

Assessment of Healthcare Providers' Knowledge in Helping Babies Breathe Program at Birth in Turkana and West Pokot Counties, Kenya

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ABSTRACT

Context: Globally, 2.3 million neonatal deaths were documented in the year 2022, predominantly occurring in low-income nations. Among these, roughly 23% are attributed to asphyxia. The initial minute after birth, often referred to as the "golden minute," holds immense significance in the lives of newborns. Therefore, it necessitates the newborn's initiation and continual maintenance of spontaneous breathing. A skill that healthcare providers (HCPs) must be well conversant with, especially those working in labor rooms. The Kenya Demographic Health Survey (KDHS) 2022 report indicated that West Pokot and Turkana counties had high neonatal mortality rates of 27 and 21 deaths per 1000 live births, respectively.

Aim: The study aimed to assess the knowledge level of healthcare providers (HCPs) regarding helping babies breathe in Turkana County and West Pokot County.

Methods: The study employed a cross-sectional descriptive design, utilizing quantitative methodologies to assess the knowledge of healthcare professionals (HCPs) regarding the facilitation of newborn respiration. Six facilities in West Pokot and Turkana Counties were purposefully selected. The study encompassed 71 healthcare professionals (HCPs), including nurses, medical officers, and clinical officers, from West Pokot and 74 from Turkana, who had served in the maternity, operating theatre, and newborn unit for the preceding year, allowing for a census approach. Data collection involved administering digitized, interviewer-administered questionnaires in three health facilities in Turkana County and three in West Pokot County to assess healthcare providers' (HCPs') knowledge of helping newborns breathe at birth.

Results: Out of the total participants, 51(35.2%) HCPs demonstrated adequate knowledge in helping newborns breathe at birth, scoring $\geq 50\%$, while 94(64.8%) exhibited inadequate knowledge. Both the healthcare facility ($p = 0.002$) and cadre ($p = 0.023$) were identified as statistically significant determinants of knowledge levels.

Conclusion: The overall level of knowledge among healthcare professionals (HCPs) in Turkana and West Pokot is suboptimal, with nearly two-thirds scoring below 50% in the study. The cadre and the facility where the HCPs were based had a significant influence on knowledge levels. The study recommends targeted training and continuous capacity building through competency-based simulations, on-the-job training, and structured mentorship to enhance knowledge and skills in managing neonatal asphyxia.

Keywords: Healthcare providers, Helping Babies Breathe, knowledge, Turkana, West Pokot

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1. Introduction

Globally, approximately 2.3 million neonatal deaths were recorded in the year 2022, with a majority occurring in low-income countries. These deaths accounted for nearly half of all deaths among children under the age of five years (Duke, 2024). Among the neonatal deaths recorded annually, about 23% are linked to hypoxic events during childbirth, also referred to as asphyxia (Oyang et al., 2023).

In industrialized nations, the prevalence of perinatal asphyxia is around two cases per 1000 live births. However,

in underdeveloped countries with limited access to maternal and neonatal care, the prevalence can be up to ten times higher. Among infants affected by perinatal asphyxia, up to 25% survive but experience long-term neurological abnormalities, and approximately 15-20% die during the neonatal period (Stutchfield et al., 2017).

Birth asphyxia poses a significant risk of infant morbidity and mortality in Sub-Saharan African countries, including Ethiopia, South Sudan, and Angola, particularly in low-income settings. Training healthcare providers in newborn resuscitation, specifically in the techniques of

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helping newborns breathe at birth, plays a crucial role in reducing the adverse consequences associated with birth asphyxia (Techane *et al.*, 2022).

Several systematic evaluations have demonstrated that brief interactive in-service training, which combines didactic and simulation-based teaching approaches, improves knowledge, skills, collaboration, and confidence among healthcare professionals over time (Merriel *et al.*, 2019).

The Helping Babies Breathe (HBB) program is a global training initiative to equip healthcare providers with life-saving resuscitation techniques. It focuses on low-cost, practical interventions such as stimulation at birth, drying, and assisted ventilation using a bag and mask to help newborns establish and maintain effective breathing (Vunni, 2017). This training-based intervention has been proven to reduce intrapartum-related neonatal deaths by 30%. While the birth of a newborn is a joyous moment for parents, the first few hours of life are critical for the newborn's survival. Although the birthing process may last several hours, the mortality risk significantly decreases as the child grows (Bettinger *et al.*, 2021). The burden of intrapartum unfortunate events is most significant in low-income settings (Goldenberg *et al.*, 2018; Shikuku *et al.*, 2017).

Over 90% of neonatal deaths can be prevented through simple and effective resuscitation techniques, making it crucial for HCPs to have the necessary skills to assist newborns in distress. Basic interventions such as stimulation, drying, warming, suction, and bag-mask ventilation in low-resource settings can significantly improve survival rates (Shukla *et al.*, 2022).

As highlighted in the literature review above, healthcare providers' proficiency in assisting newborns with breathing at birth is crucial for reducing neonatal mortality, particularly in low-resource settings such as Northern Kenya. For this reason, Turkana and West Pokot counties were selected to assess the level of knowledge among healthcare providers (HCPs) in helping newborns breathe at birth.

2. Significance of the study

In Kenya, the effectiveness of helping newborns breathe at birth largely depends on the knowledge of the attending healthcare provider, as well as access to functional essential equipment, including towels for drying, a source of heat, a bag and mask resuscitator, and a suction device (Shikuku *et al.*, 2017).

