

# Preparedness on Newborn Resuscitation: A Study Done in Kenyatta National Hospital among Health Care Providers in Labour Ward and Maternity Theatre

Koech Carolyne<sup>1\*</sup>, Dr. Joyce Jebet<sup>2</sup> and Prof. Anna Karani<sup>2</sup>

<sup>1</sup>School of Nursing Sciences, University of Nairobi, Department of Midwifery and Obstetric, P.O Box 30197-00100, Nairobi Kenya.

<sup>2</sup>Professor of Nursing Sciences, University of Nairobi, Department of Nursing education, P.O Box 30197-00100, Nairobi Kenya.

\*Corresponding author E-mail: [koechcarolyne@gmail.com](mailto:koechcarolyne@gmail.com)

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**Abstract: Background:** Preparedness in neonatal resuscitation is critical in delivery rooms for the purpose of saving newborns lives. Neonatal mortality still continue to rise in Africa and one of the main causes of neonatal death is birth asphyxia. Annually 136 million newborn are delivered and approximately 10 million require basic resuscitation. Neonatal death can be reduced by performing basic neonatal resuscitation such as drying to stimulate the newborn and assisted ventilation with bag valve and mask. Knowledge and skills on newborn resuscitation are vital in decreasing neonatal deaths. **Methodology:** Cross-sectional descriptive study where a total of 100 health care providers were sampled for the study using stratified random sampling where different carders were put in different stratum at Kenyatta National Hospital labour ward and maternity theatre. The study was conducted from February to July 2019. Questionnaires were used to collect data on knowledge on newborn resuscitation. **Results:** Majority of the respondents were nurses 79(79.8%) and had worked in this units for more than 5 years. Seventy five percent had been trained on newborn resuscitation, 34(45.3%) had been trained on Emergency Triage and Treatment plus (ETAT +). On knowledge on newborn resuscitation 78(78%) were knowledgeable. Only 44(44%) of the health care providers identified correct steps of newborn resuscitation. There was no significant association between knowledge and years of experience, cadre or working station however there was significance between training and knowledge on newborn resuscitation  $P = 0.012$ . **Conclusion:** Knowledge on newborn resuscitation was good however identification of the steps of newborn resuscitation in sequence was a challenge.

**Keywords:** Health care providers' preparedness, knowledge on newborn resuscitation, birth asphyxia.

## Introduction

Neonatal resuscitation is defined as interventions done at birth to establish breathing and circulation which is very important in the survival of the neonate (Lee, Cousens and Wall, 2011). World Health Organization (WHO) recommends that any newborn who does not initiate breathing at birth or gasping or does not cry within 30 seconds, should be resuscitated using Bag Valve Mask (WHO, 2012). Approximately 90% of newborns do not require intervention and transit from life in the uterus to extrauterine life with no difficulties-(American Academy of Pediatrics, American Heart Association (AHA/AAP) 2016).

A newborn experiencing difficulty in this transition requires timely and effective resuscitation measures that may involve ventilation with bag and mask, chest compressions and rarely medications (AAP, 2011). The airway, breathing and circulation (ABC) approach is applied in newborn

resuscitation. Airway is assessed for secretions or meconium then suctioning is done by use of a vacuum suction machine or bulb. Once the airway is clear the baby is dried and warmth is maintained. Assessment of breathing includes if it is absent, poor or gasping respirations. If absent, the health care provider starts ventilation with bag valve and mask at a rate of 30 breaths per minute. Breathing should be started within 60 seconds upon birth also called the Golden minute. With effective ventilation the heart rate increases to more than 100 beats per minute. Circulation is assessed by counting the heart rate if it's less than 60 beats per minute chest compressions are initiated (WHO, 2014).

Globally, neonatal mortality rate decreased from 5.0 million in 1990 to 2.5 million in 2017; this reduction is slower as compared to the decline in children under 5 years. Sub-Sahara Africa is leading in neonatal deaths at 37 deaths per 1,000 live births (WHO, 2017). Neonatal deaths in Kenya is still considered high at 21 deaths per a thousand live births while Kenya is aiming to reduce neonatal mortality to at least 12 per 1000 live births by 2030 according to Sustainable Development Goal (SDG) number three.

