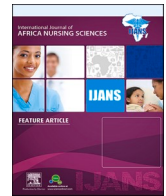


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International Journal of Africa Nursing Sciences

journal homepage: www.elsevier.com/locate/ijans

Nurses' and midwives' knowledge and practice of recommended evidence-based preterm care interventions in rural Kenya

Jane Wamuyu Kabo^{a,*}, Samwel Maina Gatimu^b, Johanna M. Mathibe-Neke^c^a School of Nursing, Kibabii University, P.O. Box 1699 – 50200, Bungoma, Kenya^b School of Economics, University of Nairobi, P.O. Box 30197, 00100 Nairobi, Kenya^c Department of Health Studies, University of South Africa, P.O. Box 392, UNISA 0003, South Africa

ARTICLE INFO

Keywords:

Implementation
Interventions
Low cost
Preterm baby care
High impact
Evidence-based

ABSTRACT

Background: Approximately 25% of four million neonatal deaths globally are due to preterm birth, a majority occurring within the first week of life and, 60% in sub-Saharan Africa. Clinical interventions to improve preterm babies' outcomes are often not used. The study assessed the availability of preterm care guidelines and resources in rural public health facilities in Kenya and nurses/midwives' knowledge and practice of preterm care interventions as per the current preterm policies and guidelines in Kenya.

Methods: A hospital-based cross-sectional design was conducted in 16 health facilities and among 102 nurses and midwives. Data were collected between January and March 2018 using the health assessment checklist and vignettes-based questionnaire. Frequencies and percentages were used to describe participants' characteristics, availability of guidelines, equipment and medicines, and knowledge, and practice on preterm care interventions. All analyses were performed using Stata 13.

Results: Sixteen public health facilities and 102 nurses were assessed. The mean age and period of clinical practice were 36 (SD: 9) and 12 (SD: 10) years, respectively. 71 (70%) participants were females, and 78 (77%) registered nurses. Three-quarters (n = 76, 74.5%) of them had in-service training in newborn care within the last two years, majority 67% (n = 69) worked at health centres/dispensaries. Vitamin K and chlorhexidine were available only in 60.8% and 47.1% of the facilities respectively. Guideline's availability in facilities were 53%, 43%, and 32% for resuscitation, warmth provision, and breastfeeding within one hour respectively. None of the nurses would practice all the recommended preterm care intervention with 17 (16.7%) practicing none. The practice of the recommended preterm care intervention ranged from 7.6% for initiation of breathing to 29% for cord clamping, 32.4% use of chlorhexidine for cord care, 36.3% immediate feeding and 47.1% thermal protection.

Conclusion: There exist gaps in the availability of medicines, equipment and guidelines for care of preterm babies, as well as implementation of evidence-based interventions to enhance the quality of care provided to preterm babies in the study area. We recommend increased provider-focussed strategies for improving the availability and implementation of low-cost high-impact evidence-based interventions for preterm care.

1. Introduction

Each year, about one in 10–15 million infants are born preterm (prematurely or before 37 completed gestational weeks) worldwide (Lawn et al., 2014). Approximately 60% of these preterm births occur in sub-Saharan Africa (SSA) and South Asia (Lawn et al., 2014), with SSA having the highest proportion of preterm-related poor outcomes (Lawn et al., 2014). Importantly, complications associated with preterm births result in 1.1 million preterm deaths annually (Ndelema et al., 2016) and are a major direct cause of newborn deaths globally and in SSA (Lawn

et al., 2013a; Lawn et al., 2013b).

More than three-quarter of preterm babies who die each year could be saved with improved care for preterm babies and even without employing complex technological care (Ndelema et al., 2016) especially in low resource settings. Compared with high-income countries where nearly all of the preterm babies survive, more than half of the preterm babies in low resource settings die due to the absence of viable and cost-effective care such as warmth, early breastfeeding support, breathing support and basic care to prevent infections (Liu et al., 2016). To improve their survival, the World Health Organization (WHO) has

* Corresponding author at: School of Nursing, Kibabii University, P.O. Box 1699, 50200 Bungoma, Kenya.

E-mail address: jwamuyu@kibu.ac.ke (J.W. Kabo).