In Turkana County and West Pokot County, the proportion of skilled attendance at birth is remarkably low at 53% and 65%, respectively, compared to the national average of 89%. The national neonatal mortality rate stands at 21 deaths per 1,000 live births, with Turkana and West Pokot recording 21 and 27 deaths per 1,000 live births, respectively (KNBS & ICF, 2023). In contrast, the Sustainable Development Goals (SDGs), adopted by the UN General Assembly in 2015, set a target for all countries to reduce neonatal mortality to 12 deaths or fewer per 1,000 live births by 2030—a goal that may not be attainable at the current pace (UN, 2016).

The study aimed to identify and address knowledge gaps among healthcare professionals (HCPs), who are often the first responders to newborns experiencing breathing difficulties. It focused on assessing their level of knowledge in assisting asphyxiated newborns to initiate and maintain effective breathing, thereby equipping them with the necessary expertise for improved neonatal care.

The study's findings highlighted the importance of enhancing healthcare professional (HCP) training and provided valuable insights for stakeholders, including the Ministry of Health and medical facilities. The study aids in developing enhanced training programs specifically tailored towards improving the practices of assisting newborns to breathe. This information is critical for healthcare providers and policymakers at various levels, as it supports the implementation of On-the-Job Training (OJTs) aimed at assisting asphyxiated newborns. By addressing these educational needs, the study contributed to the efforts to enhance newborn health and reduce neonatal mortality on a broader scale.

3. Aim of the study

The study aims to assess the knowledge levels of healthcare providers in Turkana and West Pokot counties regarding helping babies breathe at birth.

3.1. Operational definition

In this context, the Helping Babies Breathe at Birth program refers to providing life-saving interventions aimed at ensuring that newborns establish and maintain effective breathing immediately after delivery by healthcare providers.

4. Subjects & Methods

4.1. Research Design

A cross-sectional descriptive study design with a quantitative method was used. The objective of this methodology was to provide data describing healthcare providers' level of knowledge at a fixed point in time.

4.2. Study setting

The study was conducted in six health facilities: Lodwar County Referral Hospital, Lopiding Sub-county Hospital, and Kakuma Mission Hospital in Turkana County; and Kapenguria County Referral Hospital, Chepareria Sub-county Hospital, and Ortom Mission Hospital in West Pokot County. These facilities were selected due to the availability of newborn care services and high caseloads of asphyxia-related deaths, as reported by the Kenya Health Information System (KHIS) in 2022.

Turkana County, located in northwestern Kenya, spans approximately 77,000 square kilometers. It borders South Sudan, Uganda, West Pokot, Baringo, Samburu, and Marsabit counties. Lodwar, the county capital, serves as the main administrative center. The region is largely arid and semi-arid, with Lake Turkana forming part of its eastern boundary. According to the 2019 census, Turkana has a population of 926,976, primarily from the Ng'iturkan-speaking pastoralist community. Fishing is also common along Lake Turkana. The county has a poverty index of

82.7%, the highest in Kenya, and faces significant educational challenges with low literacy rates (KNBS, 2024).

West Pokot County is located in the Rift Valley region and spans 9,123 square kilometers. It borders Turkana, Baringo, Elgeyo-Marakwet, Trans-Nzoia counties, and Uganda. The administrative center is Kapenguria. With a population of 621,241, the Pokot community is the dominant group in the county, comprising both nomadic pastoralists and settled agriculturalists (KNBS, 2019). The county has a poverty index of 61.4% and a literacy rate of 61.5% (Naeku & Irungu, 2024).

Both counties face challenges, including inter-community conflict and cattle rustling. Due to shared socio-economic and geographic characteristics, they were selected to compare knowledge levels in helping newborns breathe at birth.

4.3. Subjects

The target population consisted of nurses, clinical officers, and medical officers from Turkana and West Pokot counties who worked in maternity wards, newborn units, and operating theaters.

Inclusion criteria

- HCPs who worked at maternity wards, newborn units, and operating theaters during the study period at the six selected facilities.
- HCPs who had been at the respective department for at least 1 year (Minimum period before one renews their license).
- HCPs who consented to participate in the study.

Exclusion criteria

- HCPs who were managers and administrators.
- HCPs who were too sick and incapacitated to participate in the study.
- The sites are in insecure regions.

Sample size determination

Due to the scarcity of human resources for health in Turkana and West Pokot counties, a census method was employed; therefore, every healthcare professional (HCP) in the units of interest was allowed to participate in the study. This approach ensured that all healthcare professionals (HCPs) meeting the inclusion and exclusion criteria had the opportunity to participate.

Sampling techniques

Study sites: Purposeful sampling was used to select the study sites based on the high neonatal mortality, high caseloads of asphyxia-related deaths, and the availability of newborn care health services in the study sites. Turkana County has a healthcare network comprising 177 dispensaries, 19 health centers, and 13 hospitals, whereas West Pokot County has four hospitals, eight health centers, and 142 dispensaries. Despite the availability of newborn care services and the high caseloads of asphyxia-related deaths at Ammusait General Hospital and Kacheliba Sub County Hospital, the two hospitals were excluded from the study due to insecurity within the Kakuma Refugee Camp in Turkana West and along the Kenya-Uganda border, respectively.