Preparedness is the first step to successful resuscitation by ensuring the health care providers are knowledgeable, delivery room is warm and the equipment needed for resuscitation are available and in good working condition. Appropriate resuscitation techniques are crucial to the survival of newborn infants. Availability of skilled health care provider and equipment for neonatal resuscitation is vital for prevention of newborn death which accounts for the majority of neonatal deaths and morbidity (Trevisanuto, Cavallin, Arnolda *et al.*, 2016).

Readiness for neonatal resuscitation requires assessment of perinatal risk, assemble supplies and equipment. A checklist to ensure all supplies and equipment are available, functioning and within reach for the health care providers would help institutions (Wyckoff, Aziz, Escobedo *et al.*, 2015).

The objective of the research was to assess how the health care providers' were prepared for newborn resuscitation. Knowledge was assessed to ascertain health care provider's knowledge on steps and procedures of newborn resuscitation.

## **Methodology**

This was a descriptive cross sectional study design utilizing quantitative method to assess health care providers' preparedness on newborn resuscitation at labour ward and maternity theatre of Kenyatta National Hospital. The research was conducted between the periods of February to July 2019. A total of 100 Health care providers were sampled for the study. Stratified random sampling was used to put different carders in different stratum that is nurses, doctors and clinical officers. Simple random sampling was used to choose the sample. Knowledge on newborn resuscitation was collected through self-administered questionnaires to the health care providers' .Data entry and cleaning was done to check and detect any errors and omissions.

## **Study Sample Size**

The sampling frame consisted of a 100 health care providers' based in labour ward and maternity theatre of KNH. The sample size was determined using Fisher's formula and adjustments made accordingly for population less than 10,000 using Yamane formula.

**Sampling Frame**

	<b>Doctors</b>	<b>Nurses</b>	<b>Clinical officers</b>	<b>Total</b>
Labour ward	5	69	1	75
Maternity theatre	9	40	6	55
	14	109	7	130

Sampling frame = Total Population/ Sample size

Labour ward =  $75 \times 100 / 130 = 57$

Maternity theatre =  $55 \times 100 / 130 = 41$

### **Research Tool**

Knowledge on newborn resuscitation was collected through self-administered questionnaires to health care providers. The questionnaire was divided into 4 categories where the first category included personal data, section two comprised questions on knowledge on newborn resuscitation, section three was on knowledge on equipment and drugs in newborn resuscitation and the fourth part was on maintenance of warm chain in the delivery room.

The questionnaire took almost 10 minutes to answer. The health care providers were informed that any participant who scored below 80% on knowledge on newborn resuscitation will be considered not to be knowledgeable and training will be recommended. The questionnaire was adapted from newborn resuscitation programs which indicated 80% and above was considered as good knowledge.

### **Validity of the Tool**

The study sought opinion of the supervisors and members of the department to ascertain if the study instrument met the required standards. Study tool validity was based on their expert opinion and judgement on the clarity of the questionnaires. The questionnaire was adapted from training programs of resuscitation which made it valid for the study.

### **Reliability of the Tool**

Pretesting of the questionnaire was done to judge its reliability. Pretesting provided an opportunity to check if the questions were well constructed, easily understood and whether the questions asked provided the answers expected by the researcher.

The questionnaire was administered to ten health care providers which made up the 10% of the sample size at Mbagathi County Hospital who worked in labor ward to determine its reliability and validity, consistency of the answers, check the time required to fill the questionnaire and the flow of the research tool. Mbagathi Hospital is within the same locality as KNH.

### **Data Analysis and Presentation**

Data was checked by the principal investigator for completeness and accuracy then keyed into Microsoft Excel after data cleaning. Confidentiality was maintained by excluding any identifiable information. The database was password protected to prevent unauthorized access and backed up in a remote hard disk to safeguard against data loss.

The data was analyzed using both descriptive and inferential statistics using SPSS at 95% confidence interval. P-value less than 0.05 was considered statistically significant. Frequency tables and percentages were used for categorical data. The association between the categorical tables was tested using Chi squares. Results are presented in figures, tables and narrative texts.

## **Results**

### **Socio demographic factors**

Most 55(56.7%) of the health care providers were aged between 25-35 years, followed by above 35 years who were 33(34.0%). Female 52(59.1%) participants were more than male participants and years of experience varied among the participants, most 43(43.0%) had worked for more than 5 years. Nurses were the majority 79(79.8%) of the respondents, followed by doctors 13(13.1%) then clinical officers. Table 1 illustrates the demographic findings.

