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SHORT-TERM OUTCOMES OF NEONATAL RESUSCITATION AMONG NEW-BORNS AT NAKURU LEVEL FIVE HOSPITAL, KENYA

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Abstract
The goal is to determine immediate outcomes of neonatal resuscitation among new-borns born at Nakuru Level Five Hospital. Prospective study was used to determine the immediate outcomes of neonatal resuscitation where sixty resuscitated new-borns were recruited into the study and followed up for a period of one month. The study revealed that however there was no significant difference between babies who died and those alive in terms of gender, birth weight, maternal age, parity and mode of delivery ($p>0.05$). The study concluded that there are still new-borns that survive but live with complications. The study recommended that primigravidas and mothers below 20 of age should be assessed for pelvic adequacy and intervention made in time and referrals should be done early enough so as to improve their intrapartal outcomes.

Key terms: Neonatal resuscitation, immediate outcomes, intrapartum.

1.0 INTRODUCTION

An estimated 90 per cent of births make an easy transition from intrauterine life to extra uterine life. The remaining 10 per cent will need help to establish effective ventilation. Evidence has shown that basic resuscitation involving the use of bag and mask ventilation is sufficient to for most of these babies (6-8%) who could be saved through resuscitation in low resource setting (Zaichkin et al., 2011). In their book "Defining best practice in low resource setting" Newton and English, concluded that resuscitation could be possible in low resource settings as long as the staff are skilled in resuscitation and the right equipment for resuscitation are available. This may prevent 30 per cent of deaths of full term babies with intra-partum related events as well as 5-15 per cent of deaths due to preterm deaths. "Therefore universal application of basic resuscitation may save hundreds of thousands of new-born lives currently lost each year and contribute significantly to progress towards millennium development goal 4" (Newton & English, 2006).

According to this study, to achieve impact the challenge is to improve obstetric care and provide universal coverage of basic resuscitation where resources are limited and where many even most babies are born at home. A study by Little et al. (2010) titled "Neonatal resuscitation, a global challenge concluded that a "noteworthy concern is whether better resuscitation improvements in care may increase the number of new-borns who survive but are impaired. There is a dearth of follow-up data on new-borns that required resuscitation in low resource setting and middle income countries and particularly from community setting to find out the outcomes of resuscitation".

Globally, about one quarter of all neonatal deaths are caused by birth asphyxia. These deaths can be prevented if effective resuscitation is given at birth (WHO, 2009). The International Liaison Committee on Resuscitation (ILCOR) published consensus on science and treatment for neonatal resuscitation. It was however found that those recommendations were not suitable for resource limited settings. The need for clinical guidelines on basic clinical resuscitation suitable for limited resource settings is universally recognized. Studies conducted in six African Countries by National Service provision assessments showed that only 2-12 per cent of personnel conducting births in facilities had been trained on neonatal resuscitation and only 8-22 per cent of facilities had equipment required for new-born respiratory support (Lawn et al., 2007). It is agreeable that limited health services constitute a major determinant in perinatal mortality" but there is a concern that these deaths could be due to less apparent, potentially preventable factors" (Stanton et al., 2006). According to WHO it is estimated that each year 99 per cent of neonatal deaths occur in developing countries. Studies done in Malawi 2011 reveal that, nearly 1 in every 4 neonatal deaths is as a result of neonatal asphyxia. Despite efforts by WHO to give guidelines for neonatal resuscitation, Neonatal mortality still has a slow decline. According to (KNBS, 2014),The Kenya Demographic Health Survey revealed that the neonatal mortality rate stood at 27.3/1000 live births. In Nakuru Level 5 Hospital unpublished data, shows perinatal mortality rate was 68/1000 in a retrospective study conducted between Jan 2004 to Dec 2011. There is a dearth of follow-up data on new-borns who received resuscitation in low resource settings and middle income countries and particularly from community settings as well as a dearth in the outcomes of these resuscitated new-borns. It is a noteworthy concern to find out whether better resuscitation and improvement of care may increase the number of new-borns who survive but are impaired (Little et al., 2010). This study therefore aims to determine immediate outcomes of neonatal resuscitation among new-borns born at Nakuru Level Five Hospital.

2.0 LITERATURE REVIEW

The most important cause of preventable cerebral injury occurring in the neonatal Period is birth asphyxia. Full recovery may not occur and many children are left with lifelong neurological impairment and in some cases, incapacitating disability. This creates a great burden for the family, as well as for the society. According to World Health Organization estimates, in the developing countries 3 per cent of all infants (3.6 millions) suffer from moderate to severe birth asphyxia, of which 23 per cent (840,000) die and approximately the same number develop serious sequelae yearly. It is therefore better to prevent rather than treatment.

According to WHO, 4 million neonatal deaths are attributed to birth asphyxia, which represents 38 per cent of all deaths of children under 5 years of age. In low-income countries 23 per cent of all neonatal deaths occurred due to birth asphyxia. , Asphyxia is also one of the leading causes of neonatal deaths within first week of life, according to a survey conducted by WHO in 2005. It is strongly associated with 1.1 million intrapartum stillbirths and long-term neurological disability and impairment. According to WHO classification of diseases ICD10, Severe birth asphyxia is when the APGAR score at 1 minute is 0–3. Mild and moderate birth asphyxia is when Apgar score at 1 minute is 4-7. Asphyxia is a condition that occur when there is an impairment of blood-gas exchange, resulting in hypoxemia (lack of oxygen) and hypercapnia (accumulation of carbon dioxide). The combination of the decrease in oxygen supply (hypoxia) and blood supply (ischemia) results in a cascade of biochemical changes inside the body, whose events lead to neural cell death and brain damage. Continuous asphyxia will also lead to multiple organ systems dysfunction. Birth asphyxia is a serious clinical problem worldwide and contributes greatly to neonatal mortality and morbidity.

