Trends of Neonatal Mortality and Factors Related with Neonatal Mortality Among Neonates admitted to the Neonatal Care Unit of Fatima Al Zahraa Hospital in Baghdad During 2017

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ABSTRACT:

BACK GROUND:

The neonatal mortality rate is a key outcome indicator for newborn care and directly reflects prenatal, natal, and postnatal care. Early neonatal deaths are more closely associated with pregnancy related factors and maternal health, whereas late neonatal deaths are associated more with factors in the newborn`s environment.

OBJECTIVE:

To find out the neonatal mortality rate and to identify the factors related with neonatal mortality among neonates admitted in the Aseptic Neonatal Care Unit of Fatema AL Zahraa Hospital.

METHODS:

A cross - sectional hospital-based study was done depending on data collected from records of the Aseptic Neonatal Care Unit (ANCU) of Fatema AL Zahraa Hospital in Baghdad, to find out the number of deaths within the neonatal period (0-28 days) that was conducted from 1st of Jan 2017 to 31st of Dec 2017. Data was also, collected from Obstetrical Ward to determine the number of live births for the same period. The data was collected by using special form including; the number of deaths in neonatal period, cause of death, neonatal gender, gestational age, birth weight, mother`s age, educational level, history of congenital anomaly in previous pregnancy , antenatal care, parity, consanguinity, type of delivery, pregnancy outcome, total number of live births, and history of medical disease during pregnancy .

RESULTS:

The Neonatal Mortality Rate (NMR) was 14.37 per 1000 live birth. NMR was very high among low-birth-weight preterm infants, (50%) of mothers completed the primary school, (71.89 %) of mothers had positive history for Consanguinity,15% of mothers had positive history of congenital anomaly in previous pregnancy,(70.41%) of mothers were in the (20-35 years) age group. Normal vaginal delivery (NVD) in (63.01%) of cases. The most common cause of neonatal deaths in the preterm delivery was respiratory distress syndrome (RDS), and in the full term delivery was asphyxia.

CONCLUSION:

The neonatal mortality rate was 14.37 per 1000 live birth. The maternal and neonatal demographic data that were related with increased NMR were prematurity, lack of antenatal care, multipara mother, repeated CS, mother`s hypertension, and consanguineous marriage.

KEYWORDS: neonatal mortality, prematurity, antenatal care, grand multipara, caesarean section, consanguinity.

INTRODUCTION:

About 2.7 million neonatal deaths occurred globally, most of which could have been prevented with optimal care. [1] Although neonatal mortality is decreasing, the rate of reduction has been slower than that observed for under-5 mortality [2, 3] and neonatal deaths now constitute 45% of all deaths in children younger than 5 years.[4]

In addition, 2.6 million babies die in the last 3 months of pregnancy or during childbirth (stillbirths) and 303,000 maternal deaths occur each year. We have the knowledge and

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tools to prevent at least two-thirds of these deaths [5].

Measuring levels, trends and causes of maternal, neonatal and fetal mortality are important for understanding priority areas for interventions and tracking the success of interventions at the global, national, regional and local level [6].

Globally the main causes of newborn deaths are prematurity and low-birth-weight, infections, asphyxia (lack of oxygen at birth) and birth trauma. These causes account for nearly 80% of deaths in this age group. [7-9]

The offspring of consanguineous parents are at an increased risk of preterm birth, decreased anthropometric measurements, congenital defects and mortality. [10]

In grand multipara pregnancy, both the woman and the fetus are at a greater risk during pregnancy and labor, because there is an increase in antenatal and intra-partum maternal complications. [11]

Male sex is a risk factor for neonatal deaths and it has been suggested that male fetuses are also more vulnerable to stressors in uterus. [12-14]

Cesarean delivery is lifesaving for obstructed labor and other emergency obstetrical conditions, however, as a surgical procedure, there are risks of complications and overuse can be harmful to both mothers and neonates. Moreover Cesarean delivery rates in many countries are high. [15-17]

Hypertension in pregnancy (HIP) is one of the leading causes of maternal and perinatal morbidity and mortality. [18, 19]

This study aimed to find out the neonatal mortality rate, and to identify the factors related with neonatal mortality among neonates admitted at the Aseptic Neonatal Care Unit of Fatema AL Zahraa Hospital.