**Table 1. Demographic characteristics of respondents**

Characteristics		Frequency (n)	Percentage (%)
Age	Up to 25 years	9	9.3
	25-35 years	55	56.7
	Over 35 Years	33	34.0
Sex	Male	36	40.9
	Female	52	59.1
Years of experience	Below 2 years	22	22.0
	2-5 years	35	35.0
	Above 5 years	43	43.0
Formal training	Nurse	79	79.8
	Medical Officer	13	13.1
	Clinical Officer	7	7.1
Working station	Labour ward	59	45.3%
	Maternity theatre	41	31.5%

Analysis was further done to determine the significance between demographic data with knowledge on newborn resuscitation. The study found no significance between knowledge and demographic data this was revealed after the P value was used to test the association between the variables and knowledge. The findings are presented in table 2.

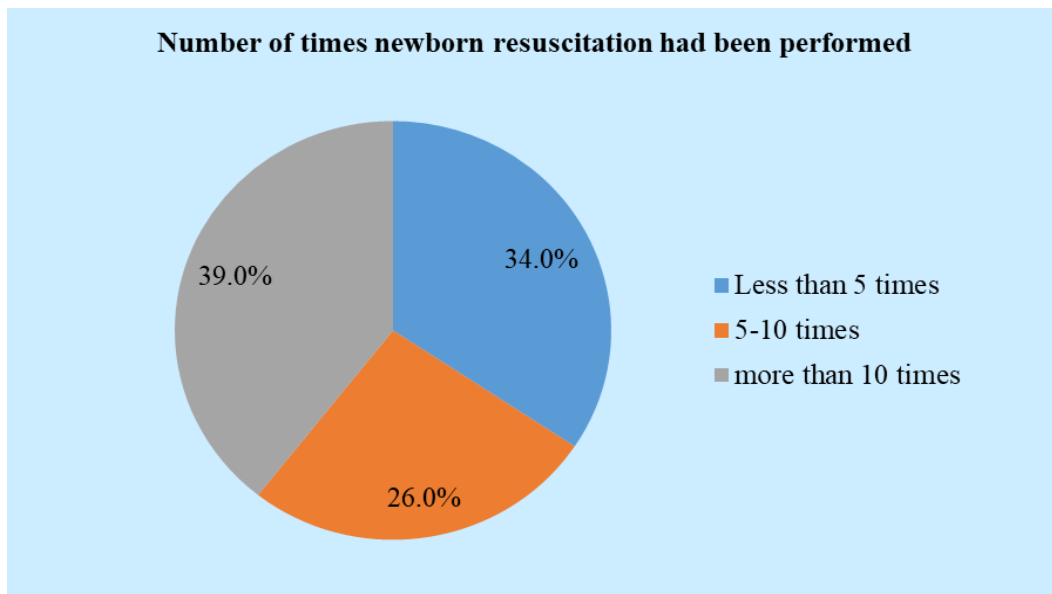
**Table 2. Relationship of knowledge on newborn resuscitation and demographic data**

		Knowledge newborn resuscitation				p- value
		Knowledgeable		Not knowledgeable		
		N	%	N	%	
Station	Maternity theatre	31	75.6	10	24.4	0.631
	Labour Ward	47	79.7	12	20.3	
Age	Up to 25 years	6	66.7	3	33.3	0.389
	25-35 years	41	74.5	14	25.5	
	Over 35 Years	28	84.8	5	15.2	
Sex	Male	31	81.6	7	18.4	0.346
	Female	38	73.1	14	26.9	
Years of experience	Below 2 years	18	81.8	4	18.2	0.780
	2-5 years	26	74.3	9	25.7	
	Above 5 years	34	79.1	9	20.9	
Formal training	Nurse	62	77.5	18	22.5	0.189
	Medical Officer	12	92.3	1	7.7	
	Clinical Officer	4	57.1	3	42.9	

### Number of times newborn resuscitation had been performed

Respondents who had performed newborn resuscitation more than 10 times in the past three months, were 39(39.4%) followed by less than 5 times 34(34.3%). Those that had performed resuscitation between 5-10 times were the least 26(26.3%).