Those who survive asphyxia at birth may have chance to develop neurological complications including epilepsy, cerebral palsy and developmental delay. Risk factors of birth asphyxia have been divided into antepartum, intrapartum and fetal. Risk factors include increasing or decreasing maternal age, prolonged rupture of membranes, meconium stained fluid, multiple births, non -attendance for antenatal care, low birth weight infants, malpresentation, augmentation of labour with oxytocin, ante partum haemorrhage, severe eclampsia and pre-eclampsia, ante partum and intrapartum anaemia. The prognosis and severity of the symptoms of child with birth asphyxia depend on the risk factors and management of the patient.

In a study by Lee et al. (2011), almost all (98%) intrapartum-related deaths occur in the first week of life, thus, early neonatal mortality may be a useful proxy measure. In a study involving 98 neonates receiving post resuscitation care, (Burns & Grove, 2010) observed that 61 per cent required assisted ventilation, 45 per cent had renal dysfunction, 27 per cent had abnormal liver functions tests and 53 per cent had low blood pressure. These findings therefore emphasize the need for post resuscitation care. Other complications of which often occur after resuscitation include; encephalopathy, hypothermia, sepsis, hypoxia and hyperexia, neonatal seizures and hypoglycaemia. The health care provider should be swift to identify and manage such complication appropriately.

Various studies indicate that resuscitation and post resuscitation care help reduce intrapartal related deaths, but the rate of neonatal encephalopathy remains unchanged, thus supporting the possibility of an increasing number of surviving babies with disability" (Little et al., 2010). Several studies show no follow-up data on both short and long term outcomes of neonatal resuscitation. Once adequate ventilation and circulation has been established, the new-born should be maintained or transferred to an environment

where close monitoring can be given since they are at risk of deteriorating even after vital signs have stabilized as compared to non-resuscitated new-borns. Post resuscitation management can improve survival and long term outcomes of new-borns following resuscitation (Little et al., 2010).

Out of the four million annual neonatal deaths, ninety-nine percent occur in low-middle income countries where most births occur at home without skilled attendant. Birth asphyxia is defined by the World Health Organization as "the failure to initiate and sustain breathing at birth" and accounts for 23 per cent of neonatal mortality. A substantial proportion (estimated at 26%) of the 1 million annual intrapartum stillbirths result from birth asphyxia. Another one million children who survive birth asphyxia live with chronic neuro-developmental morbidity, including cerebral palsy, mental retardation, and learning disabilities, although there is significant uncertainty regarding this estimate. In 2003, WHO estimated that the number of disability adjusted life years (DALYs) attributed to birth asphyxia surpassed those due to all illnesses preventable by childhood vaccination.

Accurate estimates of the global burden of birth asphyxia are difficult to establish because of limited information, including nearly absent vital registration in communities where the majority of neonatal deaths occur. According to a prospective cross-sectional survey study conducted by, (Ellis et al., 2000), on hospital births in Katmandu, Nepal between 1995-1996 estimated that the perinatal mortality rate attributable to birth asphyxia, based on rates of neonatal encephalopathy and fresh stillbirths, and was 10.8 per 1,000 births, accounting for 24 per cent of perinatal deaths. In the first national perinatal care survey of South African hospitals conducted in 2000, intrapartum-related birth asphyxia accounted for 14.3 per cent of perinatal mortality (asphyxia specific mortality rate: 4.8/1000 births). In rural regions, however, the contribution of asphyxia to perinatal mortality was substantially higher at 26.4 per cent (8.2/1,000 births). These rates may underestimate the scope of the problem, given that in many regions in Southeast Asia and sub-Saharan Africa, over two thirds of births occur at home without a skilled birth attendant, and many neonatal deaths, particularly when they occur early, go unreported.

Finally, in a prospective community-based study of home deliveries in Gadchiroli, India, Bang et al reported the incidence of mild birth asphyxia at 14.2 per cent and severe birth asphyxia at 4.6 per cent, with a 3.7 per cent and 38.5 per cent case fatality rate, respectively. The asphyxia mortality rate was 10.5/1,000 live births in this setting.

3.0 METHODS

A descriptive cross-sectional study was used to assess the knowledge and skills of skilled birth attendants where thirty-six skilled birth attendants were included in the study with various educational levels: Certificate, Diploma and Bachelors. Self-administered questionnaires were used to assess knowledge while simulated resuscitation using mannequins was used to assess the skills. Multiple linear regressions were used to compare the mean differences.

4.0 RESULTS AND DISCUSSIONS

Outcomes of Neonatal Resuscitation

Neonatal resuscitation outcomes is demonstrated in figure 1.