Subjects: A census method was used to select the HCPs (medical officers, nurses, and clinical officers) to

participate in the study, ensuring they had an equal chance to participate. The study encompassed healthcare professionals (HCPs) who had worked for at least one year in labor and delivery rooms, reproductive health operating theaters, antenatal care wards, postnatal care wards, newborn units (NBU), and Kangaroo Mother Care (KMC) units.

4.4. Tools and Data Collection

4.4.1. Digitized Interviewer-Administered Questionnaire

Data were collected using a digitized, interviewer-administered questionnaire modified to assess healthcare professionals' (HCPs') knowledge of helping newborns breathe. The tool's items were adapted from the Helping Babies Breathe (HBB) training module developed by the American Academy of Pediatrics (AAP) (*American Academy of Pediatrics, 2016*). The modifications in the tool were guided by a comprehensive review of relevant literature and comparable studies (*Hoban et al., 2013; Kamath-Rayne et al., 2018; Vunni, 2017; Wilson et al., 2020*).

It consisted of 14 closed-ended multiple-choice items, each targeting a specific aspect of the procedures and actions required to help newborns breathe effectively immediately after delivery.

The questionnaire primarily consisted of closed-ended questions, though some items allowed additional input to capture more detailed, open-ended responses. The questions reflected the key variables measured in the study, focusing on evaluating the level of knowledge among healthcare providers (HCPs) in Turkana and West Pokot counties regarding neonatal resuscitation. The tool was organized into two main sections.

The first section evaluated the fundamental determinants of knowledge related to neonatal failure to initiate spontaneous respiration at birth. In this section, the researcher constructed a set of socio-demographic items, encompassing participants' age, gender, educational attainment, professional cadre, years of clinical experience, and receipt of specialized training in newborn resuscitation. The second section assessed participants' knowledge of the essential steps involved in supporting asphyxiated newborns to begin breathing at birth.

Scoring system

The knowledge score was determined by assigning a value of one to correct answers and zero to incorrect answers across all 14 questions. The total score was then summed and converted into a percentage. Following Doggrell's (2023) recommendation, participants who scored 50% or higher were classified as knowledgeable, and those who scored below 50% were classified as not knowledgeable.

4.5. Procedures

Ethical Considerations: Approval to conduct the research was granted by the School of Nursing, Midwifery, and Paramedical Sciences (SONMAPS) at Masinde Muliro University of Science and Technology, under reference number MMU/COR:509099. Ethical clearance was

obtained from the Masinde Muliro University of Science and Technology – Institutional Scientific Ethics Review Committee (MMUST-ISERC), with reference number MMU/COR: 403012 Vol 6 (01).

Additionally, a research permit was issued by the National Council for Science, Technology, and Innovation (NACOSTI), Ministry of Higher Education, Science, and Technology, under reference number 459226. Collecting data was approved by the County departments responsible for research in both Turkana and West Pokot, as well as from the facility administration at the respective study sites.

Before participation, all respondents were provided with detailed information about the study's objectives, procedures, potential risks, and benefits. Participants were allowed to ask questions and voluntarily provided written informed consent before data collection began. Respondents were informed of their right to withdraw at any stage without consequences. Respondents were assured of the confidentiality of the information they gave. Names and other identifying means were not used during the data collection to ensure privacy. Anonymity was strictly maintained throughout the study. Participants' personal information was anonymized, and no identifying details were used during data collection or included in the final report. All information obtained was securely kept in strict confidence, accessed only by the researcher, and used only for the study purposes.

Validity of the instrument: A well-structured, interviewer-administered questionnaire was submitted to three experts: A senior lecturer from the School of Nursing, Midwifery, and Paramedical Sciences at Masinde Muliro University of Science and Technology (MMUST), another senior lecturer from the School of Nursing at Moi University, and a statistician who is knowledgeable in the development and use of software, for expert review. Their input was instrumental in establishing the content validity of the study instrument. Based on their recommendations, items considered inadequate or irrelevant to the study objectives were revised, removed, or reorganized. These modifications informed the development of the final version of the questionnaire used in the study.

Reliability was established through pilot testing of the research instrument at Kanamkemer Sub County Hospital. This facility was chosen due to its commonalities with the intended study sites. The research tool was administered to twenty-two respondents. This step enabled checking on the accuracy and restructuring of the instruments to achieve true and accurate answers. Cronbach's alpha coefficient was then calculated to assess the reliability of the tool. The interviewer-administered questionnaire yielded a Cronbach's alpha value of 0.62, indicating acceptable reliability. According to *Suhartini et al. (2021)*, a Cronbach's alpha value of 0.6 or higher is sufficient to declare a research tool reliable.

Data collection procedure: This study utilized interviewer-administered questionnaires to collect data. The questionnaires assessed the individual's understanding, familiarity, and comprehension of concepts, techniques, and protocols related to helping newborns breathe. Participants responded to the questionnaire items based on

their knowledge and experiences, providing valuable insights into their level of understanding.

The interviewer-administered questionnaire was digitized using KoboToolBox to enhance accuracy, ensure real-time data monitoring, and uphold data security and privacy. This tool was chosen because, as *Gangopadhyay et al. (2024)* put it, KoboToolBox is a digital, free data collection platform with a user-friendly interface and customizable features. They further add that KoboToolBox offers tools for data management, effectively addressing cost constraints, reducing human errors, and overcoming time limitations in data collection and management.