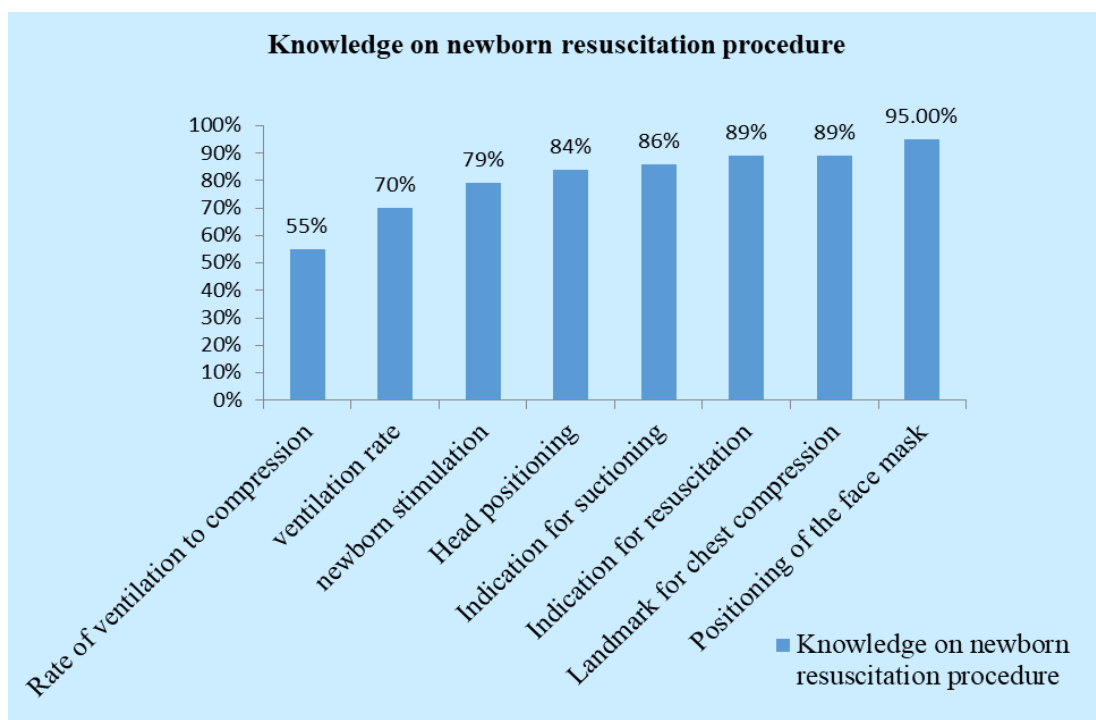
There was no significance in the number of times newborn resuscitation was done and knowledge on newborn resuscitation this was known after P value was used to test the association between the number of times one had performed newborn resuscitation and knowledge, P value at 0.426. Figure 1 below presents the findings.



