Effect of Timing of First Postnatal Check on Neonatal Death in Indonesia: Analysis of IDHS 2002-2003, 2007, and 2012 with Retrospective Cohort Study

Ira Marti Ayu[1], Asri Adisasmita[2], Decy Situngkir[1] and Ratna Djuwita[2]

[1]*Departement of Public Health, Faculty of Health Sciences, Universitas Esa Unggul*
[2]*Department of Epidemiology, Faculty of Public Health, University of Indonesia*

Keywords: Neonatal death; Postnatal, Survival, Cohort Study

Abstract: Many of under-five death occurs during the neonatal period. The first week of life after birth, especially the first day of life is the most vulnerable time for child survival. Neonatal period accounts for more than one third (over 44%) in under five death. In Indonesia, Neonatal Mortality Rate in 2012 is 19 per 1000 livebirth. One of the intervention to increasing of neonatal survival is by the timing of first postnatal check-up but from the previous study showed inconsistent effect. The objective of this study was to identifythe effect timing of the first postnatal check-up for the newborn on neonatal survival. This study used the data from 2002-2003, 2007, and 2012 IDHS. The design of this study was a retrospective cohort study and assessed the association of factors related to neonatal death used survival analysis by Cox regression.A total of 35.985 live birth singleton in IDHS 2002-2003, 2007 and 2012 were analyzed. Multivariate analysis showed that Babies who received a first postnatal check-up by health professional ≥24 hours up to 7 days after birth has a significant protective effect on neonatal death (HR=0,09;95%CI: 0,04-0,23). The study also found other finding that birth weight (HR=13,23; 95%:5,47-32,04)and pregnancy complication (HR=1,66; 95%CI: 1,17-2,36) were significant associated with neonatal death.In order to get the more accurate timing of first postnatal check-up, it recommended observing the timing of postnatal check-up directly.

1 INTRODUCTION

One of dimension Human Development Index is long and healthy life (Badan Pusat Statistik, 2018). Globally life expectancy at birth in 2013 is 70,8. It means every child was born in 2013 will survive until 70-71 years(UNDP, 2014). 138 million children born every year in 2013, but many of them did not survive like life expectancy estimation. Even over 6,3 million die before their fifth birthday(UNICEF, WHO, World Bank, and UN Population Division, 2014).

Many of under-five death occurs during the neonatal period. Neonatal period (first 28 days after birth) is the most vulnerable time for child survival (UNICEF, WHO, World Bank, and UN Population Division, 2014). Neonatal period account more than one third (over 44%) in under five death (UNICEF, 2014), two third in child mortality (Mathews et al., 2000), and three-quarters neonatal death occur in the first week of life (Lawn et al., 2005). In Jimma zone, Southwest Ethiopia, Neonatal Mortality Rate was

35,5 per 1000 live birth, and 69,1% die at the first week of life(Debelew et al., 2014). It showed that it needs the high-quality care of childbirth(Lawn et al., 2014).

In Indonesia, Neonatal Mortality Rate in 2012 is 19 per 1000 livebirth(BKKBN et al., 2013). Between 1997-2002, 54,7% infant death occurred in the neonatal period and it estimates 29,9% occurred in the first day of life dan 75,6% in the first week of life (Titaley et al., 2008).

Increasing of neonatal survival can be done by preventing the cause of death. Many of cause of neonatal death is preventable with low cost and low-level technology (Lawn et al., 2005;Darmstadt et al., 2005)so that it can be implemented in low and middle-income countries like Indonesia. One of intervention to improve neonatal survival is postnatal check for a newborn. WHO recommendation on timing first postnatal check-up is at least 24 hours after birth in a health facility and as early as possible within 24 hours after birth at home(WHO, 2014a). First postnatal check-up must be done as early as

possible so professional birth attendant can promote healthy behavior likes exclusive breastfeeding, early detection and referral of complication, pneumonia case management and hypothermia prevention management including kangaroo mother care for low birth weight baby (Kerber et al., 2007;Darmstadt et al., 2005).

