0.9)	44 (4.7)	

Table 2 shows the utilization of health services both after and before admission the hospital. Infants with asphyxia were more likely (70.2%) to be born from mothers who received antenatal care during the index pregnancy compared to healthier infants (29.8%), the difference was statistically significant (p=0.042). When evaluating the referral variables, the data showed that infants with asphyxia were significantly more likely born to mothers who were referred to the hospital, and more likely to be aided by TBA prior to hospital admission compared to those with no asphyxia (76.5% versus 51.4%, p<0.001, and 24.7% versus 8.6%, p<0.001, respectively). However, caution should be made when interpreting aided by TBA prior to admission to hospital because there were around 50% data missing both among infants suffered from asphyxia, and those who did not.

In regards to mode of delivery, infants diagnosed with asphyxia were more like delivered through vaginal involving instrument compared to health infants (34.9% versus 18%), and on the contrary, healthy infants were more likely to be delivered normally through vaginal, and barely no difference in proportion when comparing the two groups based on Caesarean delivery. There was no difference in proportion between the two groups of infants based on previous caesarean section performed on their mother.

Table 2. Health services utilization of mothers giving birth in Pandeglang and Serang district hospitals (1 November 2003- October 31, 2004)

Variable	Total N=1628	Asphyxia N=396	Non-asphyxia N=1232	P value
History of antenatal care				
Yes	1075	278 (70.2)	797 (64.7)	
No	553	118 (29.8)	435 (35.3)	0,042
Referred from other facilities				
Yes	747	228 (76.5)	519 (51.4)	
No	561	70 (23.5)	491 (48.6)	<0,001
Aided by TBA before being referred to the hospital				
Yes	204	98 (24.7)	106 (8.6)	
No	599	105 (26.5)	494 (40.1)	<0,001
Not recorded	825	193 (48.7)	632 (51.3)	
Mode of delivery				
Normal vaginal delivery	846	143 (36.5)	703 (57.7)	<0,001
Vaginal delivery with instrument	356	137 (34.9)	219 (18.0)	
Caesarean section	409	112 (28.6)	297 (24.4)	
Previous Caesarean section				
Yes	89	16 (4.0)	73 (5.9)	
No	1539	380 (96.0)	1159 (94.1)	0,138

TBA=Traditional Birth Attendant

There were no differences of percentages per sex of infants, and preterm delivery between the two categories of infants. However, there were significant differences among the two groups of infants in proportions of LBW, IUGR, presence of meconium aspiration, fetal distress at

admission, and umbilical abnormalities.

Table 3. Characteristics of infants born to mothers giving birth in Pandeglang and Serang district hospitals (1 November 2003- October 31, 2004)

Variable	Total N=1628	Asphyxia N=396	Non-asphyxia N=1232	P value
Sex of the infant				
Girl	752	170 (42.9)	582 (47.2)	0,133
Boy	876	226 (57.1)	650 (52.8)	
LBW				
< 2500 g	158	49 (12.5)	109 (9.1)	
> = 2500 g	1433	344 (87.5)	1089 (90.9)	0,058
IUGR				
Yes	103	26 (6.6)	62 (5.1)	
No	1513	368 (93.4)	1145 (94.9)	0,037
Meconium aspiration				
Yes	186	93 (23.5)	93 (7.5)	
No	1442	303 (76.5)	1139 (92.5)	<0,001
Fetal Distress at admission				
Yes	50	19 (4.8)	31 (2.5)	
No	1578	377 (95.2)	1201 (97.5)	0,001
Preterm labour				
≤ 37 weeks	202	50 (12.7)	152 (12.4)	
>37 weeks	1417	345 (87.3)	1072 (87.6)	0,900

Variable	Total N=1628	Asphyxia N=396	Non-asphyxia N=1232	P value
Umbilical cord abnormalities				
Yes	54	19 (4.8)	35 (2.8)	
No	1574	377 (95.2)	1197 (97.2)	<0,001

LBW=Low Birth Weight; IUGR=Intra-uterine Growth Retardation

DISCUSSION

Birth asphyxia is responsible for nearly 25% of neonatal deaths (Engmann et al. 2012). Therefore, effective case management of birth asphyxia is expected to contribute largely to the reduction of neonatal deaths. This issue is of great importance, particularly in many developing countries where reduction of neonatal mortality rate (NMR) has been challenging, including Indonesia (Statistics Indonesia 2013). A well-established understanding about factors associated with the incidence of asphyxia is then very essential to address this problem; however, local data are limited in many cases. The present study describes maternal and infant's characteristics associated with the occurrences of birth-asphyxia among newborns delivered in two district hospitals, in Banten Province, between 2003 and 2004. In this study, about 24.3% of alive newborns were diagnosed with birth-asphyxia. Overall, maternal age, socioeconomic, and obstetric-related factors (except preterm birth) were significantly associated with the incidence of birth-asphyxia. The fact that preterm birth was not associated with birth-asphyxia was somewhat peculiar, this might be because our samples consisted of infants who were born alive. A large percentage of preterm infants born to mothers giving birth in these two district hospitals were born as stillbirth, leaving preterm infants who survived were those with better conditions. This phenomenon might be the reason why our results showed no association between preterm birth and birth-asphyxia.