**Figure 1. Number of times newborn resuscitation had been performed**

### Knowledge on newborn resuscitation procedures

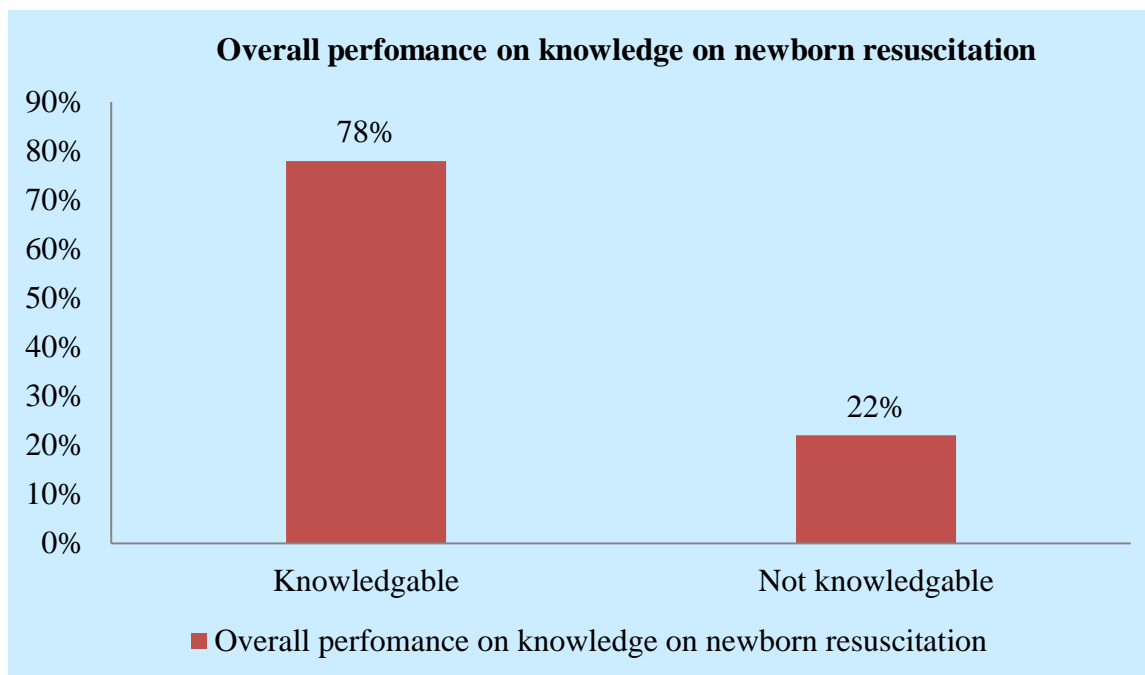
Health care providers were given questionnaires which consisted of 10 questions on basic newborn resuscitation procedures. A score of 80% and above was considered as good knowledge. Health care providers who identify a newborn who required resuscitation were 89(89.9%). Majority 86(86.0%) were able to identify a newborn that required suctioning. Positioning of the newborn in neutral position before ventilation was known to 84(85.7%) of the respondents. Ventilation rate was known to the majority 70(70.7%) of the health care providers. Chest compression and landmarks for cardio pulmonary resuscitation (CPR) was also well identified by more than half of the health care providers'. Most of the health care providers 79(79.0%) were able to identify that stimulation of the newborn is done by drying and rubbing the back. Only 55(55%) were able to identify the rate of ventilation to chest compression. The response to each of the questions on newborn resuscitation was analyzed as shown below in figure 2.



**Figure 2. Knowledge on newborn resuscitation procedure**

### Overall performance on knowledge on newborn resuscitation

On overall performance hundred health care providers who participated in the study 78(78%) scored above 80% and were considered to have good knowledge. Only 22(22%) were not able to attain the mark and were considered not to be knowledgeable. The data is presented in figure 3 below.



**Figure 3. Overall performance on knowledge on newborn resuscitation**

### Steps on newborn resuscitation

WHO recommends that every resuscitation room should be kept warm before conducting deliveries and resuscitation. Health care providers were asked to identify the sequence on newborn resuscitation the correct sequence being providing warmth, dry and stimulate, clear the airway, ventilation and chest compression then administration of adrenaline. Less than half 44(44%) of the health care providers identified the steps correctly. Table 3 presents the findings

**Table 3. Steps on newborn resuscitation**

Steps of neonatal resuscitation	No		Yes	
	n	%	n	%
a) Provide warmth-dry and stimulate –position head and clear the airway- ventilation-chest compression- administer adrenaline	56	56.0	44	44.0
b) Position head and clear the airway-ventilation-chest compression–provide warmth-administer adrenaline	58	58.0	42	42.0
c) Administer adrenaline – administer 10% dextrose – chest compression- ventilation-provide warmth	98	98.0	2	2.0