Seven volunteer nurses were selected as research assistants from the 6 study sites: Three from West Pokot and four from Turkana. They were taken through a one-day training session on the tools, during which they learned how to use the digital tool to collect and administer data themselves. Additionally, they were informed about all the ethical standards to be upheld during data collection. During data collection, the research assistants were periodically supervised (at least once a month) and supported by the researcher, who visited the study sites in both Turkana and West Pokot counties to address any concerns raised by the assistants. The study took six months, spanning from February to July 2024.

4.6. Data analysis

The quantitative data obtained from the KoboToolBox in this study underwent cleaning, coding, and analysis using the Statistical Package for the Social Sciences (SPSS) version 28. Descriptive statistical methods, including frequency, mean, percentages, and standard deviation, were employed to summarize and analyze the quantitative data. Additionally, the chi-square test was used to examine associations between categorical variables. A p-value of $p \leq 0.05$ was used throughout the analysis to determine statistical significance. Inferential statistical methods, including univariate and bivariate analyses, were used to examine the relationships between categorical independent variables and the primary outcome. These analyses facilitated the identification of significant associations and patterns that were relevant to the study's objective.

5. Results

Table 1 indicates the social and demographic characteristics of the population. A total of 145 out of 187 healthcare professionals (HCPs) participated in the study, yielding a response rate of 77.5%. As shown in Table 1, the majority (95.2%) were between 21 and 40 years old, while only 4.9% were above 40. Participants had varying years of experience in their respective units during the study, with the majority (55.9%) having less than three years of experience in their current unit, while only 14.5% had been in the same unit for 6-10 years. The participants were fairly distributed by gender across both counties, with 74 females outnumbering 71 males by just three participants. Most participants, 82.8%, were nurses, while clinical officers accounted for 14.5% and medical officers 2.8%. Notably, 75% of all medical officers were from the Turkana region.

Table 2 presents the distribution of participants by their previous training and qualifications. The majority, 52

(73.2%), of respondents from West Pokot confirmed that they had undergone training incorporating a neonatal resuscitation component. In comparison, only 40(54.1%) of respondents in Turkana affirmed having received similar training. Among those trained in neonatal resuscitation, 60 (65%) participants acknowledged having undergone training in Emergency Obstetrics and Newborn Care (EmONC).

Additionally, among those who had been trained in the neonatal resuscitation component, 40 (43.5%) had received training less than a year prior to the study period, 26 (28.3%) between one and two years prior, and 26 (28.3%) more than three years prior. The majority (75.2%) held a diploma (a technical training program lasting 3.5 years). Another 9.7% held a certificate (A post-secondary technical education program lasting 2.5 years). Additionally, 0.7% held a master's degree (postgraduate training with advanced knowledge and specialized skills lasting 2 years), and 1.4% had a higher diploma (an advanced extension of the diploma, often with more specialized or advanced training). Notably, the participants with the master's degree and the higher diploma were from Turkana.

Table 3 reveals the knowledge assessment by county. The table shows that of the 14 questions assessing participants' knowledge of assisting newborns to breathe at birth, only four questions were answered correctly by more than 50% of the participants. These included the appropriate depth for neonatal airway suctioning (93.8%), the necessity of oxygen for resuscitation (93%), aspects checked in the neonate while drying (69%), and the part of the neonate left exposed after drying and warming (52.1%).

The study identified substantial gaps in critical steps of helping newborns breathe at birth, particularly in the number of inflation breaths delivered in a newborn who does not begin spontaneous breathing (29.2%), the initial step of the Helping Babies Breathe (HBB) protocol (18.1%), and the frequency of neonatal reassessment (17.5%), with 15.5% from West Pokot and 19.4% from Turkana showing familiarity with this critical aspect of neonatal care. Meanwhile, the majority (80.4%) of participants were aware of the national guidelines on neonatal resuscitation, including 83.1% from West Pokot and 77.8% from Turkana counties.

Table 4 shows the total knowledge scores ranged from 0 to 71.4%, with a mean of 43.2 ± 11.9 and a median of 42.9 (IQR: 35.7, 50). Only 35.2% of respondents met the threshold for knowledgeability, while 64.8% lacked knowledge about helping newborns breathe at birth, as shown in Figure 1.

Table 5 reveals the knowledge level by facility affiliation. As shown in Table 5, the analysis of the knowledge levels in helping newborns breathe at birth across facility affiliation indicates that participants from faith-based facilities had higher percentages of correct responses compared to those from county government-affiliated facilities in most questions. Notable disproportions were observed in key areas such as the first step in Helping Babies Breathe, where 25.6% of participants in Faith-based facilities answered correctly compared to 14.9% in Government facilities. Similarly, knowledge of neonatal airway positioning was higher in

Faith-based facilities at 48.8%, while 32.0% of participants in Government facilities answered correctly. However, both groups demonstrated a strong understanding of neonatal airway suctioning depth, with rates of 93.1% and 95.3% in Governmental and Faith-based facilities, respectively, as well as the necessity of oxygen in resuscitation, at rates of 91.9% and 95.3%, respectively.

Despite this, critical gaps were evident in the frequency of neonatal reassessment, which was correctly identified by 20.9% of facilities in the faith-based sector and 16.0% of facilities in the government sector. Knowledge of indications for ventilation was also low, with 23.3% in Faith-based facilities and 32.7% in Government facilities answering correctly. Awareness of national neonatal resuscitation guidelines remained high across both facility types, with 81.4% of participants in Faith-based facilities and 80.0% in Government facilities reporting familiarity with the national guidelines.