METHODS:

A cross – sectional hospital-based study was done depending on data collected from records of the ANCU of Fatema AL Zahraa Hospital in Baghdad {ANCU: is receiving and admitting newborns that were delivered in Obstetrical Ward of Fatema AL Zahraa Hospital immediately after birth}, to figure out the number of deaths within the neonatal period (0-28 days), that was conducted from 1st of Jan 2017 to 31st of Dec 2017. Data was also, collected from Obstetrical Ward to find out the number of live births for the same period. Hospital records were abstracted for information on any medical conditions the mothers exhibited at the time of admission, mode of delivery, and inter-partum complications, as well as the condition of the baby, including; number of deaths in neonatal period, cause of death, neonatal gender, gestational age , and birth weight, mother`s age, educational level, history of congenital anomaly in previous pregnancy, antenatal care, parity, consanguinity, type of delivery, pregnancy outcome, total number of live births, and mother`s history of medical disease during pregnancy like Hypertension and Diabetes Mellitus.

Then NMR is calculated, according to the method recommended by World Health Organization (WHO), 2006.Neonatal mortality rate is the number of resident newborns in a specified geographic area (country, state, county, etc.) dying at less than 28 days of age divided by the number of resident live births for the same geographic area (for a specified time period, usually a calendar year) and multiplied by 1000. [20]

Low birth weight (LBW) is defined by the World Health Organization as a birth weight of an infant of 2,499 g or less, regardless of gestational age. Subcategories include very low birth weight (VLBW), which is less than 1500 g, and extremely low birth weight (ELBW), which is less than 1000 g. Normal weight at term delivery is 2500–4200 g. [20]

Preterm birth, also known as premature birth, is the birth of a baby at fewer than 37 weeks gestational age. [20]

Perinatal asphyxia is a condition in the neonate where there is lack of oxygen and lead to acidosis and failure of function of at least two organs (may include lung, heart, liver, brain, and kidneys) [21].

Respiratory distress syndrome (RDS): an acute lung disease related to immaturity of the lungs and, specifically, surfactant deficiency. Diagnosis of RDS is by clinical presentation, including recognition of risk factors; blood gas analysis showing hypoxemia and hypercapnia; and Chest x-ray shows diffuse atelectasis (a ground-glass appearance with visible air Broncho gram). [22]

Anemia in pregnancy is defined as a hemoglobin concentration of less than 110 g/L (less than 11 g/dL) in venous blood. [23]

Hypertension in pregnancy: include chronic hypertension (ie, preexisting hypertension), gestational hypertension (ie,hypertension that develops after 20 weeks' gestation), and/or preeclampsia/eclampsia (gestational hypertension with proteinuria and/or other target organ involvement), hypertension is defined as having a blood pressure greater than 140/90 mm Hg.[24, 25]

Antepartum hemorrhage (APH) is defined as bleeding from or in to the genital tract, occurring from 24+ weeks of pregnancy and prior to the birth of the baby. [26]

Urinary tract infections (UTIs): UTIs include acute cystitis, pyelonephritis and asymptomatic bacteriuria (positive urine culture in an asymptomatic woman).

Inclusion criteria: all neonatal deaths weighing 500 grams and above, dying at less than 28 days of age, at the ANCU.

Exclusion criteria; stillbirths were excluded. Stillbirth is fetal death at or after 24 weeks of pregnancy . It results in a baby born without signs of life. [27]

Birth weight was measured to the nearest 50 g using pan-type spring scales. Gestational age was estimated from the date of the last menstrual period.

Data was analyzed using Statistical Package for Social Science 16.0. Descriptive statistics such as (frequency, percentage, mean and standard deviation) were used in order to describe the data. Significance was defined as P value ≤0.05.

Ethical approval for this study was secured from Internal Review Board at the ANCU of Fatema AL Zahraa Hospital. Permission letter for conducting the research was obtained from AL Rusafa health director.

RESULTS:

Between 1st Jan 2017 and 31st Dec 2017 in Fatema Al zahraa hospital, there were 23518 births, 2548 neonates were admitted to the ANCU, 1668 were full term , and 880 were preterm neonates. It was found that 83 full terms and 255 preterm died in the first week of life. The NMR was 14.37 per 1000 live birth. The neonatal mortality, by birth weight and length of gestation, is shown in table (1&2). As expected, NMR was very high among low-birth-weight preterm infants, and decreased exponentially with increasing birth weight and gestational period.

Table 1: Numbers and percentage of neonatal deaths by gestational age.