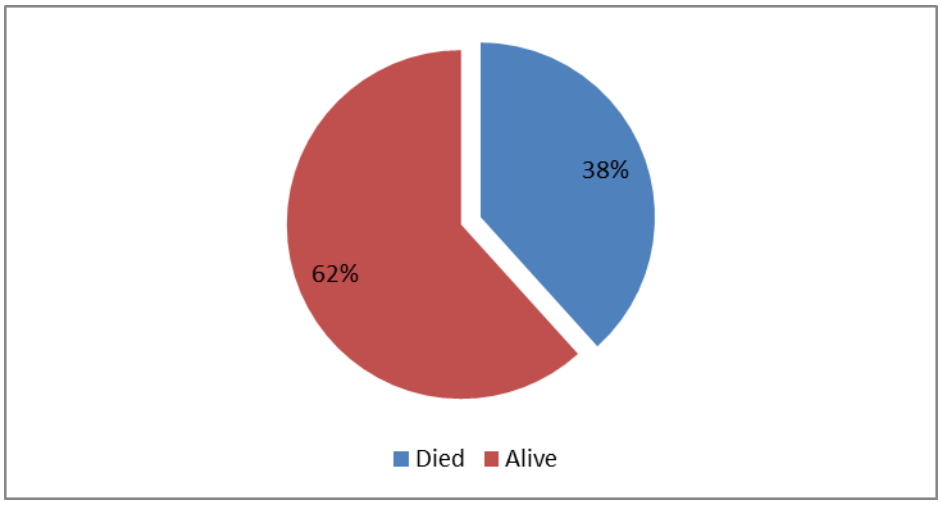

Fig 1: Outcomes of Neonatal resuscitation.

Among new-borns who were resuscitated, 38 per cent of the resuscitated new-borns died during the early neonatal period, while 62 per cent survived with 30(81.08%) being discharged home in stable condition while, 7(18.9%) developed complications as illustrated by figure 1 below.

Gender of the New-borns

The figure 2 below elaborates the new-borns' gender

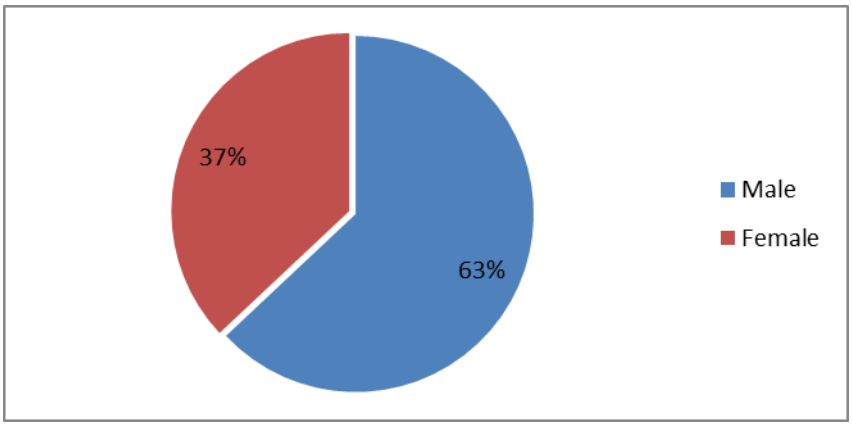

Fig 2: Gender of the New-borns.

Majority of the resuscitated new-borns resuscitated in Nakuru level 5 hospital, 63 per cent were males.

Maternal Age

The figure 3 below illustrates the maternal age.

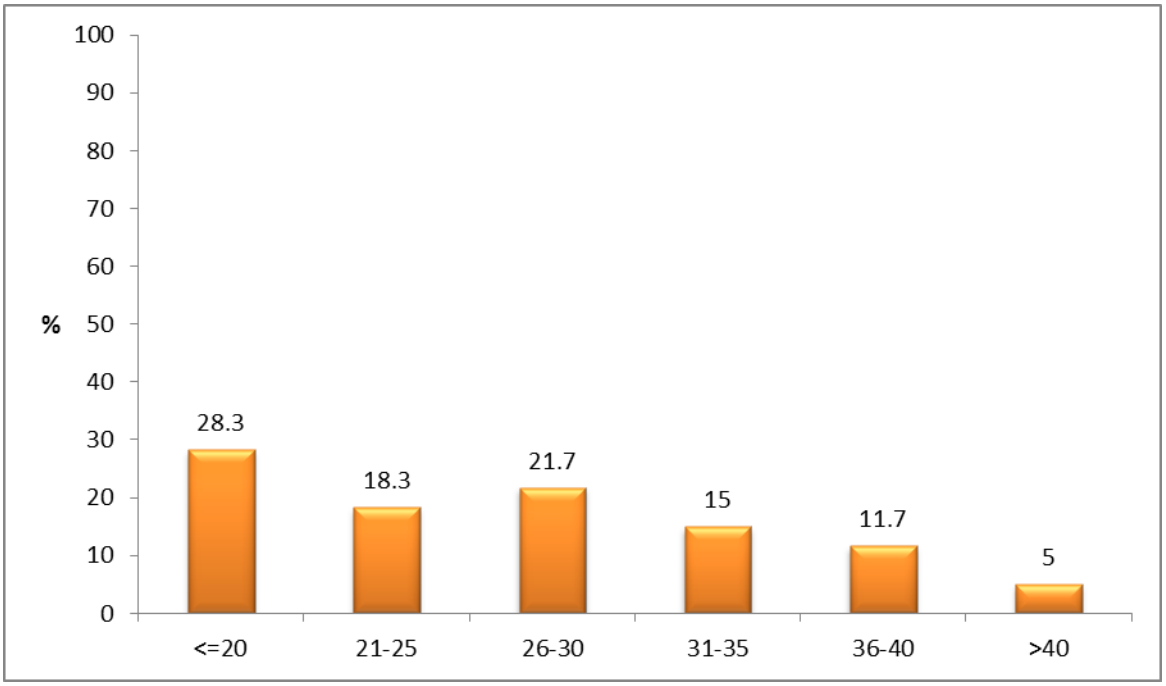

Fig 3: Maternal Age

Majority of the resuscitated new-borns (28.3%) were born of mothers who were less than 20 years of age and only 5 per cent were of mother above 40 years of age, with a Median parity 0(0, 4) with 53.2 being primigravidas.