The first postnatal checkup is cost-effective and cost-efficient intervention so it can be used in low and middle-incomecountries. However, the first postnatal check-up within two days after birth is only 48% (WHO, 2014b). In India, only 48,3% newborn received a first postnatal check-up within 24 hours after birth (Singh et al., 2012). While in Indonesia in 2012 only 40,5% newborn receive their first postnatal check-up at less than 24 hours after birth (BKKBN et al., 2013). It shows that the intervention coverage still low, whereas this intervention was implemented with high coverage (99%), it can save the life of newborn over 41%-72% (Darmstadt et al., 2005).

Effect of timing postnatal check up on neonatal death has variation result. The previous study by Baqui et al. show that the risk of neonatal mortality had a protective effect 0,33 times compared with newborn did not first receive a postnatalcheck-up(Baqui et al., 2009). However,Titaley and Dibley study in Indonesia found that postnatal care is not related to newborn survival (Titaley and Dibley, 2012). Singla et al. study in India also found that there was no significant difference in neonatal mortality among infant received first postnatal check-up within 24 hours compared to infant did not receive a first postnatal check-up within 24 hours after birth (Singh et al., 2012).

In Indonesia, neonatal death is still a problem. Prevention of neonatal death can be done by applying postnatal check-upas early as possible after birth.A postnatalcheck-up is used to detect any illness of danger sign for the baby after birth, so the treatment can be done as early as possible to prevent death.A postnatalcheck-up is a cost-effective and cost-efficient intervention with low cost and low-leveltechnology so that it can be implemented in a developing country likes Indonesia. However, there is inconsistent result about effect timing of first postnatal on neonatal death, so a study needs to be done to know the effect of timing first postnatal check-up in neonatal death.

2 RESEARCH METHOD

This study used secondary data of Indonesia Demographic and Health Survey (IDHS) in 2002-2003, 2007, and 2012. This study used a retrospective cohort study. The subject of this study was women in reproductive age (15-49 years) and used household and women questionnaires. IDHS used multi-stage sampling such as cluster sampling, stratified sampling, systematic sampling, until simple random sampling (SRS). First, the sampleis clustered by choosing provinces in Indonesia. Second, every province is stratified by rural and urban area,and every level of stratum has census blocks (CB). In urban are, CBis chosen by systematic sampling,andevery CB is chosen 25 households randomly. In a rural area, there arethreestages to choose a household sample. First, choosing sub-district with Probability Proportional to Size (PPS) of the household. Second, every selected sub-district take CB by systematic sampling, and every CB is chosen 25 households randomly

Time to event was the dependent variable, timing of first postnatal check-up as the independent variable. The timing of first postnatal check-up is categorized as received a first postnatal check-up by health professional <24 hours after birth, received a first postnatal check-up by health professional ≥24 hours up to 7 days after birth and did not receive first postnatal check-up or receive postnatal checkup >7 days. This study also considers about potential confounding factor, such as type residence, maternal education, maternal age delivery, parity, household wealth index, desire for pregnancy, delivery complication, birth weight, antenatal care services, mode of delivery, place of delivery, delivery attendant. The data were analyzed with survival analysis with Cox regression test and analysis using SPSS and complex sample. This study also presented probability survival with KaplanMeier curve.

3 RESULTS

There was 35985 live birth singleton infant, of which 353 (0,1%) babies die in the neonatal period. Based on the data there was an increasing probability of neonatal survival from IDHS 2022-2003 (98,5%), IDHS 2007 (98,8%) and IDHS 2012 (98,9%) and probability survival overall (99,0%) (Figure 1).
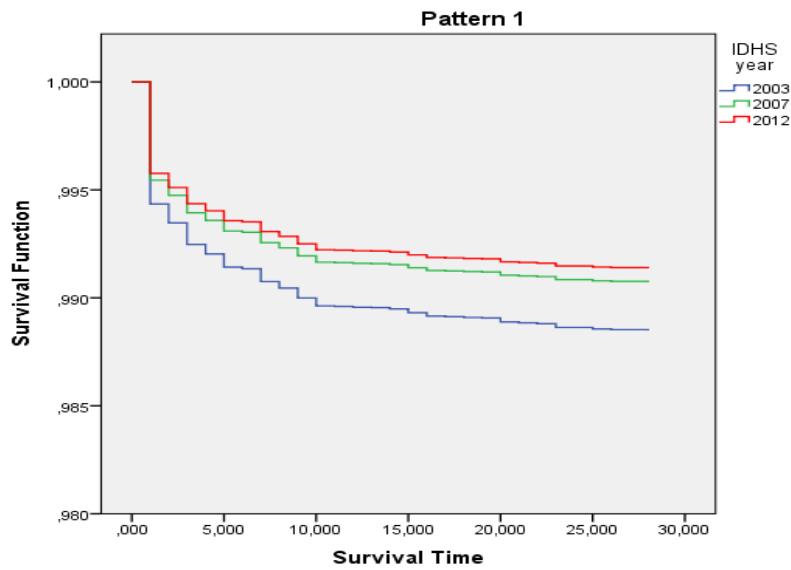
Figure 1: Neonatal survival probability curve based on IDHS