<https://doi.org/10.1016/j.ijans.2022.100405>

Received 6 July 2021; Received in revised form 3 February 2022; Accepted 9 March 2022

Available online 26 March 2022

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developed a cost-effective high-impact chain of bundles of care for preterm babies that builds upon the essential newborn care (World Health Organization, 2015). These care bundles comprise immediate initiation of breathing, immediate and continuous feeding support, hygienic cord care, and thermal care (Lawn et al., 2013a; Lawn et al., 2013b, World Health Organization, 2015).

Most countries including Kenya have adopted these care bundles for preterm babies and incorporated them in their national child health policies and guidelines (World Health Organization, 2015). In Kenya, where one in eight babies (12.8%) is born preterm (KDHS, 2014), the 2016 basic paediatric protocols recommend early initiation of breathing, immediate and continuous feeding, warmth provision (including Kangaroo Mother Care) and use of antiseptic for cord care (Ministry of Health Kenya, 2016, Robb-McCord, 2017, World Health Organization, 2015). These low technology preterm care interventions can be delivered at all levels of care including at the health centres. Effective implementation of these interventions can prevent preterm deaths in Kenya. However, studies have shown that the uptake of these interventions, separately or together, is minimal resulting in poor quality of preterm care hence poor outcomes (Murphy et al., 2018, World Health Organization, 2019). The uptake of these interventions has been hampered by the lack of resources and poor provider training (Murphy et al., 2018, World Health Organization, 2019).

Health professionals trained on care of preterm babies are key in the effective implementation of these preterm interventions (Gondwe et al., 2016, Gravett and Rubens, 2014). However, knowledge needs to be translated into practice to deliver these essential newborn care (Requejo et al., 2014). In Kenya, evidence shows that the implementation of the preterm interventions is sub-optimal and varies (Aluvaala et al., 2015) in many public health facilities across Kenya. Despite these observations, more evidence is needed on the extent of implementation of these interventions especially in rural areas in Kenya, where the most preterm deaths are recorded (KDHS, 2014). Moreover, it is important to understand the knowledge and practice of nurses working in rural facilities on these high-impact low-cost interventions and whether these guidelines are available for nurses in these settings. Therefore, the study assessed the availability of preterm care guidelines and resources in rural public health facilities in Kenya and nurses/midwives' knowledge and practice of preterm care interventions as per the current preterm policies and guidelines in Kenya.

2. Material and methods

2.1. Study design, setting and population

The objective was to assess the availability of preterm care guidelines and resources as well as nurses'/midwives' knowledge and practice of preterm care interventions as per the current preterm policies and guidelines in Kenya. A hospital-based cross-sectional study was conducted among public health facilities in Kilifi County, Kenya. Kilifi, one of the 47 counties in Kenya, is a semi-arid area located along the Kenyan coast with a population of 1,447, 670 (Kenya National Bureau of Statistics, 2019), neonatal mortality of 17.1 per 1000 live births (KDHS, 2014) and an annual per capita healthcare expenditure of US \$50.3. It has 143 government-owned health facilities (1 county referral hospital, 4 sub-county hospitals, 14 health centres and 124 dispensaries) and 151 private/faith-based health facilities. The nurse/midwife-patient ratio is 40:100,000 against the Kenya national standard of 166:100,000 and WHO standard of 356:100,000 (Department of Health Services County Government of Kilifi, 2021). Maternal and neonatal care services are offered at all levels of care but mainly at health centres and hospitals.

Of the 143 government-owned health facilities in the county, 17 facilities (4 sub-county hospitals, 11 health centres and 2 dispensaries) were chosen since they had the capacity to deliver and take care of preterm babies; and all the 146 nurses and midwives working these facilities at the time of data collection were sampled using census

method because of their capacity to offer preterm baby care.

2.2. Data collection tools and techniques

Between January and March 2018, two trained research assistants, who are nurses, collected data using a health assessment checklist and standardised questionnaire. The health assessment checklist was adapted from the Service Availability and Readiness Assessment tool (World Health Organization, 2013) and tailored to assess the availability of policies and guidelines, requisite tools and equipment as well as essential medicine for improving preterm babies' outcomes. The most senior nurse/midwife in the maternity/newborn unit helped with completion of the checklist. This was done by first asking the nurse/midwife if the policies/guidelines, tools, medicine and equipment were available and requesting to see them to confirm their availability. The researchers then performed physical verification of the availability of policies, guidelines, tools and medicines and functionality of equipment.