Gestational age	Number	Percentage
Less than 37 weeks	255	75.4
37 week and above	83	24.6
Total	338	100

Table 2: Numbers and percentage of neonatal deaths by body weight in grams.

Body weight in grams	No.	Percentage
Less than 1000 gram	54	15.98
1000-1499 gram	72	21.30
1500-2499 gram	108	31.95
2500 gram and above	104	30.77
Total	338	100

There were 168(49.70%) male neonate and 170 (50.29%)female .Male to female ratio 1:1.1.

The mother's age mean in years, was 25.3±6.7, gestational age in weeks mean was 32.5 ± 4.2, age of the baby at death in hours mean was 35.6 ±43.8.

Regarding mother`s educational level: 118 (34.91%) were illiterate, 169 (50%) completed the primary school, 45(13.31%) completed the intermediate school. Two hundred forty three (71.89%) mothers had positive history for consanguinity. Positive history of congenital anomaly in previous pregnancy in 15%of mothers. Regarding mother`s age, 62(18.34%) of mothers were in the(less than 20 years) age group, 238(70.41%) of mothers were in the (20-35 years) age group, and 38(11.24%) of them were in the age group (more than 35 years).

Sixty seven mothers (19.82%) were primipara, but 271(80.17) were multipara. Two hundred forty six mothers (72.78%) had received antenatal care. Normal vaginal delivery (NVD) in 213(63.02%). Cesarean section (CS) in 125(36.98%) of cases. Four pregnancies were twins, and the others were singletons.

Table 3: Neonatal death according to mother`s health status during delivery.

mother`s health status:	No. of neonatal death	Percent
Mother`s Hypertension	61	18.04
Previous CS	59	17.46
Ante partum hemorrhage	42	12.43
Mother`s Anemia	37	10.95
Urinary tract infection	32	9.47
Fetal Malpresentation	33	9.76
Mother `s diabetes mellitus	15	4.44
Meconium stained liquor	3	0.89
None of them	56	16.57
Total	338	100

The most common causes of neonatal deaths in the preterm delivery were: ELBW 54(21.18%), respiratory distress syndrome (RDS) 135(52.94%), multiple Congenital abnormality 45(17.65%), asphyxia 8 (3.13%), and sepsis in 13(5%) of cases.

The most common causes of neonatal deaths in the full term delivery were asphyxia 37(44.58%), multiple Congenital abnormality 23(27.71%), RDS 13(15.66%), and sepsis 10 (12.05%) of cases.

When we calculate the most common causes for the 338 neonate term and preterm, we found that RDS 148(43.79%), multiple congenital abnormality 68(20.11%), ELBW 54(15.98%), asphyxia 45(13.31%), and sepsis in 23(6.80%) of cases.

Regarding the mother`s health status before and during delivery, mother`s previous CS associated with 59 (17.46%) of neonatal deaths, fetal malpresentation contribute to 33(9.76%) of cases. Mother`s anemia, mother`s hypertension, mother`s diabetes mellitus (DM) and mother`s urinary tract infection were associated with 37(10.95%), 61(18.04 %), 15(4.44%), and 32 (9.47%) of neonatal deaths respectively. Ante partum hemorrhage contributes to 42(12.43%) of early neonatal deaths. Table3.

The most common causes to do CS were, previous CS in 59(47.2%), labor failure to progress in 35(28%), breach presentation 14(11.2 %), APH 8(6.4%), hypertension 4(3.2%), meconium stained liquor 2(1.6%), DM 1(0.8%), and twin 2(1.6%) of cases.

The study found that the factors related to increased neonatal mortality rate were: prematurity (low birth weight p value 0.01 and low gestational age p value 0.01), multipara mother p value 0.01, repeated CS p value 0.04, mother`s hypertension p value 0.04, lack of antenatal care p value 0.02, and consanguineous marriages p value 0.03. Significance was defined as P value ≤ 0.05, Table4.

Table 4: The relation of neonatal and obstetrical variables with early neonatal deaths: (*not significant).