Overall, the knowledge levels of healthcare professionals (HCPs) regarding helping babies breathe at birth, based on facility ownership, reveal that a higher proportion (41.9%) of HCPs in Faith-based facilities were knowledgeable about assisting newborns to breathe at birth compared to those in Government-owned facilities (32.4%). Conversely, a greater proportion of participants in Government facilities (67.6%) were classified as not knowledgeable compared to 58.1% in Faith-based facilities.

Table 6 presents the bivariate analysis examining background factors related to HCPs' knowledge of assisting newborns to breathe at birth. Statistically significant variations in knowledge were observed across the names of the health facilities ($p = 0.002$) and cadres ($p = 0.023$), with Ortum Mission Hospital reporting the highest proportion of knowledgeable respondents (63%) and Kapenguria County Referral Hospital reporting the lowest (8%). Knowledge also significantly varied by cadre ($p = 0.023$), with all medical officers classified as knowledgeable, while nurses and clinical officers showed similar levels (33.3%). Master's degree holders (100%) were more knowledgeable than all other categories; however, this trend was not statistically significant ($p = 0.094$).

Prior training (including EMNOC and Helping Babies Breathe) showed no significant association with knowledge ($p > 0.05$), and knowledge declined with time since training ($p = 0.26$). Although the facility affiliation did not have a statistically significant impact on knowledge levels ($p = 0.27$), faith-based facilities reported a higher proportion of knowledgeable healthcare providers (41.9%) compared to government facilities (32.4%).

6. Discussion

In low-resource settings, providing essential newborn care immediately after birth is crucial for enhancing neonatal survival outcomes. Helping Babies Breathe (HBB), a globally recognized initiative emphasizes timely interventions to support newborns in establishing and sustaining effective breathing immediately after birth. The effective implementation of HBB practices has been associated with significant reductions in neonatal mortality; however, knowledge gaps among healthcare providers (HCPs) remain a barrier to optimal practice. Assessing the

Table (1): Frequency and percentage distribution of healthcare providers' demographic characteristics (n=145).

Variables	West Pokot No=71		Turkana No=74		Total No=145	
	Freq.	%	Freq.	%	Freq.	%
Age in years						
21-30	34	49.3	37	50.0	71	49.7
31-40	31	44.9	34	45.9	65	45.5
41-50	4	5.8	2	2.7	6	4.2
>50	0	0.0	1	1.4	1	0.7
Years worked in the current unit						
<3	41	57.7	40	54.1	81	55.9
4-5	21	29.6	20	27.0	41	28.3
6-10	9	12.7	12	16.2	21	14.5
>10	0	0.0	2	2.7	2	1.4
Gender						
Male	35	49.3	36	48.6	71	49
Female	36	50.7	38	51.4	74	51
Cadre						
Nurse	60	84.5	60	81.1	120	82.8
Clinical officer	10	14.1	11	14.9	21	14.5
Medical officer	1	1.4	3	4.1	4	2.8

Table (2): Frequency and percentage distribution of healthcare providers' training on neonatal resuscitation (n=145).

Variables	West Pokot No=71		Turkana No=74		Total No=145	
	Freq.	%	Freq.	%	Freq.	%
Ever been trained in neonatal resuscitation?						
No	19	26.8	34	45.9	53	36.6
Yes	52	73.2	40	54.1	92	63.4
If yes to the above, which one						
EmONC	35	66	25	64	60	65
EPLS	0	0	1	3	1	1
American PLS	1	2	5	13	6	7
Emergency Triage Assessment And Treatment Plus	9	17	7	18	16	17
HBB	7	13	15	38	22	24
Continuous medical education	1	100	0	0	1	11
Newborn resuscitation	0	0.0	1	100	1	1
When did training happen?						
<1 yr	17	32.7	23	57.5	40	43.5
1-2 yrs	17	32.7	9	22.5	26	28.3
>3 yrs	18	34.6	8	20	26	28.3
Highest level of education						
Certificate	4	5.6	10	13.5	14	9.7
Diploma	58	81.7	51	68.9	109	75.2
Degree	9	12.7	10	13.5	19	13.1
Master	0	0.0	1	1.4	1	0.7
Higher Diploma	0	0.0	2	2.7	2	1.4

knowledge levels of healthcare professionals (HCPs) is therefore imperative for identifying existing deficiencies and informing targeted capacity-building interventions (*Kak et al., 2001*). Consequently, the study aimed to assess the knowledge level of healthcare providers (HCPs) regarding Helping Babies Breathe at birth in Turkana and West Pokot Counties.

In this study, the majority of participants were between 21 and 40 years of age. With fewer percentages falling within the 41-50 years and over 50 years old categories, respectively. This finding could be attributed to older people being given administrative and supervisory roles due to their wealth of experience. However, there was no statistically significant association between age and knowledge levels in this study. This finding coincides with a study by *Muli*

(2020) and *Kembabazi (2023)*, which assessed newborn resuscitation practices among nurses in Machakos and midwives in Kampala, respectively. Both studies had the majority of participants below 35 years old. Conversely, a study by *Carroll et al. (2023)* on the knowledge and familiarity assessment of primary care practitioners found that more than half of the participants were over 41 years old.

Nurses comprised the majority of participants, while other cadres collectively made up less than one-fifth of the participants. There was a statistically significant close association between cadre and the knowledge in helping newborns breathe at birth, with all doctors being more knowledgeable than other cadres. This finding reflects Kenya's health system structure, which prioritizes hiring

Table (3): Frequency and percentage distribution of correctly answered questions by healthcare providers to assess knowledge per county (n=145).