Factors Associated with Neonatal Resuscitation

The figure below illustrates the factors associated with neonatal resuscitation.

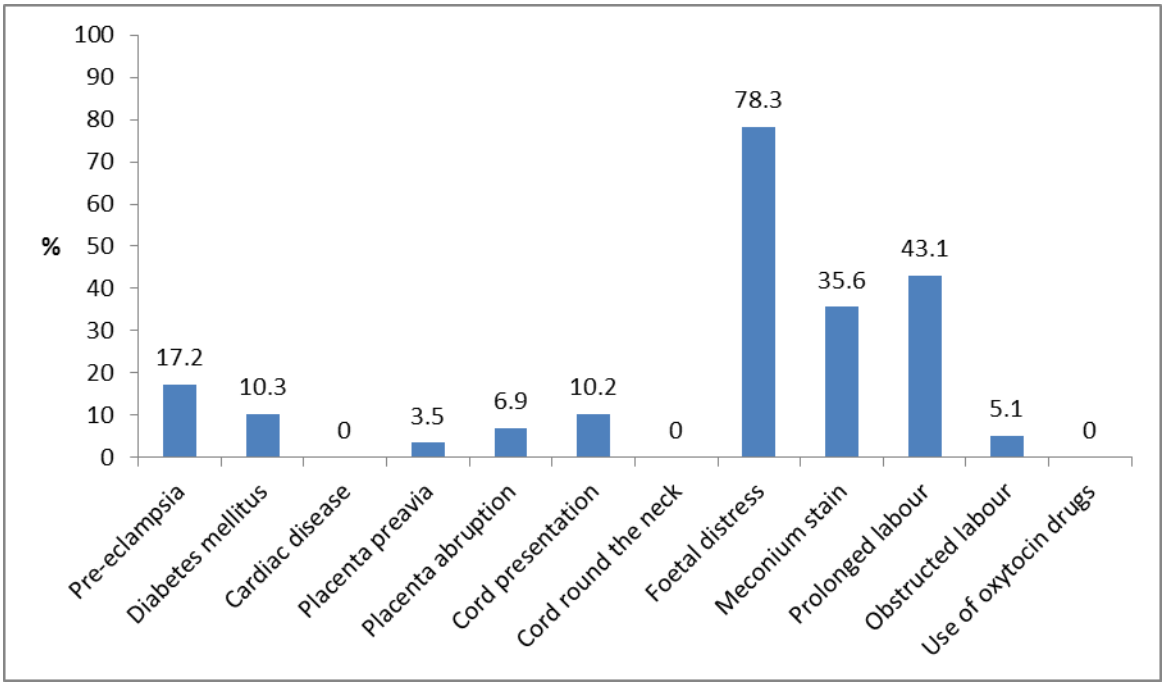

Fig 4: Factors Associated with Neonatal Resuscitation

Factors associated with neonatal resuscitation were (78.3%) fetal distress, prolonged labour (43.1%), meconium stain (35.6%), pre-eclampsia (17.2%), diabetes mellitus (10.3%), cord presentation (10.2%), placenta abruption (6.9%), and obstructed labour (5.1%) with only 3.5 per cent being attributed to Ante partum haemorrhage-placenta praevia as illustrated in figure 4 below.

Birth Asphyxia

Birth asphyxia is elaborated in the figure below.

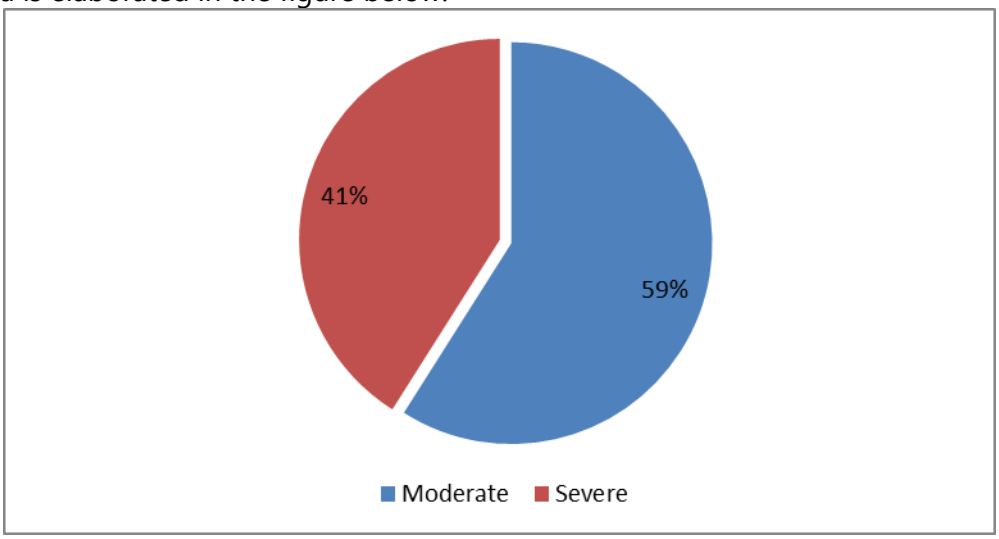

Fig 5: Birth Asphyxia

Babies were followed up twice daily. Note was kept for pallor, cyanosis, apnoea, respiratory distress, level of consciousness, convulsion, muscle tone, abdominal distension GI bleeding, Fifty-nine percent had moderate asphyxia while forty one percent had severe birth asphyxia. A total of 92 per cent of those with severe birth asphyxia succumbed during the early neonatal period.