The probability of neonatal survival based on the timing of postnatal check-up is highest in babies who received first postnatal check-up by health professional ≥ 24 hours up to 7 days after birth (99,1%). Moreover, the lowest probability is in babies who did not receive a first postnatal check-up or receive a postnatalcheck-up but >7 days after birth (Figure 2).
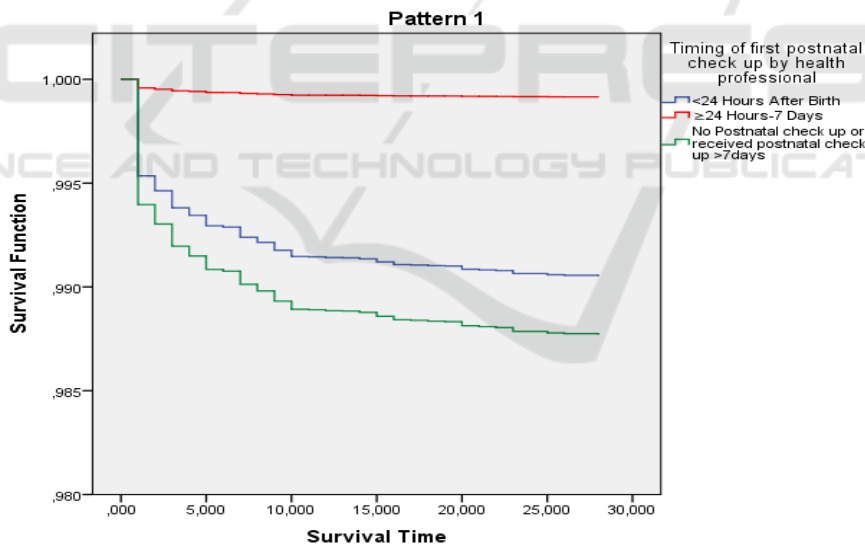

Figure 2: Neonatal survival probability curve based on timing first postnatal check up

Table 1: Bivariate and multivariate analysis

Variable	HR Crude	HR Adjusted
Timing Of First Postnatal Check Up (By Health Professional)		
<24 Hours After Birth	1(Reference)	
≥24 Hours-7 Days	0,09 (0,04-0,23)*	0,09 (0,04-0,23)*
No Postnatal check up Or received postnatal check up>7days	1,30 (0,95-1,77)**	1,004 (0,64-1,58)

Table 1: Bivariate and multivariate analysis (cont.).