Correlation between neonatal deaths and	P value(significance)
Male baby	0.21*
Low birth weight	0.01
Low Gestational age	0.01
Neonatal age at death time	0.72*
Mother's Education level	0.31*
Repeated CS	0.04
Lack of antenatal care	0.02
multipara mother	0.01
Consanguineous marriages	0.03
Mother`s age	0.72*
Mother`s hypertension	0.04

DISCUSSION:

The neonatal mortality rate was 14.37 per 1000 live birth. The value for NMR (per 1,000 live births) in Iraq, in 2017 was 17.1.As over the past 33 years this indicator reached a maximum value of 30.10 in 1983 and a minimum value of 17.1 in 2017.[28,29] . Our result was consistent with Al-Muhsen A E in Missan [9]. But better than Kujala S, et al. in Uganda, when they found the NMR was 26 per 1000 live birth. [13]

We found that there were 5 causes mainly including RDS 43.78%, congenital anomalies 20.11%, ELBW 15.97%, birth asphyxia 13.31%, and neonatal sepsis 6.8%. Our result were in line with other studies, Shefali Oza, et al. (2), Al-Muhsen A E in Missan, (9), Azize P, et al. in Sulaimania [30], HJ Mahmood in Mosel,[31].

The current study found that more than 37.27% of the early neonatal deaths are caused by prematurity who delivered between 25-32 weeks of gestation with low birth weight as the majority was weighed between 0.500 - 1.1499 gm. This result was consistent with studies [2,9,30,31] .

We found that neonatal infection contribute to 6.8% of neonatal deaths. The results were lower than the global rate 14%, (2), and lower than the result found by Chan GJ, et al.{ 23.4% of the neonatal deaths were because of neonatal infection [32]}, but our result was consistent with Azize P, et al. in Sulaimania (30), they found that sepsis caused 7.4% of neonatal deaths. This may be explained by that this study was calculating the neonatal deaths in Aseptic NCU in which there is less risk of neonatal sepsis.

The current study found that the higher early neonatal death 70.41% were happening amongst mothers aged between 20 -35 years and the mean age of the mothers was (25.3± 6.7) years. Therefore, there is no significant association between younger mother's age and neonatal causes of death, we think this was because younger mothers(less than 20 years) age group, have a good access to cesarean delivery in emergency situations in our hospital .Our result was consistent with Azize P, et al. in Sulaimania [30], but the result was inconsistent with other study, Anggondowati T, et al.[33], Delprato M, Akyeampong K. [34], Fonseca SC, et al. [35], when they found that younger mother`s age group was associated with increased NMR.

We also observed differences between gravidity (primi and multipara) in terms, of early neonatal death and reported that almost 63.17% of the early deaths happened in multipara, who delivered mostly with normal vaginal delivery. Other studies consistent with our result were, Mondal D, et al. (12), Anggondowati T, et al. [33], Delprato M, Akyeampong K. [34].

The current study found that repeated CS was the main primary obstetric events that led to early neonatal deaths in 17.45% pregnancies. The result was consistent with others, Molina G, Weiser T, Lipsitz S, et al. 2015 (15), and Ghaedmohammadi Z, et al. in Iran. (16)

Mother`s Hypertension was the main health problem associated with increased neonatal mortality rate (18.04%), this result was consistent with other studies, Nathan H.et al. in South Africa (18), Browne JL, et al. 2015. (19).

There were no association between NMR and mother`s educational level in this study, this was inconsistent with Fonseca SC et al 2017, when they found that neonatal mortality rate was higher in newborns of mothers with low educational levels [35], and Sosnaud, Benjamin . 2017, when they found that infants whose mothers received less than 12 years of education are, more than twice as likely to die as those born to college educated mothers (36). We think our result was because the local society didn't allow the female to continue their study after the primary school so most of the mothers were in the same educational level.

The association of lack of antenatal care with a high risk of neonatal mortality has been noted in previous studies, Blencowe H, et al. 2016, and Roy R, Vernekar M. 2017 (6,11). In our study, lack of check-ups for pregnancy complications, unskilled antenatal care provision were associated with neonatal mortality. This result was consistent with other studies, Arunda M, Emmelin A, Asamoah BO, in Kenya [37], and Iqbal S. in Pakistan 2017 (38). If it is assumed that this relationship is causative, substantial improvement in neonatal mortality can occur by enhancing coverage of antenatal care.

CONCLUSION:

The neonatal mortality rate was 14.37 per 1000 live birth. It was found that there were 5 causes for neonatal mortality mainly including: RDS, extremely low birth weight, congenital anomalies, birth asphyxia, and neonatal sepsis. The maternal and neonatal demographic data that were associated with increased neonatal mortality rate were prematurity, lack of ANC, multipara mother , repeated CS, mother`s hypertension, and consanguineous marriage .