### Training on newborn resuscitation

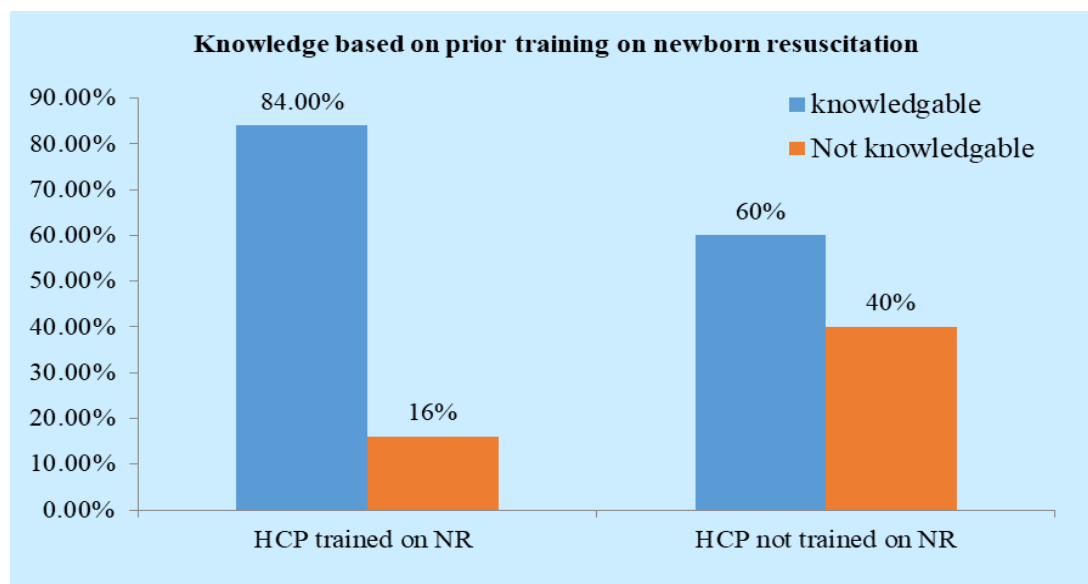
Health care providers who had been trained on newborn resuscitation were more than half 75(75.0%), those who had not been trained reported that they never had a chance to attend the course. Thirty four(45.3%) of the health care providers had done Emergency Triage and Treatment (ETAT+) course then Basic Emergency Obstetric and Newborn care (BEmONC) 23(30.7%) and Essential newborn care. The findings are presented in table 4

**Table 4. Training on newborn resuscitation**

	Frequency (n)	Percentage %
<b>Training on newborn resuscitation</b>	75	75.0
a) EPLS- European Pediatric Advance Life Support	8	10.7
b) HBB- Help Baby Breath	5	6.7
c) ETAT+- Emergency Triage and Treatment	34	45.3
d) BEmONC- Basic emergency obstetric and newborn care.	23	30.7
e) Essential newborn care	23	30.7
f) Others specify	2	2.7
<b>Reasons never been trained on newborn resuscitation</b>		
a) Never had a chance to attend	21	84.0
b) Cost of the course is expensive	2	8.0
c) Have never heard of any course	0	.0
d) No time off work to attend the course	1	4.0
e) Not interested	1	4.0

**Knowledge based on prior training on newborn resuscitation**

Health care providers who were trained on newborn resuscitation performed better than those who had not. Out of 75 health care providers who had been trained on newborn resuscitation 63(84%) were knowledgeable. The results are presented in figure 4 below.

**Figure 4. Knowledge based on prior training on newborn resuscitation**

Further correlation was done to determine significance between training and knowledge on newborn resuscitation p- value was 0.012 which was significant.

**Table 5. Relationship between knowledge on newborn resuscitation and training**

		Frequency (n)	Percentage (%)	Frequency (n)	Percentage (%)	P-value
Have you ever been trained on newborn resuscitation?	Yes	63	84.0	12	16.0	0.012
	No	15	60.0	10	40.0	