Mode of Delivery

The figure below elaborates the mode of delivery used.

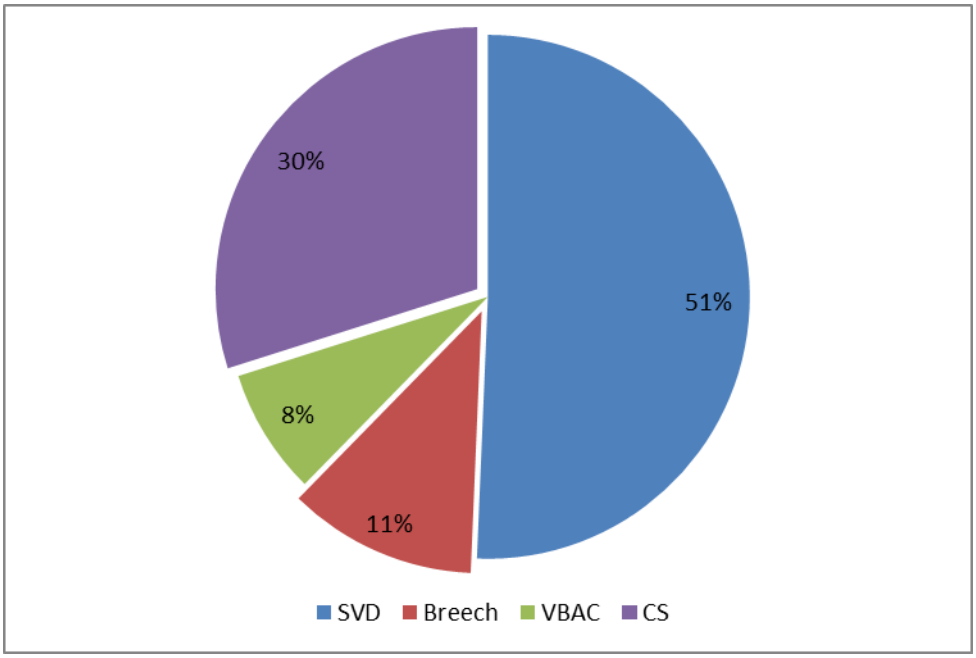

Fig 6: Mode of Delivery

Slightly more than half, 50 per cent, of these resuscitated new-borns were born through SVD, 30 per cent C/S with 19(95%) being emergency CS, with majority 15(78.9 %) of the emergencies being attributed to fetal distress. While 12 per cent and 8 per cent were breech and VBAC deliveries respectively as indicated in Fig. 6 below.

Factors Associated with Outcomes of Neonatal Resuscitation

The researcher analysed demographic data to investigate any associations for neonatal resuscitation including gender, birth weight, maternal age, referral and mode of delivery as shown in table 2.

Table 2: Factors Associated with Neonatal Resuscitation

Factor	Outcome		Statistic	P-value
	Alive	Died		
Baby gender Male Female	 23(60.5%) 14(63.6%)	 15(39.5%) 8(36.4%)	$\chi 2=0.057$	0.811
Birth weight (kg)	27.8(sd 7.4)	25.6(sd 7.8)	t=1.122	0.266

Maternal age	3(sd 2.5)	2.6(sd 2.5)	t=0.588	0.559
Parity	3.2(sd 0.5)	3.2(0.4)	t=0.173	0.863
Mother referred Yes No	 18(51.4%) 19(76%)	 17(48.6%) 6(24%)	 χ2=3.725	 0.054
Mode of delivery Svd Breech Vbac Cs	 16(61.5%) 3(50%) 3(75%) 13(61.9%)	 10(38.5%) 3(50%) 1(25%) 8(38.1%)	 χ2=0.763 	 0.918*

*** Fishers exact**

Thirty-five (58.3%) of the mothers were referrals and a higher proportion of the babies born to these mothers (referrals) 17(48.6%) died compared to only 6(24%) of those who were not referred (χ2=3.725, p=0.054). The ratio of resuscitated new-borns males to females was 2.3: 1.3 respectively. However, there was no significant difference between babies who died and those alive in terms of gender, birth weight, maternal age, parity and mode of delivery (p>0.05) as indicated in table above.

Outcomes of Neonatal Resuscitation

The researcher illustrated the neonatal resuscitation outcomes in the figure below.

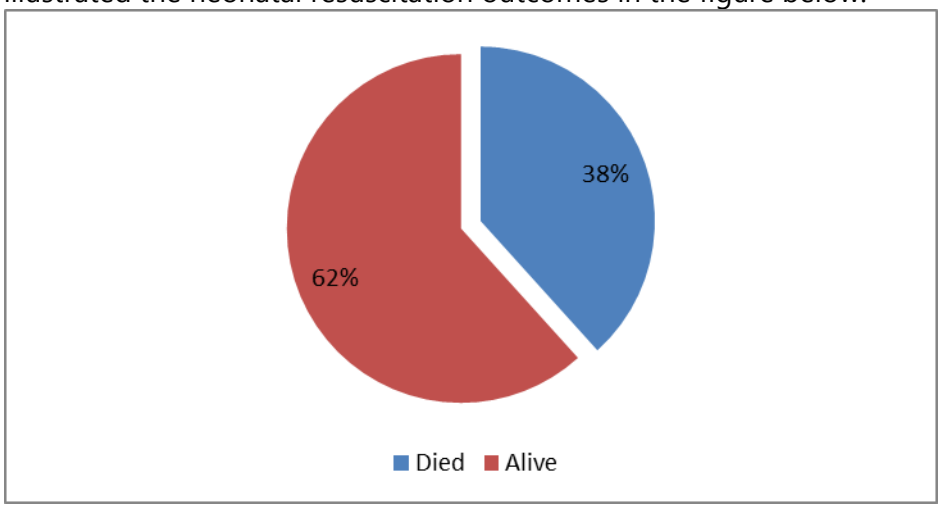

Fig 7: Outcomes of Neonatal Resuscitation

Among new-borns who were resuscitated, 38 per cent of the resuscitated new-borns died during the early neonatal period, while 62 per cent survived with 30(81.08%) being discharged home in stable condition while, 7(18.9%) developed complications as illustrated by figure below.