The researcher-administered questionnaire consisted of three sections: participant characteristics, awareness of the availability of guidelines, policies, tools, equipment, and medicine in their facility, and five vignettes on their practice of the preterm interventions for a preterm baby on their first day of life. Based on the individual vignettes, the nurses' practices on the four high-impact, low-cost and evidence-based preterm care interventions implemented at all levels of care: warmth provision (including kangaroo mother care), preterm resuscitation, immediate and continuous feeding, and the use of antiseptic for umbilical cord care were assessed. The vignettes were structured in form of questions/Scenarios with multiple answers but the respondents were expected to choose only the best response which was scored. The questionnaire was found to be valid and reliable after an assessment by three experts – a midwife, neonatologist and public health nurse and a pilot test among 12 non-participants- nurses/midwives, neonatologist, and reproductive health specialist to ensure that the questions and accompanying instructions were comprehensive, precise and understandable. They gave feedback on correcting grammatical/typographical errors and rearrangement of some of the questions for better flow. This was done before using the questionnaire for data collection.

2.3. Statistical analysis

Frequencies and percentages were used to describe the sample characteristics, knowledge, and practice on recommended preterm babies care interventions and the availability of guidelines, equipment, and medicines for preterm care. Nurses' and midwives' knowledge and practice was assessed by individual vignettes focusing on evidence-based preterm care interventions. Only one response in each case was the recommended evidence-based practice, hence they either had the knowledge and practised correctly or had incorrect knowledge and practice. All analyses were performed using Stata version 13.0.

2.4. Ethics

The Health Research Ethics Committees of the University of South Africa (REC-012714-039 (NHERC)), Aga Khan University – Kenya (2017/REC-50(v2)), National Council of Science and Technology (NACOSTI/P/17/32115/17346) and County Government of Kilifi (HP/KCHS/VOL.VIX/6) approved the study. Eligible participants voluntarily took part in the study and provided written informed consent. Data were anonymised to ensure confidentiality.

3. Results

Of the 146 nurses working in sampled public health facilities in Kilifi county, 102 (71.3% response rate) were interviewed from 16 out of the 17 targeted health facilities. The participants' mean age and period of clinical practice were 36 (SD: 9) and 12 (SD: 10) years, respectively.

Seventy one (70%) participants were females, 78 (77%) registered nurses, 21(21%) certificate while 2(2%) were degree holders. Three-quarters 76 (74.5%) of the participants had undertaken in-service training in newborn care within the last two years while 69 (67%) worked at health centres/dispensaries and 33 (32%) at sub-county hospitals.

3.1. Availability of guidelines, medications, and equipment

3.1.1. Health facility assessment

More than half of the health facilities did not have resuscitation guidelines: Fifty six per cent on chest compression and 68.8% on intubation. For warmth provision, 13 (81.2%), 10 (62.5%) and 9 (56.2%) of the health facilities did not have any guideline on wrapping the baby to keep warm, kangaroo mother care and delayed bathing respectively (Table 1). Guidelines on initiation and exclusive breastfeeding were missing in 11 (68.8%) facilities and 8 (50.0%) facilities, while guidelines on the use of chlorhexidine for cord care were missing in 9 (56.2%) facilities. Almost all (n = 15, 93.8%) facilities did not have a referral guideline. Five facilities (31.3%) did not have intravenous fluid/infusion sets, nine (56.2%) did not have chlorhexidine and three (18.8%) Tetracycline ointment (Table 1). Most facilities had a supply of oxygen (93.8%), suction machine/nasal aspirator (87.5%) and bag and masks (81.2%) and Vitamin K (87.5%) and tetracycline ointment (81.2%).

3.2. Participants' awareness of the availability of preterm care interventions guidelines

Nurses were aware of the availability of most guidelines, equipment, and medicines. The nurses were most aware of the availability of guidelines on immediate drying of preterm baby (78.4%), wrapping of the baby (71.4%), administration of oxygen (74.5%), use of bag and mask (77.5%) and chest compression (69.6%). About 81.4% and 63.7% of the nurses were unaware of the availability of guidelines on intubation and the use of chlorhexidine for cord care (Table 2).

Table 1

Health facility assessment of the availability of guidelines, medication, and equipment.