Recommendations:

Antenatal care can potentially serve as a platform to deliver interventions to improve maternal nutrition, promote behavior change to reduce

harmful exposures and risk of infections, screen for and treat risk factors.

Encourage skilled attendance at birth, improving intrapartum monitoring for fetal distress. Training health professionals or other individuals to perform neonatal resuscitation.

A special effort must be made to direct women identified as high risk to the hospitals able to care for them, in facilities with rapid access to comprehensive emergency obstetric and neonatal care capabilities.

REFRENCES:

1. Levels and trends in child mortality – report 2013. Estimates Developed by the UN Inter-agency Group for Child Mortality Estimation. New York: UNICEF; 2013.
2. Shefali Oza , Joy E Lawn , Daniel R Hogan , Colin Mathers & Simon N Cousens. WHO | Neonatal cause-of-death estimates for the early and late neonatal periods for 194 countries: 2000–2013 [Internet]. Who.int. 2018. Available from: http://www.who.int/bulletin/volumes/93/1/14-139790/en/
3. Lawn J, Blencowe H, Oza S, You D, Lee A, Waiswa P et al. Every Newborn: progress, priorities, and potential beyond survival. The Lancet. 2014; 384:189-205.
4. UNICEF, World Health Organization, World Bank Group, United Nations. Levels & Trends in Child Mortality 2015. UNICEF, World Health Organization, World Bank Group, United Nations: New York, 2015.
5. Victora CG, Requejo JH, Barros AJD *et al*. Countdown to 2015: a decade of tracking progress for maternal, newborn, and child survival. *Lancet* 2015;385: 466–76.
6. Blencowe H, Calvert, PhD C, Lawn J, Cousens S, Campbell O. Measuring maternal, foetal and neonatal mortality: Challenges and solutions. Best Practice & Research Clinical Obstetrics &Gynaecology. 2016;36:14-29.
7. Mengesha HG, Sahle BW. Cause of neonatal deaths in Northern Ethiopia: a prospective cohort study. BMC public health. 2017;17:62.
8. Newborns: reducing mortality [Internet]. World Health Organization. 2018 . Available from: http://www.who.int/en/news-room/fact-sheets/detail/newborns-reducing-mortality.
9. Al-Muhsen A E. Neonatal Mortality Rate in Aseptic Neonatal Care Unit of Al-Sadder Teaching Hospital in Missan Province From 2011 to 2014. European Scientific Journal. 2016; 12.
10. Abbas H, Yunis K. The Effect of Consanguinity on Neonatal Outcomes and Health. Human Heredity. 2014;77:87-92.
11. Roy R, Vernekar M. Feto-maternal outcome in grand multipara. International Journal of Reproduction, Contraception, Obstetrics and Gynecology. 2017; 6:2846.
12. Mondal D, Galloway TS, Bailey TC, Mathews F. Elevated risk of stillbirth in males: systematic review and meta-analysis of more than 30 million births. *BMC Med* 2014:12: 220.
13. Kujala S, Waiswa P, Kadobera D, Akuze J, Pariyo G, Hanson C. Trends and risk factors of stillbirths and neonatal deaths in Eastern Uganda (1982-2011): a cross-sectional, population-based study. Tropical Medicine & International Health. 2016; 22:63-73.
14. Mishra S, Ram B, Singh A, Yadav A. Birth Order, Stage of Infancy and Infant Mortality in India. Journal of Biosocial Science. 2017;50:604-25.
15. Molina G, Weiser T, Lipsitz S, Esquivel M, Uribe-Leitz T, Azad T et al. Relationship Between Cesarean Delivery Rate and Maternal and Neonatal Mortality. JAMA. 2015;314:2263.
16. Ghaedmohammadi Z, Anaraki A, Khajeian A, Khajehian M, Ostovar A. Association of caesarean section and neonatal death: a population-based case–control study in Islamic Republic of Iran. Eastern Mediterranean Health Journal. 2015;21:266-72.
17. Arlier S, Seyfettinoğlu S, Yilmaz E, Nazik H, Adıgüzel C, Eskimez E et al. Incidence of adhesions and maternal and neonatal morbidity after repeat cesarean section. Archives of Gynecology and Obstetrics. 2017; 295:303-11.
18. Nathan HL, Seed PT, Hezelgrave NL, De Greeff A, Lawley E, Conti-Ramsden F, et al. Maternal and perinatal adverse outcomes in women with pre-eclampsia cared for at facility-level in South Africa: a prospective cohort study. Journal of global health. 201;8.
19. Browne JL, Vissers KM, Antwi E, Srofenyoh EK, et al. Perinatal outcomes after hypertensive disorders in pregnancy in a low resource setting. Tropical medicine & international health. 2015;20:1778-86.
20. Sinha S, Miall L, Jardine L. Essential neonatal medicine. 6th ed. Hoboken, NJ: John Wiley & Sons Inc.; 2018;1:15.