Gender of the New-borns

The figure below shows the gender of the new-borns.

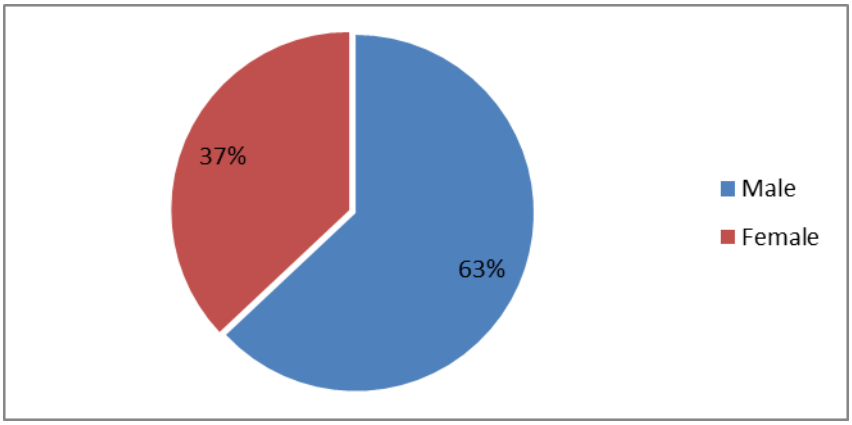

Fig 8: Gender of the New-borns

Majority of the resuscitated new-borns resuscitated in Nakuru level 5 hospital, 63 per cent were males.

Maternal Age

The figure below provides the findings on the maternal age associated with the resuscitation of the new-borns.

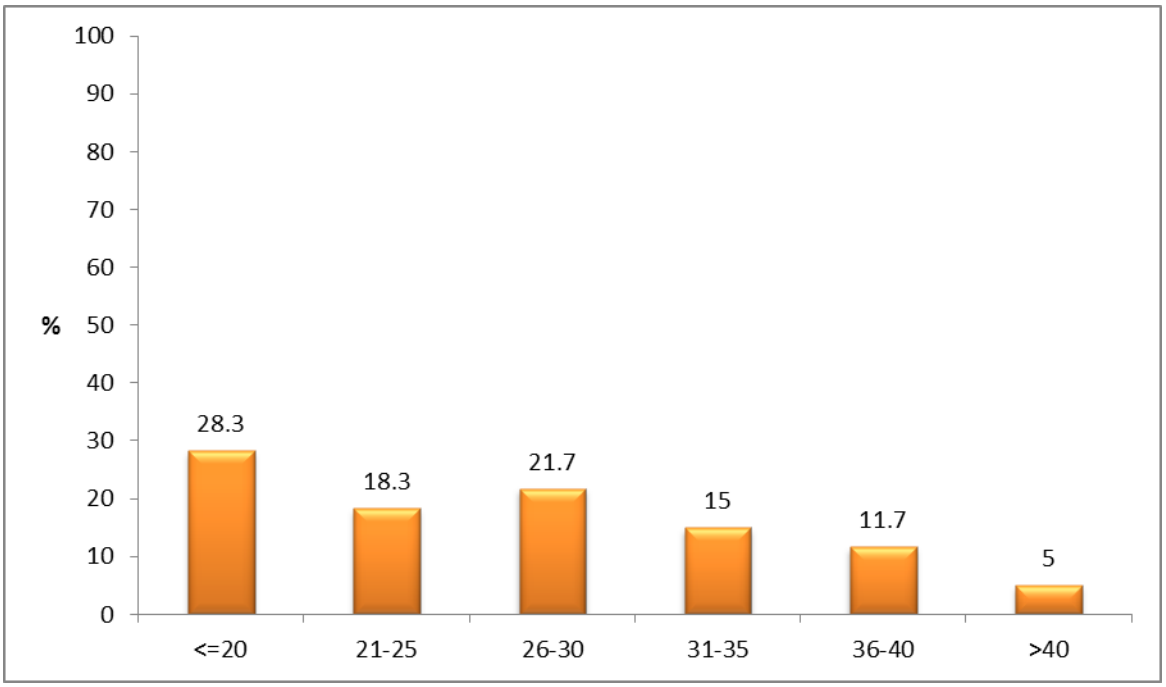

Fig 9: Maternal age

Majority of the resuscitated new-borns (28.3%) were born of mothers who were less than 20 years of age and only 5 per cent were of mother above 40 years of age, with a Median parity 0(0, 4) with 53.2 being primigravidas.

Factors Associated with Neonatal Resuscitation.
The figure below elaborates the factors associated with neonatal resuscitation.