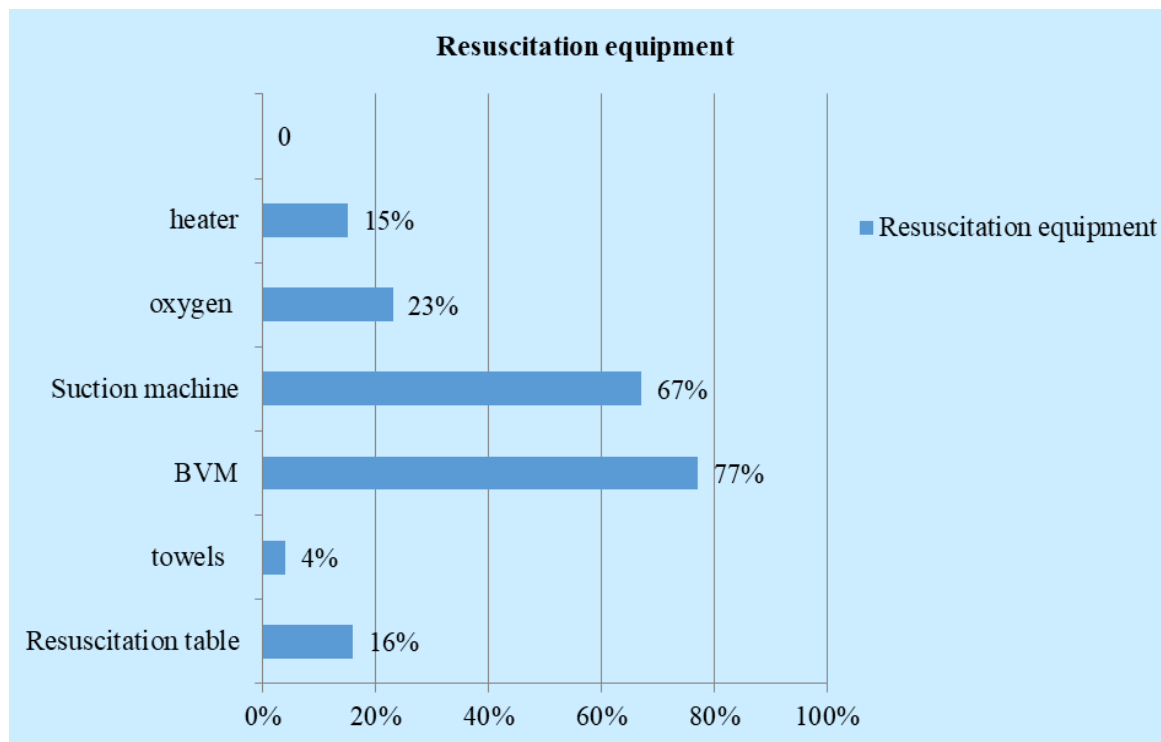
On conducting multivariate analysis to determine factors associated with effective newborn resuscitation it was found out that health care providers who have been trained on newborn resuscitation are 3.5 times better in performing newborn resuscitation effectively. Table 6 presents the findings.

**Table 6. Multivariate Analysis of training and knowledge on newborn resuscitation**

	Coefficient	Standard Error of coefficient	p-value	OR	95% C.I. for OR	
					Lower	Upper
Prior Training on Newborn resuscitation	1.253	.516	.015	3.500	1.274	9.616

### Health care providers' knowledge on resuscitation equipment

Health care providers' identified the following equipment as the basic equipment needed for resuscitation: resuscitation table was identified by 16(16%) of the health care providers', towels for drying the newborn was identified by only 4(4%) of the participants, bag valve and mask was identified by majority 77(77%) of the respondents, most 67(67%) identified suction machine while 23% stated oxygen as the main requirement for resuscitation.



**Figure 5. Knowledge on resuscitative equipment**

### Discussion

Newborn resuscitation is effective only when health care providers have sufficient knowledge (Gebreegziabher, 2014). The knowledge is acquired during formal training of nurses, doctors and clinical officers and through neonatal resuscitation programs such as Emergency Triage and Treatment Plus (ETAT+), Help Baby Breath (HBB), and Essential newborn care among others. More than half (78%) of the health care providers were knowledgeable this is contrary to a study conducted by Murila *et al.*, (2012) on assessment of newborn resuscitation on health care professionals concluded that only 35.4% were knowledgeable. Whereas the basic newborn resuscitation steps were assessed, other advanced steps such as endotracheal intubation and drug administration were included in the study. In this study only basic newborn resuscitation steps was assessed.



In overall three quarters of the health care providers attained more than 80% and were considered to have good knowledge on newborn resuscitation. A similar study which was conducted in the same units that is labour ward and maternity theatre KNH concluded that health care providers had poor knowledge on newborn resuscitation as more than half of the respondents had failed (Alwar, 2010). These are some of the studies that prompted the hospital to train the health care providers on newborn resuscitation. This findings of the study could be attributed to the training done by the health care providers.

The steps of newborn resuscitation are considered critical in performing resuscitation. The study looked at the proportion of the health care providers that identified the steps correctly. Less than half (44%) identified the steps correctly. Although the general knowledge of the health care providers was good there was a challenge in identifying the right sequence on newborn resuscitation. These findings could be attributed to health care providers' not attending continuous medical education or refresher courses after the training. Finding of a similar study conducted in Nigeria suggested that most of the health care providers had adequate knowledge on newborn resuscitation but their knowledge on decision making during resuscitation was low (Ogunlesi and Tinuade 2008).