Maternal age has been found to be one of the strong risk factors for birth-asphyxia, both in developed and less-developed settings (Lee et al. 2007). In this study, infants suffered from birth-asphyxia were significantly more likely to be born from mothers aged less than 20 years compared to healthier infants. Our findings, however, do not suggest an association between increased incidence of asphyxia and advanced maternal age, which was consistent with previous studies (Aslam et al. 2014; Pitsawong and Panichkul 2011). Young maternal age has been

demonstrated to affect other pregnancy outcomes, such as low birth weight, IUGR and prematurity which are also associated with asphyxia (Deshmukh et al. 1998). The association between young maternal age and pregnancy outcomes might be partly explained by the poor antenatal care, inadequate weight gain during pregnancy, and maternal anemia among young mothers, as well as low socio-economic (Kang et al. 2015). Interestingly, our study found an inverse association between antenatal care and asphyxia. A proportion of antenatal care (ANC) is higher among women in the asphyxia group compared to non-asphyxia. However, this association should be interpreted with caution given the fact we do not have detailed information about the ANC history, such as frequency, services received among others. This may be due to the facts that mothers who did not receive antenatal care were not aware of any risk factors at birth related to their newborn outcome. However, it can also mean that antenatal care cannot be used as one of the interventions to reduce risk factors for complications for both the mother and baby.

This study indicated an association between low economic status and asphyxia, as shown by the higher proportion of beneficiaries of insurance for the poor among the asphyxia group compared to non-asphyxia. In general, insurance scheme helps alleviate financial barrier related with direct health care cost. However, a significant portion of non-health care cost (e.g. transportation cost) may still prevent some women from seeking maternal care timely, thus, putting them at risk for poorer outcomes at childbirth. In this study, the delay in seeking care was confirmed with a higher proportion of women who sought care from TBA among the asphyxia group (24.7%) than non-asphyxia (8.6%; p-value <0.001). It should be noted that the proportion of women seeking TBA care is likely under-reported due to the large missing data on this variable. Furthermore, in our study, 76.5% of the women whose infants suffered asphyxia were referred from other facilities before reaching the study hospitals, compared to 51.4% in the non-asphyxia group. This finding, as well as information about the TBA care, suggests that many women gone through multiple care points, which could extend the delay in receiving adequate care. For asphyxiated infants, such situation could increase their mortality risk due to the short therapeutic window, i.e. possibly no longer than 1 to 2 hours in full-term infants (Haider and Bhutta 2006).

In regards to obstetric-related factors, our study suggests the association between asphyxia and grand multiparity, as well as grand multigravida. These two conditions have been widely established as risk factors for adverse reproductive outcomes (Pitsawong and Panichkul 2011). As has been shown in other studies (Pitsawong and Panichkul 2011), a substantially higher proportion of assisted delivery (with an instrument) was observed among asphyxiated infants,

than non-asphyxiated infants. The use of assisted deliveries implies intrapartum complications and extends the labour process, thus putting infants at a higher risk for asphyxia.

Infants' conditions, i.e. umbilical cord abnormalities, LBW, IUGR, meconium aspiration, and fetal distress at admission were significantly associated with asphyxia. However, the difference in the proportion of LBW between asphyxia and non-asphyxiated newborns is smaller than what we would expect (12.5% and 9.1%, respectively). A previous study demonstrated that LBW doubled the risk of asphyxia (Pitsawong and Panichkul 2011). A possible explanation for our findings is that the asphyxia was associated stronger with intrapartum complications while LBW is more associated with antepartum conditions. We do not observe a significant association between asphyxia and pre-term labour as what have been found in previous studies (Pitsawong and Panichkul 2011).

Our study describes important maternal and infant characteristics that are associated with asphyxia. One of the highlights is the potential delay in seeking care that may contribute to the incidence of asphyxia. Existing literature suggested that 50% of asphyxia cases had a primary origin in antepartum, 40% in intrapartum, and the remaining 10% in the postpartum period (Dilenge et al. 2001). However, given the fact that a large proportion of deliveries in the developing countries does not occur in the health facility, it is likely the effect of intrapartum causes is substantially higher (Haider and Bhutta 2006). Therefore, it is crucial to ensure that women have adequate and timely access to care when the complication occurs.

This present study has several strengths. Secondary data taken in this study were used by Immpact researchers to determine the severity of life-threatening complications occurred in hospitals. Therefore, the data used is a good quality and valid data since it was taken by medical doctors who received training prior data collection, and regularly monitored by a team of senior researchers during the data collection process. In addition, the quality assurance of data processing and analysis was well performed including double entry and data cleaning supervised by a qualified data manager. However, the findings should be interpreted with regards to the study limitations. This is a retrospective hospital-based study. Thus, the completeness of the information relies on the quality of hospital reporting. Large missing data were found in a few of the variables. This study is an analytical descriptive, therefore relative risk of each factor was not examined. Future research could focus on examining the quality of health facilities in the case management of asphyxia to prevent asphyxia-related mortality.

CONCLUSION

Our study describes important maternal and infant characteristics that are associated with birth asphyxia. One of the highlights is the potential delay in seeking care among the mothers surrounding labor that may contribute to the incidence of birth asphyxia. Improving adequate referral of pregnant women would improve the access to health care and affect the health status of the newborn. Adequate care for women with complication is needed to prevent asphyxia of the newborn.

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