Characteristics	Available n (%)	Not available n (%)
Resuscitation of a preterm baby		
Administration of oxygen	11 (68.8)	5 (31.3)
Use of bag and mask	13 (81.2)	3 (18.8)
Chest compression	7 (43.8)	9 (56.2)
Intubation	5 (31.2)	11 (68.8)
Provision of warmth		
Immediate drying of a preterm baby	11 (68.8)	5 (31.3)
Wrapping of the baby, including the head	3 (18.8)	13 (81.2)
Incubator/radiant heater/heated cot	10 (62.5)	6 (37.5)
Kangaroo mother care	7 (43.8)	9 (56.2)
Delayed bathing	6 (37.5)	10 (62.5)
Feeding		
Feeding within 1-hour of birth	5 (31.2)	11 (68.8)
Exclusive breastfeeding	8 (50.0)	8 (50.0)
Alternative feeding for a baby unable to breastfeed	7 (43.8)	10 (62.5)
Infection prevention		
Cord care	7 (43.8)	9 (56.2)
Use of chlorhexidine for cord care	1 (6.2)	15 (93.8)
Referral protocol guidelines, equipment		
Bag and mask	13 (81.2)	3 (18.8)
Oxygen supply	15 (93.8)	1 (6.3)
Suction machine/nasal aspirator	14 (87.5)	2 (12.5)
Intravenous fluid and infusion set	11 (68.8)	5 (31.3)
Essential drugs		
Vitamin K	14 (87.5)	2 (12.5)
Chlorhexidine	7 (43.8)	9 (56.2)
Tetracycline ointment	13 (81.2)	3 (18.8)

Table 2

Self-report of implementation of recommended preterm care interventions in Kilifi County.

Characteristics	Aware n (%)	Not Aware n (%)	I don't know n (%)
Resuscitation of a preterm baby			
Administration of oxygen	76 (74.5)	20 (19.6)	6 (5.9)
Use of bag and mask	79 (77.5)	15 (14.7)	8 (7.8)
Chest compression	71 (69.6)	24 (23.5)	7 (6.9)
Intubation	19 (18.6)	67 (65.7)	16 (15.7)
Provision of warmth			
Immediate drying of a preterm baby	80 (78.4)	17 (16.7)	5 (4.9)
Wrapping of the baby including the head	73 (71.4)	17 (18.6)	10 (9.8)
Incubator/radiant heater/heated cot	63 (61.8)	25 (24.5)	14 (13.7)
Kangaroo mother care	57 (55.9)	29 (28.4)	16 (15.7)
Delayed bathing	54 (52.9)	26 (25.5)	22 (21.6)
Feeding			
Feeding within 1 h of birth	65 (63.7)	21 (20.6)	16 (15.7)
Exclusive breastfeeding	60 (58.8)	15 (14.7)	27 (26.5)
Infection prevention			
Use of chlorhexidine for cord care	37 (36.3)	43 (42.4)	22 (21.6)

3.3. Knowledge and practice on the care of preterm babies

Overall, none of the nurses would practice all the recommended best practice for the care of a preterm baby but two (2%) would practice at least four of the recommended practices while 17 (16.7%) would practice none of the recommended practices.

Specifically, only 18 (18%) would dry and rub gently to stimulate a 34-week-old preterm baby that did not cry immediately after birth, 48 (47%) would give the first bath to a 36-week-old preterm baby after 24 h while 37 (36%) would insert an oral or nasal gastric tube and give expressed breast milk to a 28-week-old preterm baby who is not able to breastfeed. Also, only 30 (30.0%) and 33 (32.4%) would clamp the umbilical cord of a stable preterm baby 2–3 min after delivery and apply antiseptic cream for cord care, respectively (Table 3).

Notably, 21% and 18% of the participants did not know what to do to a preterm baby who does not cry immediately after delivery and is unable to breastfeed while 14% did not know the best time for the first birth (Table 3).

4. Discussion

Our study shows gaps in availability and use of guidelines/protocols, equipment and medicines for the care of preterm babies'. A study by Vesel et al (2013) that assessed the quality of preterm care in Ghana revealed similar findings, with health facilities lacking important equipment and medicines for the care of preterm babies. That study estimated that only 33.2% of babies born in health facilities had access to high quality, basic resuscitation because necessary equipment were lacking. The findings highlight constraints in preterm care guidelines, equipment and medicines, which is likely to negatively impact preterm babies' health outcomes.