Variables	West Pokot		Turkana		Total	
	Freq.	%	Freq.	%	Freq.	%
The first and most important step in HBB	14	19.7	12	16.4	26	18.1
The neonate part that is left exposed after drying and warming	34	47.9	41	56.2	75	52.1
Things checked in neonate while drying	39	55.7	59	81.9	98	69.0
How deep neonatal airway suctioning is done	66	93.0	69	94.5	135	93.8
Indication for airway suctioning	27	38.0	22	30.1	49	34.0
Number of inflation breaths for a baby who does not begin spontaneous breathing	19	26.8	23	31.5	42	29.2
Number of breaths given per minute when using Bag-Valve-Mask (BVM)	26	36.6	30	41.1	56	38.9
When to start resuscitation in the presence of only one healthcare provider	33	46.5	31	42.5	64	44.4
The ratio of breaths to cardiac compressions in a neonate	23	32.9	33	45.2	56	39.2
Frequency of neonatal reassessment	11	15.5	14	19.4	25	17.5
Indications for ventilation	20	28.2	23	31.5	43	29.9
Preferred position on opening neonate airway	26	36.6	27	37.5	53	37.1
Is oxygen necessary for resuscitation?	68	97.1	64	88.9	132	93.0
Aware of national guidelines on neonatal resuscitation						
Yes	59	83.1	56	77.8	115	80.4
No	12	16.9	16	22.2	28	19.6

Table (4): Frequency and percentage distribution of total knowledge scores per county (n=145).

Knowledge score	West Pokot		Turkana		Total	
	Freq.	%	Freq.	%	Freq.	%
0.0	0	0.0	1	1.4	1	0.7
21.4	3	4.2	0	0.0	3	2.1
28.6	7	9.9	11	14.9	18	12.4
35.7	20	28.2	18	24.3	38	26.2
42.9	18	25.4	16	21.6	34	23.4
50.0	12	16.9	12	16.2	24	16.6
57.1	2	2.8	11	14.9	13	9.0
64.3	6	8.5	4	5.4	10	6.9
71.4	3	4.2	1	1.4	4	2.8
Total mean score	43.2±11.9					

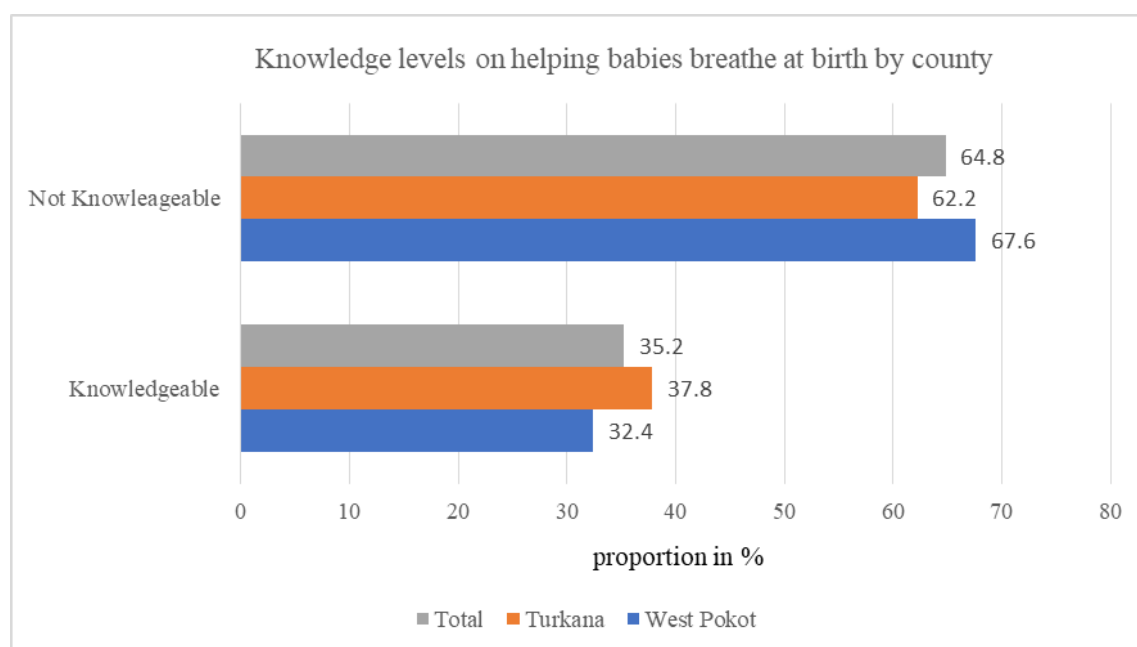
**Figure (1): Percentage distribution of knowledge levels by county (n=145).**

Table (5): Frequency and percentage distribution of healthcare providers' knowledge of HCPs in helping newborns breathe at birth per facility affiliation (n=145).