The steps include warmth, drying to stimulate the newborn, positioning the head in neutral position then clear the airway through suctioning, ventilation then chest compression. It is important that health care providers follow the steps during resuscitation to prevent inhalation of secretion or expose the child to cold during resuscitation causing hypothermia. In a study conducted by Shikuku *et al.*, (2018) through observation of newborn resuscitation concluded that there is need to train health care providers' on maintaining warm chain during resuscitation and airway maintenance in cases of presence of meconium. In Pakistan health care providers failed to provide warmth during resuscitation (Arrif *et al.*, 2010). In both labour ward and maternity theatre the resuscitation table had a warmer attached to it so the health care providers might have gotten used to placing the newborn in a warm place without knowing that warmth is the first step to newborn resuscitation.

The second step of resuscitation is stimulation in case of absence of meconium, a question on stimulation of the newborn was asked and most (79%) of the participants identified drying and rubbing the back as a way of stimulation. A study conducted on newborn resuscitation through observation health care providers dried and gently rubbed the newborn's back (Shikuku *et al.*, 2018). The health care providers, may have a challenge in identifying the steps correctly but they know how to stimulate a newborn. Most resuscitated newborns will initiate spontaneous breathing after simple stimulation such as drying. This implies that in resource limiting settings many babies who do not initiate breathing at birth needs simple stimulation like drying.

Questions asked on head position and identifying a newborn who requires suctioning most (79%) of the health care providers knew about it. The participants were also asked to explain how suctioning was done less than half (39%) of the health care providers, mentioned position of the head, suction what you can see and suctioning of the mouth followed by the nose. Similar findings from a research done in Malawi identified that suctioning was the worst performed step (Bhurji, 2011). Newborns who do not respond to stimulation with secretion suctioning should be done in a correct manner to prevent damage of the mucosa which can lead to poor breastfeeding and risk of infections.

When newborns do not respond to suction then ventilation and chest compression should be done immediately to reverse asphyxia. Health care providers were asked to identify a way of placing a face mask during ventilation and majority (95%) knew that the mask should cover both the nose and the mouth. The health care providers were not sure whether ventilation to chest compression ratio was 1:3 or 15: 2. Only (55.7%) knew the rate of ventilation to chest compression of a newborn is 1:3. Identification of landmarks for chest compression was known to (89.0%) of the participants. When breathing is delayed the chances of reversing asphyxia is reduced which can lead to permanent brain damage.

Training of health care providers enables them to provide quality and effective care to the newborn. The study found no association between knowledge and number of times resuscitation was performed (P value=0.426) but there was significance on knowledge and training on newborn resuscitation (P value 0.012). The health care providers who had been trained on newborn resuscitation prior to the study performed better than those who had not been trained. The study found out that health care providers who had received prior training before the study performed three and a half times better than those who had not.

In low and middle income countries training of health providers in newborn resuscitation resulted in reduction in early neonatal mortality (Pammi, Dempsey, Ryan and Barrington, 2016). The health care providers were asked if they had received prior training to the study, more than half (75%) had been trained with majority (45.3%) being trained ETAT+. However Murila found that only 12-14% of health care workers had received formal training. Health care providers (n=21) who had not been trained stated that they never had a chance to attend any short course on newborn resuscitation. Health care providers that had been trained the average duration after training was 4 years with a range of 1-10 years. Majority of the health care providers had been trained on newborn resuscitation but not all of them scored above 80% which was considered as having good knowledge. This shows that there is decline in the knowledge in spite of previous training. There was a similar study conducted in Zambia and showed that there is decline in knowledge despite of training (Carlo *et al.*, 2010).

The number of times newborn resuscitation was performed or observed did not contribute to health care providers' knowledge on newborn resuscitation. This was revealed after P value was used to test association between this variable and knowledge, the correlation was found to be weak and not significant. This finding is contrary to that of Ogulesi *et al.*, (2015) who observed higher levels of knowledge of newborn resuscitation among those performed more times compared to those that had not. It is expected that health care providers who had performed resuscitation severally to be more knowledgeable than those who had performed fewer times. The more resuscitation is performed the more the chances of the health care provider to perform effective resuscitation. One of the standards of WHO in improving quality maternal and newborn care is to have health care providers in child birth areas receive training or regular refresher courses on newborn resuscitation. Regular continuous medical education can also be done in every unit to help in retention of knowledge to all carders.

## **Conclusion**

More than half of the health care providers had adequate knowledge on newborn resuscitation however identification of steps of newborn resuscitation was a challenge that could be improved with training on newborn resuscitation.

## **Acknowledgement**

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