Variable	HR Crude	HR Adjusted
Birth Weight		
≥2500	1(Reference)	
<2500	8,29 (5,55-12,38)*	13,23(5,47-32,04)*
Not Weighted	3,58 (2,46-5,21)*	4,17(2,32-7,521)*
Don't Know	14,25(5,91-34,31)*	8,06(5,42-11,99)*
Maternal Age Of Delivery		
12-19	1(Reference)	
20-35	1,17 (0,70-1,95)	
>35	1,91 (1,25-2,91)*	
Parity		
Primiparous	1(Reference)	
Multiparrous	0,96 (0,67-1,38)	
Grandmultiparous	2,02 (1,26-3,22)*	
Desire For Pregnancy		
Wanted Then	1(Reference)	
Wanted No More	1,23 (0,79-1,89)	
Dont Know	2,130E-009(,083E-009-4,188E-009)*	
Antenatal Care (ANC) Visit		
≥4 And According To Standard	1(Reference)	
< 4	1,69 (1,21-2,38)*	
No ANC	3,40 (1,84-6,28)*	
Don't Know	0,89 (0,33-2,42)	
Pregnancy Complication		
No	1(Reference)	1
Yes	2,65 (1,85-3,80)*	1,66 (1,17-2,36)*
Dont Know	2,074E-009 (9,423E-010-4,564E-009)*	1,83 (0,99-3,39)*
Delivery Attendant		
Health Professional	1(Reference)	1
TBA/ Others	1,32 (0,93-1,87)**	0,61 (0,31-1,22)
Don't Know	2,205E-009 (5,894E-010-8,248E-009)*	2,566E-009 (6,002E-010-1,098E-008)
Place Of Delivery		
Hospital	1(Reference)	
Other Health Facility	0,33 (0,21-0,54)*	
Home	0,65 (0,44-0,97)*	
Dont Know	1,82 (0,20-14,46)	
Mode Of Delivery		
Non-Caesarean Section	1(Reference)	
Caesarean Section	1,62 (0,95-2,77)**	
Don't Know	0,13 (0,02-0,92)*	
Delivery Complication		
No	1(Reference)	
Yes	1,72 (1,21-2,45)*	
Don't Know	3,63 (2,09-6,28)*	
Maternal Education		
Higher Education Level	1(Reference)	1
Lower Education Level	1,98 (1,16-3,37)*	1.51 (0,85-2,68)
Type Of Residence		
Urban	1(Reference)	
Rural	1,14 (0,84-1,56)	
Wealth Status		
Rich (Q4-Q5)	1(Reference)	
Poor (Q1-Q3)	1,26 (0,89-1,78)**	

* p value <0,05

**p-value <0,025

According to Table 1, the Multivariate analysis showed that birth weight and delivery and pregnancy complication were significantly associated with neonatal death. Babies who received first postnatal check-up by health professional ≥24 hours up to 7 days after birth has a significant protective effect on neonatal death.

4 DISCUSSION

There was 353 neonatal death, of which 283 (80,2%) occur in the early neonatal period (first week of life) and 173 (49,0%) in the first day of life. It means most of the neonatal death occurred in the first week (early neonatal period) and especially on the first day of life(Oza et al., 2014). There was an improvement of neonatal survival from IDHS 2002-2003, 2007 and 2012. This due to an effort to improve maternal and child health like a continuum of care services. Continuum of care is integrated service delivery for mother and children from pre-pregnancy to delivery, the immediate postnatal period and childhood(WHO, 2011). Pregnancy health service cannotbe separated with delivery, postnatal period and newborn health services. Quality of antenatal care services will affect maternal and fetus during pregnancy, and for baby and maternal after delivery (Kemenkes RI, 2010).

This study found that pregnancy complication and birth weight have significant associated with neonatal death. In developing countries, more than 9 million babies die every year before birth and during the first week of life due to a complication during delivery (Yego et al., 2013). Pregnant women from developing countries are 36 times more likely suffer a pregnancycomplication than pregnant women in developed countries (WHO, 2015). Severe hypertension, anemia, postpartum hemorrhage, puerperal fever, abruptio placentae, diabetes mellitus, are pregnancy complication (Nwankwo et al., 2013).

Birth weight is the weight of baby which weighed within an hour after birth (Muslihatun, 2010). In developing countries, almost half (48,7%) of babies born not weighed and from those who weight only 14% were born with low birth weight (Blanc and Wardlaw, 2005). According to WHO, babies born with low birth weight are caused by preterm birth or small gestational age (SGA) or both (World Health Organization and others, 2011). The incidence rate of neonatal mortality with low birth weight is six times higher than for neonatal mortality with normal weight (*Incidence Rate Ratio*=6,4) (Slyker et al., 2014). A case-control study at the Hawasa University Hospital showed that baby with very low birth weight, and low

birth weight was 3,95 times increased risk of early neonatal death than normal weight (Bayou and Berhan, 2012).