Variables	Facility ownership				Total	
	Government		Faith-Based			
	Freq.	%	Freq.	%	Freq.	%
The first and most important step in HBB	15	14.9	11	25.6	26	18.1
The neonate part that is left exposed after drying and warming	47	46.5	28	65.1	75	52.1
Things checked in neonate while drying EXCEPT	65	65.7	33	76.7	98	69.0
How deep neonatal airway suctioning is done	94	93.1	41	95.3	135	93.8
Indication for airway suctioning	34	33.7	15	34.9	49	34.0
Number of inflation breaths for a baby who does not begin spontaneous breathing	29	28.7	13	30.2	42	29.2
Number of breaths given per minute when using BVM	42	41.6	14	32.6	56	38.9
When to start resuscitation in the presence of only one healthcare provider	47	46.5	17	39.5	64	44.4
The ratio of breaths to cardiac compressions in a neonate	34	34.0	22	51.2	56	39.2
Frequency of neonatal reassessment	16	16.0	9	20.9	25	17.5
Indications for ventilation EXCEPT	33	32.7	10	23.3	43	29.9
Preferred position on opening neonate airway	32	32.0	21	48.8	53	37.1
Is oxygen necessary for resuscitation?	91	91.9	41	95.3	132	93.0
Aware of national guidelines on neonatal resuscitation						
No	20	20.0	8	18.6	28	19.6
Yes	80	80.0	35	81.4	115	80.4
Knowledge Levels						
Not knowledgeable	69	67.6	25	58.1	94	64.8
Knowledgeable	33	32.4	18	41.9	51	35.2

more nurses due to their broad scope of services. The higher knowledge of the medical officers is attributed to the scope of their training, which focuses on advanced skills, and the smaller number of medical officers in the study. Similarly, *Briggs et al. (2021)* assessed the retention of neonatal resuscitation knowledge and skills among primary healthcare workers in Southern Nigeria, with nurses being the majority of participants. *Usman et al. (2022)* similarly found that nurses were the majority; however, doctors demonstrated greater knowledge than other cadres.

Almost three-quarters of the participants in the study held a diploma as their highest level of education. This finding aligns with the health system structure in Kenya, where hiring policies tend to favor the employment of diploma holders over other qualifications. Additionally, HCPs with higher degrees are often placed in managerial or specialized roles, limiting their representation in frontline service delivery and, consequently, their participation in this study. Similarly, *Muli (2020)* found that 52.7% of participants in his study were diploma holders. In contrast, *Ahmed (2022)*, in his study assessing the knowledge and practices of nurses and midwives regarding newborn A study on resuscitation in Somalia reported that 82.5% of participants were degree-holders.

At the time of the study, most participants had received prior training that included neonatal resuscitation as a key component, with a similar percentage specifically citing Emergency Obstetric and Newborn Care (EmONC) as the training they had undergone. This finding highlights the efforts of county governments and other stakeholders in addressing newborn deaths due to asphyxia. *Mihretie et al. (2024)*, in their systematic review and meta-analysis on the knowledge and skills of newborn resuscitation among healthcare professionals in East Africa, assert that healthcare professionals who have undergone newborn resuscitation

training are 2.8 times more likely to be competent than those without such training.

These findings are consistent with a study by *Shikuku et al. (2017)* on the quality of care during neonatal resuscitation at Kakamega County General Hospital in Kenya, which found that 64.3% of healthcare providers at the facility had received training in neonatal resuscitation, further underscoring the critical role of capacity building in enhancing competency.

However, this contrasts with a study by *Kamau et al. (2022)* on the assessment of neonatal resuscitation skills among healthcare workers in Uasin Gishu County, Kenya, where only 39% of the 46% of healthcare workers with prior neonatal resuscitation training had undergone EmONC training.

Knowledge of Healthcare Providers on Helping Newborns Breathe at Birth. The results of this study reveal that a substantial number of HCPs, comprising about two-thirds of the HCPs, lacked the requisite knowledge in assisting asphyxiated newborns at birth, with slightly more than one-third demonstrating sufficient understanding. This discrepancy is of weighty concern, underscoring a critical gap in knowledge that may compromise the quality of neonatal care, ultimately contributing to adverse neonatal outcomes, including newborn deaths.

This finding can be attributed to inadequate capacity-building initiatives, exacerbated by the vast geographical expanse of the region, where healthcare facilities are widely dispersed (averaging 35 km in Turkana and 25 km in West Pokot). This finding is against the WHO recommendation of a 5 km distance between health facilities (*Ashiagbor et al., 2020*). Furthermore, the effectiveness of support supervision is suboptimal, further limiting opportunities for continuous capacity building among healthcare providers.

Table (6): Bivariate analysis of factors associated with knowledge levels on helping newborns breathe at birth among healthcare providers.

Variables	Knowledgeable N=51		Not knowledgeable N=94		p-value
	Freq.	%	Freq.	(%)	
Name of the facility:					
Chepareria Sub County Hospital	7	30	16	70	0.002
Kapenguria County Referral Hospital	2	8	23	92	
Kakuma mission hospital	6	25	18	75	
Lodwar County Referral Hospital	18	47	20	53	
Loading sub-county hospital	4	33	8	67	
Ortum Mission Hospital	12	63	7	37	
County					
West Pokot	23	32	48	68	0.49
Turkana	28	38	48	62	
Facility ownership					
Government	33	32.4	69	67.6	0.27
Faith-based	18	41.9	25	58.1	
Age in years					
21-30	23	32	48	68	0.50
31-40	26	40	39	60	
41-50	1	17	5	83	
>50	0	0	1	100	
Years worked in the current unit.					
<3	26	32	55	68	0.42
4-5	18	44	23	56	
6-10	7	33	14	67	
>10	0	0.0	2	100	
Cadre					
Nurse	40	33.3	80	66.7	0.023
Clinical officer	7	33.3	14	66.7	
Medical officer	4	100.0	0	0.0	
Highest level of education					
Certificate	3	21.4	11	78.6	0.094
Diploma	35	32.1	74	67.9	
Degree	11	57.9	8	42.1	
Master	1	100.0	0	0.0	
Higher Diploma	1	50.0	1	50.0	
Ever been trained in neonatal resuscitation?					
No	19	36	34	64	0.83
Yes	31	34	60	66	
Course					
EMNOC	17	28	43	72	0.075
European Paediatric Life Support (EPLS)	1	100	0	0	0.17
Pediatric Life Support (American PLS)	2	33	4	67	0.94
Emergency Triage Assessment & Treatment Plus	5	31	11	69	0.74
Helping Newborns Breathe (HBB)	9	41	13	59	0.49
Duration since training					
<1 yr	18	44	23	56	0.26
1-2 yrs	7	28	18	72	
>3 yrs	7	27	19	73	