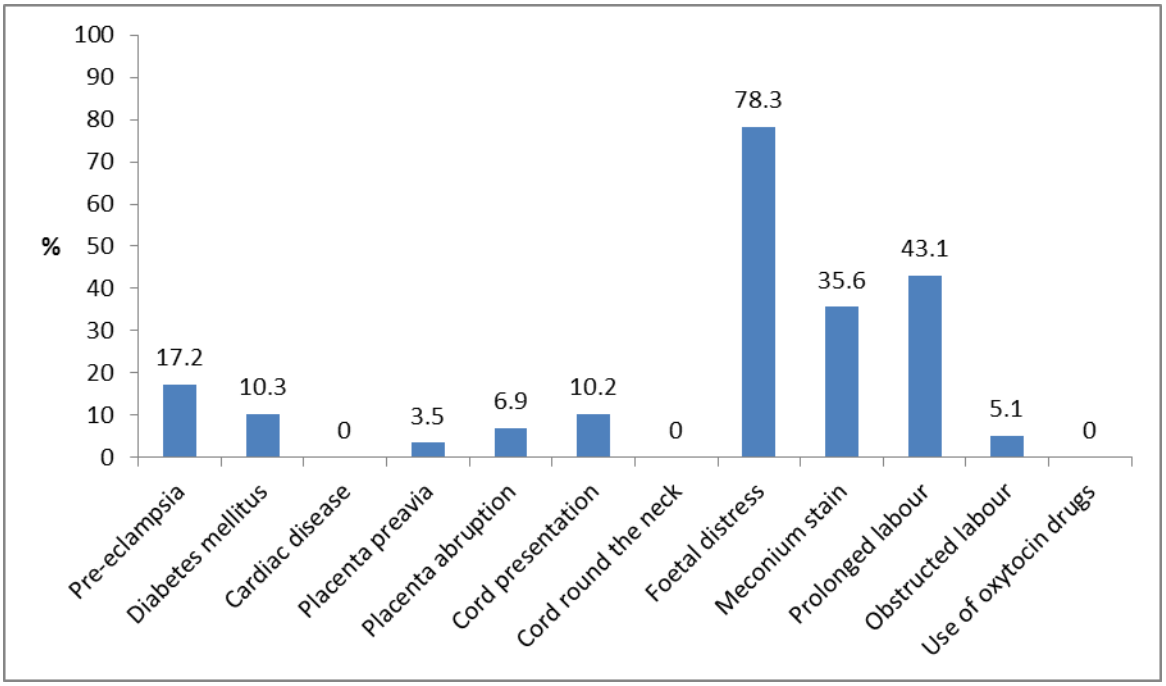

Fig 10: Factors Associated with Neonatal Resuscitation

Factors associated with neonatal resuscitation were (78.3%) fetal distress, prolonged labour (43.1%) with only 3.5 per cent being attributed to Ante partum haemorrhage-placenta praevia as illustrated in figure 6 below.

Birth Asphyxia
The figure below demonstrates the cases of birth asphyxia.

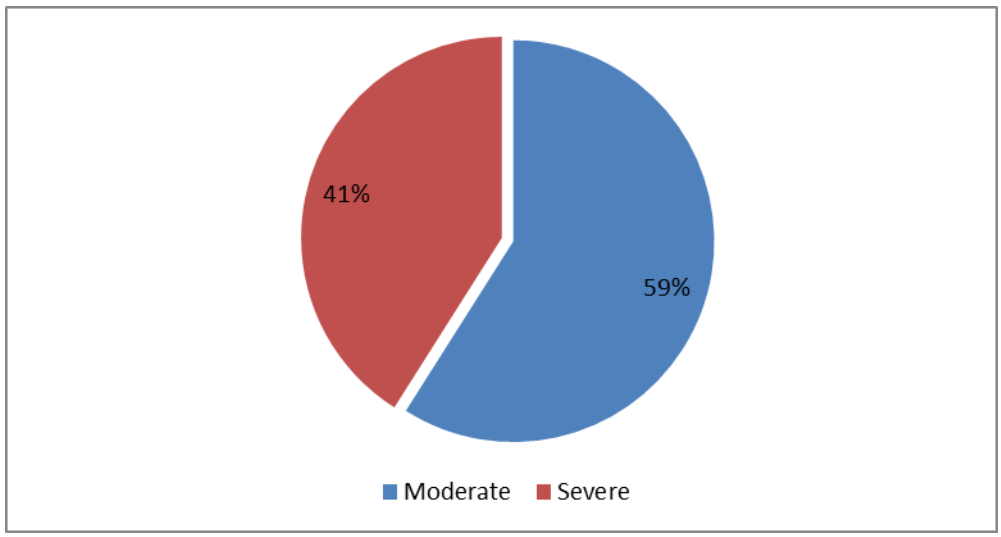

Fig 11: Birth Asphyxia.

Babies were followed up twice daily. Note was kept for pallor, cyanosis, apnoea, respiratory distress, level of consciousness, convulsion, muscle tone, abdominal distension GI bleeding. 59 percent had moderate asphyxia while 41 per cent had severe birth asphyxia. 92 per cent of those with severe birth asphyxia succumbed during the early neonatal period.

Mode of Delivery

The figure below elaborates the modes of delivery on the resuscitated new-borns.