More than half of the participants indicated that chlorhexidine was not always available suggesting a gap in supply of essential drugs for the care of preterm babies. A study done in Nigeria to evaluate the use of chlorhexidine among nurses and midwives showed that chlorhexidine

Table 3

Knowledge and practice about the care of preterm babies among the nurses and midwives.

Characteristic (N = 102)	Frequency n (%)
Best action when a 34-week-old preterm baby does not cry after delivery	
Stimulate by drying and rubbing gently*	18 (18.0)
Examine and suction the mouth	23 (23.0)
Ensure extra warmth for the baby	17 (17.0)
Use a bag and mask to ventilate	23 (23.0)
Don't know	21 (21.0)
Best timing for the first bath for a 36-week-old preterm baby	
After 2 h	3 (3.0)
Soon after birth	31 (30.0)
Within 4–6 h	6 (6.0)
After 24 h*	48 (47.0)
Don't know	14 (14.0)
The best action to take when a 28-week-old preterm baby is unable to breastfeed	
Insert an oral/nasogastric tube and give expressed breast milk*	37 (36.0)
Give glucose via cup	16 (16.0)
Wait for some hours then try again	13 (13.0)
Feed expressed breast milk with a cup	9 (9.0)
Insert an intravenous line and give fluids	9 (8.8.0)
Don't know	18 (18.0)
Best timing for clamping and cutting the cord of a stable, preterm baby	
Soon after delivery	53 (52.0)
After 30 s	4 (4.0)
After 50 s	13 (13.0)
After 2–3 min*	30 (30.0)
After 5 min	2 (2.0)
Best practice for cord care to prevent cord infection	
Apply antiseptic cream/ointment*	33 (32.0)
Clean with saline	27 (27.0)
Leave it alone to dry	21 (21.0)
Apply surgical spirit	17 (17.0)
Wash with soap and water	2 (2.0)
Don't know	2 (2.0)
Correct responses	
0	17 (16.7)
1	25 (24.5)
2	41 (40.2)
3	17 (16.7)
4	2 (2.0)

* Policy and guidelines recommendation.

out of stock most of the time and nurses and midwives feared using it, since it lengthened the time of cord separation (Wright, Umar-Farouk & Ricca 2018). This suggests that the availability of drugs may sometimes depend on nurses' and midwives' perceptions about its use.

Formal protocols/guidelines on admitting or referring preterm babies, were missing in most facilities. Similar findings from a systematic review of guidelines for the management of preterm babies indicated that standardised referral systems were missing to guide healthcare providers regarding referral of preterm babies to a higher-level facility (Guillén et al 2015). The implication for this is delay in decision making for timely transfer and proper care.

Implementation of evidence-based interventions is supported by availability of guidelines, essential equipment and medications (Baker et al., 2015). Without their availability and knowledge on their use, the care of preterm babies would be suboptimal impacting negatively on the SGD 2030 agenda.

Low-cost and low-technology evidence-based interventions such as immediate breastfeeding, thermal care and use of kangaroo mother care for small babies are recommended for all stable preterm babies (Bick, 2012). Failure to implement evidence-based best practices may adversely affect preterm babies' health outcomes (Payne et al., 2010). Our study reveals dissimilarities in the use of evidence-based care for preterm babies, which could be contributing to the high infant morbidity and mortality in the country. Our findings reinforce the

notion that discrepancies between research evidence and clinical practice lead to inappropriate use of interventions that are not supported by scientific evidence, or inadequate use of interventions that could be favourable (Brok et al., 2008). Lack of correct knowledge regarding guidelines has previously been mentioned as a barrier to the implementation of best practices to improve care (Stokes et al., 2016). Healthcare institutions should reduce these variations in the care of preterm babies by advocating for best care practices (e.g. implementation of evidence-based practice), training of health care providers, and adherence to clinical practice guidelines to improve their health outcomes (Kleinpell and Zimmerman, 2017).

Our study found that about one-fifth of the nurses knew and practiced evidence-based recommendations for the initiation of breathing for preterm babies. This mirrors findings in Malawi where healthcare providers did not know how to initiate the resuscitation despite their knowledge of failure to breathe as a common problem after birth among preterm babies (Robb-McCord, 2017). However, it differs from a study in India that found that knowledge and skills in resuscitation among healthcare providers were largely satisfactory (Malhotra et al., 2014). The initiation of breathing is very critical for newborn preterm babies who do not breathe after birth by drying and rubbing the baby gently (World Health Organization, 2015).