These findings align with a study by *Kamau et al. (2022)* conducted in six hospitals in Uasin Gishu County, Kenya, where the highest percentage of healthcare workers (54%) lacked sufficient knowledge to pass a written examination on newborn resuscitation. These results align with a study conducted in Eastern Ethiopia, which assessed the knowledge of basic neonatal resuscitation among nurses and midwives in public health institutions, revealing that only 9.8% had good knowledge of neonatal resuscitation (*Sintayehu et al., 2020*).

Similarly, a study by *Briggs et al. (2021)* in Port Harcourt, Rivers State, southern Nigeria, found that the baseline knowledge of neonatal resuscitation among primary healthcare workers was inadequate, with only 35.22% demonstrating proficiency. The results are also consistent with a study conducted by *Ahmed (2022)* in two hospitals in Mogadishu, Somalia, where 57.5% of nurses and midwives lacked adequate knowledge to assist asphyxiated newborns effectively. In addition, an Indian study assessing the effectiveness of a Structured Teaching Program (STP) on birth asphyxia knowledge among staff nurses found similar

results, with 70% of nurses demonstrating poor knowledge (Kuriakose et al., 2021).

Conversely, a study by Manurung (2020), which evaluated midwives' knowledge regarding the management of asphyxiated newborns within the Work Area of the Deli Serdang Health Service, indicated that most midwives (55.9%) possessed adequate knowledge. Further findings from Kembabazi (2023), who evaluated the level of knowledge regarding neonatal resuscitation among midwives at Kampala International University Hospital, revealed that nearly all participating midwives possessed a solid understanding of the protocols for managing asphyxiated newborns. This finding indicated a commendable level of preparedness among healthcare providers in addressing critical neonatal emergencies. The findings from these two studies underscore the importance of ongoing training and education in ensuring high standards of newborn care and a reduction in early neonatal deaths.

The study identified substantial gaps in critical steps of helping newborns breathe at birth, particularly in the initial step of the Helping Babies Breathe (HBB) protocol, the frequency of neonatal reassessment, and the number of inflation breaths delivered during resuscitation. Most participants performed poorly in these areas, reflecting the need for more individualized capacity-building strategies to master essential knowledge and skills. These findings are consistent with those of Bang et al. (2016), who reported that only 5% of participants demonstrated adequate knowledge of the critical HBB steps. Similarly, a study by Mohamedsharif et al. (2024) found that only 5.3% of participants demonstrated good performance using the bag-valve-mask, indicating low practical competence.

Examining the knowledge levels by facility ownership, the study found that healthcare professionals (HCPs) in faith-based facilities were more knowledgeable than their counterparts in government-owned facilities, with 41.9% of participants scoring at least 50% compared to 32.4% in government-owned facilities. This finding can be attributed to the better governance and accountability structures within the faith-based setup compared to those in government-owned facilities. However, a study conducted in Nairobi city by Murphy et al. (2019) found minimal differences in knowledge levels regarding newborn resuscitation between public and Faith-based facilities, with public facilities reporting 68% and Faith-based facilities 66%. This finding suggests that factors beyond facility ownership play a more significant role in shaping the knowledge levels of healthcare providers.

7. Conclusion

In conclusion, this study's findings demonstrate that healthcare providers in Turkana and West Pokot counties possess limited knowledge in the management of birth asphyxia, with only 35.2% demonstrating adequate knowledge in helping newborns breathe at birth. The primary determinants influencing knowledge levels were the healthcare provider cadre ($p = 0.023$) and the healthcare facility of employment ($p = 0.02$). Medical officers exhibited greater knowledge than other cadres, while healthcare

providers from Ortum Mission Hospital demonstrated higher knowledge levels than those in other healthcare facilities.

8. Recommendations

The study presents several key recommendations aimed at the County Department of Health, facility administrators, and policymakers to address the identified gaps. The study emphasizes the need to intensify training and continuous capacity building for healthcare providers through classroom-based and virtual learning, continuous medical education (CMEs), and targeted structured mentorship programs. These interventions strengthen healthcare providers' knowledge and competencies in managing newborns who fail to breathe at birth.

Furthermore, the study recommends that future research investigate the effectiveness of training programs on neonatal outcomes and the underlying factors hindering knowledge retention, which in turn affect the consistent implementation of newborn care protocols. Understanding these barriers will provide critical insights for strengthening clinical practice, improving health system responsiveness, and ultimately reducing mortality associated with birth asphyxia.

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