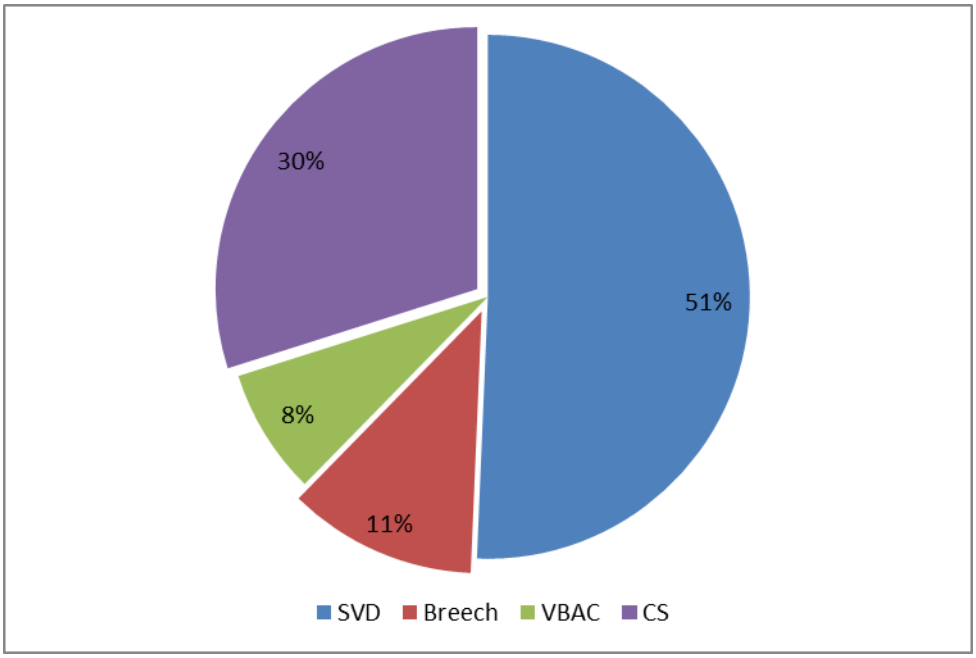

Fig 12: Mode of delivery

Slightly more than half, 51 per cent, of these resuscitated new-borns were born through SVD, 30 per cent C/S with 19(95%) being emergency CS, with majority 15(78.9 %) of the emergencies being attributed to fetal distress. While 11 per cent and 8 per cent were breech and VBAC deliveries respectively as indicated in Fig. 12 below.

Factors Associated with Outcomes of Neonatal Resuscitation.

The researcher analysed demographic data to investigate any associations for neonatal resuscitation including gender, birth weight, maternal age, referral and mode of delivery as shown below.

Table 3: Factors Associated with Neonatal Resuscitation

Factor	Outcome		Statistic	P-value
	Alive	Died		
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*** Fishers exact**

Thirty-five (58.3%) of the mothers were referrals and a higher proportion of the babies born to these mothers (referrals) 17 (48.6%) died compared to only 6 (24%) of those who were not referred (χ2=3.725, p=0.054). The ratio of resuscitated new-borns males to females was 2.3: 1.3 respectively. However, there was no significant difference between babies who died and those alive in terms of gender, birth weight, maternal age, parity and mode of delivery (p>0.05) as indicated in table above.

Thirty eight percent of the resuscitated new-borns died during the early neonatal period, while Sixty two percent survived. Thirty (81.08%) were discharged home in stable condition while, 7 (18.9%) developed complications. These findings are similar to those from various studies which indicate that resuscitation and post resuscitation care help reduce intrapartum related deaths but the rate of neonatal encephalopathy remains unchanged, thus supporting the possibility of an increasing number of surviving babies with disability", due to both short and long term outcomes of neonatal resuscitation (Little et al., 2010). It is further supported by a study conducted by Ann et al. 2001 which revealed that, birth asphyxia accounted for 30 per cent of neonatal deaths, and 70 per cent of asphyxia deaths occurred in the first 24 hours of life.

Thirty five (58.3%) of the mothers were referrals with a higher proportion of the babies born to these mothers (referrals) 17 (48.6%) dying, compared to only 6 (24%) of those who were not referred (χ2=3.725, p=0.054). This study concurs with findings by Shireen et al. (2009), that poor intrapartal outcomes is more prevalent in un-booked cases (emergency) as compared to those who had been booked earlier. (elective cases). The ratio of resuscitated new-borns males to females was 2.3: 1.3. These findings were shared by Shireen et al. (2009) in a study in Dhaka which revealed that the ratio of new-borns receiving resuscitation was male-3: female 2. However, there was no significant difference between babies who died and those alive in terms of gender, birth weight, maternal age, parity and mode of delivery (p>0.05).

Majority of the resuscitated new-borns (28.3%) were born of mothers who were less than 20 years of age, these This study further revealed that (53.2 %) of the resuscitated new-borns being born to primigravidas, these findings were shared by Shireen et al (2009) which showed that 57 per cent of the asphyxiated new-borns were born to primigravida women. Sjöberg & Singer (2013) , concluded that, anticipation, adequate preparation, accurate evaluation and prompt initiation of support are critical for successful resuscitation. Prior identification of risk factors prior to delivery will aid in early preparation for effective resuscitation.

Identified factors associated with neonatal resuscitation in this study were (78.3%) fetal distress, prolonged labour (43.1%), meconium stain (35.6%) with only 3.5% being attributed to ante partum haemorrhage due to placenta praevia. This was contrary to other findings from a study by Pitsawong et al. (2011) which reaffirmed that asphyxia is strongly related to moderate to thick meconium stained amniotic fluid.

5.0 CONCLUSION AND RECOMMENDATION

Conclusion: This study only assessed the immediate outcomes of neonatal resuscitation, which revealed that there are still new-borns that survive but live with complications.

Recommendation: Primigravidas and mothers below 20 of age should be assessed for pelvic adequacy and intervention made in time and referrals should be done early enough so as to improve their intrapartal outcomes.

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