After controlling covariate variables, there was no associated between babies who did not receive a first postnatal check-up or receive postnatal checkup >7 days with neonatal survival. The adjusted Hazard ratio on babies who received postnatal check-up by health professional ≥24 hours up to 7 days after birth has a significant protective effect on neonatal death (HR=0,0995%CI: 0,04-0,23)

The result of this study indicates that babies who receive postnatal check-up by health professional < 24 hours after birth did not prevent neonatal death compared with babies who receive a postnatalcheck-up ≥24 hours-7 days. It was contrary with the study Baqui et al. (2009) and Singh et al. (2014). Babies who did not check up were 3,03 times (95%CI;0,23-0,46) more likely to die than babies who checked up in the first day of life (Baqui et al., 2009). Also, babies who checked up in the first week by a health professional or not were associated with the decline of neonatal mortality (OR: 0,51; 95%CI: 0,35-0,75; OR 0,34; 95%CI 0,30-0,38) (Singh et al., 2014).

The result of this can not prove that babies who receive first postnatal check-up by health professional ≥24 hours have a protectiveeffect on neonatal death. This is contrary to the objective of this study. The babies who received checked than ≥24 hours can influence babies' life because it cannot detect any illness of danger sign as early as possible. It is because there is a limitation of the secondary data. First, when we used secondary data, we cannot control the quality of collection data, and there is missing data. Second, there is a recall bias because the respondentwas asked about something that happens5 years ago. Mother who asked about the timing of first postnatal check-up can not remind the timing exactly. For further study

The study also found others finding that birth weight, and pregnancy complication can prevent neonatal death. So to improve neonatal survival, it needs to prevent risk factors of low birth weight during pregnancy and also prevent pregnancy complication through adequate antenatal care.

5 CONCLUSION

The result of this study is babies who receive first postnatal check-up by health professional longer than ≥24 hours has a protectiveeffect on neonatal death because of the limitation of secondary data. It isrecommendedfor further studyto observe the timing

of postnatal check-up directly, so the result is more accurate.

REFERENCES

Badan Pusat Statistik(2018). Badan Pusat Statistik [WWW Document]. Available at: https://www.bps.go.id/subject/26/indeks-Pembangunan-manusia.html (accessed 7.11.18).

Baqui, A.H., Ahmed, S., Arifeen, S.E., Darmstadt, G.L., Rosecrans, A.M., Mannan, I., Rahman, S.M., Begum, N., Mahmud, A., Seraji, H.R., and others.(2009). *Effect of timing of first postnatal care home visit on neonatal mortality in Bangladesh: an observational cohort study*. BMJ 339.

Bayou, G., and Berhan, Y.(2012). Perinatal mortality and associated risk factors: a case-control study. *Ethiopian journal of health sciences*, 22(3).

BKKBN, BPS, Kemenkes RI, ICF International.(2013). *Survei Demografi dan Kesehatan Indonesia tahun 2012*. Jakarta, Indonesia : BKKBN, BPS, Kemendkes RI, ICF International.

Blanc, A. K., and Wardlaw, T. (2005). Monitoring low birth weight: an evaluation of international estimates and an updated estimation procedure. *Bulletin of the World Health Organization*, 83: 178-185d.

Darmstadt, G. L., Bhutta, Z. A., Cousens, S., Adam, T., Walker, N., De Bernis, L., and Lancet Neonatal Survival Steering Team. (2005). Evidence-based, cost-effective interventions: how many newborn babies can we save?. *The Lancet*, 365(9463): 977-988.

Debelew, G. T., Afework, M. F., and Yalew, A. W. (2014). Determinants and causes of neonatal mortality in Jimma zone, southwest Ethiopia: a multilevel analysis of prospective follow up study. *PLoS One*, 9(9): e107184.

Kemenkes RI.(2010). *Pedoman Pelayanan Antenatal Terpadu*. Jakarta: Direktorat Jenderal Bina Kesehatan Masyarakat.