21. Qureshi AM, Rehman A, Siddiqi TS. Hypoxic ischemic encephalopathy in neonates. Journal of Ayub Medical College Abbottabad. 2010;22:190-93.
22. Hay W, Levin M, Deterding R, Abzug M. CURRENT Diagnosis & Treatment Pediatrics. 21st ed. New York: The McGraw-Hill Companies, Inc.; 2012;2: 29.
23. Heidkamp R, Guida R, Phillips E, Clermont A. The Lives Saved Tool (LiST) as a model for prevention of anemia in women of reproductive age. The Journal of nutrition. 2017;147:2156S-62S.
24. Cunningham F, Leveno K, Bloom S, Spong C, Dashe J, Hoffman B et al. Williams obstetrics. New York: McGraw Hill Medical; 2014;40:747 .
25. Magee L A, Pels A, Helewa M. et al. Diagnosis, evaluation and management of the hypertensive disorders of pregnancy.*Pregnancy Hypertension*. 2014; 4:105-45.
26. http://busog.org.uk/wp-content/uploads/2013/01/Antepartum-Haemorrhage.pdf). Busog.org.uk. 2018 [cited 13 Nov. 2018].
27. "Stillbirths". World Health Organization. Archived on 2016-10-02. Retrieved 2016-09-29.
28. WHO EMRO | Iraq | Data and statistics | Child and adolescent health [Internet]. Emro.who.int. 2018. Available from: http://www.emro.who.int/child-adolescent-health/data-statistics/iraq.html.
29. Iraq Neonatal mortality rate, 1960-2017 - knoema.com . [cited 14 November 2018]. Available from: https://knoema.com/atlas/Iraq/Neonatal-mortality-rate).
30. Azize P, Muhammad L, Kareem N. The causes of early neonatal death in Sulaimani Intensive Care Unite at Maternity Teaching Hospital between Jan 2016 - Feb 2017. Kurdistan Journal of Applied Research. 2018;2:121-27.
31. HJ. Mahmood, SJ. Sulaiman, "Assessment Of Factors Causing Mortality Rate Of Neonate In Al- Batool Teaching Hospital In Mosul City," Journal of Kufa for Nursing Science. 2013;3:1-6.
32. Chan GJ, Lee AC, Baqui AH, Tan J, Black RE. Risk of early-onset neonatal infection with maternal infection or colonization: a global systematic review and meta-analysis. PLoS medicine. 2013;10:e1001502.
33. Anggondowati T, El-Mohandes AA, Qomariyah SN, Kiely M, Ryon JJ, Gipson RF, Zinner B, Achadi A, Wright LL. Maternal characteristics and obstetrical complications impact neonatal outcomes in Indonesia: a prospective study. BMC pregnancy and childbirth. 2017;17:100.
34. Delprato M, Akyeampong K. The Effect of Early Marriage Timing on Women's and Children's Health in Sub-Saharan Africa and Southwest Asia. Annals of Global Health. 2017;83:557.
35. Fonseca SC, Flores PV, Camargo Jr KR, Pinheiro RS, Coeli CM. Maternal education and age: inequalities in neonatal death. Revista de saude publica. 2017;17:51:94.
36. Sosnaud, Benjamin. "Inequality in Infant Mortality: Cross-State Variation and Medical System Institutions," Social Problems, October 2017, doi: 10.1093/socpro/spx034.
37. Arunda M, Emmelin A, Asamoah BO. Effectiveness of antenatal care services in reducing neonatal mortality in Kenya: analysis of national survey data. Global health action. 2017; 10:1328796.
38. Iqbal S, Maqsood S, Zakar R, Zakar MZ, Fischer F. Continuum of care in maternal, newborn and child health in Pakistan: analysis of trends and determinants from 2006 to 2012. BMC health services research. 2017; 17.