Delaying the first bath of a baby until 24 h ensures thermal protection in the early days of neonatal life (Lawn et al., 2013a; Lawn et al., 2013b). Our study though found that less than half of nurses knew about delaying the first bath, with almost one-third of them noting that they would give bath soon after birth. This supports findings of a facility-based study in Ghana where delayed bathing was inadequately implemented for births that occurred in health facilities (Vesel et al., 2013). However, our finding differed from those in a study in India where most healthcare providers had satisfactory knowledge and skills on hypothermia prevention (Malhotra et al., 2014). In our study, participants seemed to fall short of the required level of practice.

Extra feeding support is recommended for babies born preterm (World Health Organization, 2019). However, slightly more than a third of the nurses would take the correct intervention for a stable preterm baby who is unable to breastfeed after birth which is to insert an oral or nasal gastric tube and give expressed breast milk. Similar to our findings, Lawn et al. (2013) found that guidelines on the feeding of preterm babies existed but were not followed consistently across continents while Vesel et al. (2013) found that early initiation of breastfeeding was inadequate (below 50%) in the health facilities.

Optimal timing of clamping and cutting the cord has the potential to reduce major morbidities and mortality in preterm babies (Knol et al., 2018, Vento and Lista, 2015). More than half of the nurses noted they would clamp and cut the cord soon after birth, denoting a gap in the implementation of evidence-based practice that supports delayed cord clamping. Most maternity care providers (70–72.6%) in India were found to practise early cord clamping for both normal term and preterm newborns (Madhavanprabhakaran et al., 2018). Contrary, 67.9% of maternity care providers in Rwanda delayed cord clamping and cutting (Mujawamariya, 2019). Moreover, only a third of the nurses acknowledged chlorhexidine for the prevention of cord infection. The introduction of chlorhexidine gluconate 7.1% gel positively changed cord care practices and prevented omphalitis in preterm babies at public health facilities in Nigeria (Abegunde et al., 2017).

5. Limitations of the study

This study used vignettes to assess the knowledge and use of evidence-based interventions, which could result in an over-report of practice. With the use of facility assessment tool, it was possible to some extent to ascertain the reported practice since correct practice must be in line with the availability of equipment, medicines and guidelines. The study also had a small sample (this was because the county is among the counties in Kenya with shortage of nurses and midwives) which may

limit the generalisability of the findings. However, 16 out of 17 of all the facilities offering new-born care in the county were included and census sampling was employed for the nurses and midwives.

6. Conclusion

Our study shows heterogeneity in the knowledge and practice about the care of preterm babies among nurses in Kilifi and highlights key actionable gaps in the care of preterm babies. Health facilities should be equipped with the necessary guidelines, equipment, and medicines to provide optimal preterm care and contribute to the national goals of reducing infant mortality. Healthcare providers and managers in Kilifi county—one of the counties with a high burden of infant morbidity and mortality—should embrace and promote the recommended low-cost high-impact evidence-based interventions for the care of preterm babies. The issue of maximum care of preterm babies' birth is of paramount importance in order to realize the United Nations Sustainable Development Goal 3 target #3.2, whose goal is to end all preventable deaths of newborns and all children under the age of 5 years by 2030, hence the importance of addressing it in the study area.

7. Implications

The implication of the study findings is that interventions need to be put to change the practice of nurses and midwives through trainings or refresher courses, moreover ensuring availability of essential commodities would ensure that the nurses and midwives are supported to care for the preterm. At the policy level there is need to ensure that protocols and guidelines are able to reach the lowest level of health facilities and monitoring of their use. Additionally, further research is paramount to understand the beliefs of some nurses and midwives regarding the new guidelines to ensure buy in and avoid use of outdated ones.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgements

The authors are grateful to all the participants and partners who made the research a success.

Authors' contribution

Jane Wamuyu Kabo prepared the initial draft. All authors reviewed the manuscripts for intellectual content and approved the final draft manuscript for publication.

Availability of data and materials

The datasets generated and analysed for this study are available on request from the corresponding author.

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