Kerber, K.J., de Graft-Johnson, J.E., Bhutta, Z.A., Okong, P., Starrs, A., and Lawn, J.E.(2007). Continuum of care for maternal, newborn, and child health: from a slogan to service delivery. *The Lancet*, 370: 1358–1369.

Lawn, J. E., Blencowe, H., Oza, S., You, D., Lee, A. C., Waiswa, P., ... and Mathers, C. (2014). Every Newborn: progress, priorities, and potential beyond survival. *The Lancet*, 384(9938): 189-205.

Lawn, J. E., Cousens, S., Zupan, J., and Lancet Neonatal Survival Steering Team. (2005). 4 million neonatal deaths: when? Where? Why? *The Lancet*, 365(9462): 891-900.

Mathews, T. J., Curtin, S. C., and MacDorman, M. F. (2000). Infant mortality statistics from the 1998 period linked birth/infant death data set. *National vital statistics reports*, 48(12): 1-125.

Muslihatun, W.N. (2010). *Asuhan neonatus bayi dan balita*. Fitramaya, Yogyakarta.

Nwankwo, T. O., Aniebue, U. U., Ezenkwele, E., and Nwafor, M. I. (2013). Pregnancy outcome and factors affecting vaginal delivery of twins at University of Nigeria Teaching Hospital, Enugu. *Nigerian journal of clinical practice*, 16(4).

Oza, S., Cousens, S. N., and Lawn, J. E. (2014). Estimation of daily risk of neonatal death, including the day of birth, in 186 countries in 2013: a vital-registration and modeling-based study. *The Lancet Global Health*, 2(11): e635-e644.

Singh, A., Yadav, A., and Singh, A. (2012). Utilization of postnatal care for newborns and its association with neonatal mortality in India: an analytical appraisal. *BMC pregnancy and childbirth*, 12(1): 33.

Singh, K., Brodish, P., and Haney, E. (2014). Postnatal care by provider type and neonatal death in sub-Saharan Africa: a multilevel analysis. *BMC public health*, 14(1): 941.

Slyker, J. A., Patterson, J., Ambler, G., Richardson, B. A., Maleche-Obimbo, E., Bosire, R., ... and John-Stewart, G. (2014). Correlates and outcomes of preterm birth, low birth weight, and small for gestational age in HIV-exposed uninfected infants. *BMC pregnancy and childbirth*, 14(1): 7.

Titaley, C. R., Dibley, M. J., Agho, K., Roberts, C. L., and Hall, J. (2008). Determinants of neonatal mortality in Indonesia. *BMC public health*, 8(1): 232.

Titaley, C. R., and Dibley, M. J. (2012). Antenatal iron/folic acid supplements, but not postnatal care, prevent neonatal deaths in Indonesia: analysis of Indonesia Demographic and Health Surveys 2002/2003–2007 (a retrospective cohort study). *BMJ Open*, 2(6): e001399.

UNDP.(2014). *Human development report 2014: Sustaining human progress: Reducing vulnerabilities and building resilience*. United Nations Development Programme, New York.

UNICEF.(2014). *Committing to Child Survival : A Promise Renewed*. United Nations Children's Fund, New York.

UNICEF, WHO, World Bank, and UN Population Division.(2014). *Levels and Trends in Child Mortality 2014*. New York, USA : UNICEF, WHO, World Bank, & UN Population Division.

WHO.(2015). *Pregnancy-related complications* [WWW Document]. WHO. Available at: http://www.who.int/ surgery/challenges/esc_pregnancycomp/en/ (accessed 6.16.15).

WHO.(2014a). *WHO recommendations on the postnatal care of the mother and newborn*. World Health Organization, Geneva.

WHO.(2014b). *World Health Statistic 2014*. World Health Organization, Geneva.

WHO.(2011). *WHO | PMNCH Fact Sheet: RMNCH Continuum of care* [WWW Document]. WHO. Available at: http://www.who.int/pmnch/about/ continuum_of_care/en/ (accessed 7.12.18).

Yego, F., Williams, J. S., Byles, J., Nyongesa, P., Aruasa, W., and D'Este, C. (2013). A retrospective analysis of maternal and neonatal mortality at a teaching and referral hospital in Kenya. *Reproductive health*, 10(1): 13.