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Assessing the Impact of Client Knowledge and Demand on Service Provision from Antenatal to Postnatal Care - An Implementation Science Design

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Abstract

Background: In low resource countries suboptimal clinical care has been identified a contributor to maternal and infant mortality. This study aimed to test the impact of a community intervention promoting client demand on provision of care during ANC, labour and the first postnatal contact (PNC).

Methods: This was implementation science research in Kasungu district of Malawi using a quasi-experimental design with an intervention site where mothers were exposed to a package of interventions aiming to improve knowledge and demand. The results were compared with a site where there was no intervention in the same district. The intervention included checklists for mothers, posters and a Radio Distance Learning (RDL) program. The study used mixed methods (qualitative and quantitative). A total of 1040 mothers participated in individual interviews. Sixteen Focus Group Discussions (FGDs) were conducted with 128 mothers and 8 Key Informant Interviews were conducted with health workers. Health passports were used to check service provision at both comparison and intervention sites. In addition, mothers' checklists were used at the intervention site to verify service provision. Quantitative data were processed in Stata 16.0 using binomial regression and two-sample proportion tests. NVivo 12 was used to process qualitative data for thematic analysis through coding and merging or creation of new codes.

Results: At the intervention site there was a 21.9% mean increase in knowledge of demandable services in ANC (43.3% to 56.1%, $p<0.001$,), intrapartum services for the mother (20.6%, 41.8% to 62.6%, $p=0.003$,) and the neonatal services before discharge (17.5%, 47% to 64.5%, $p=0.0039$). For PNC, changes were non-significant. Overall, women at the intervention site were 50% more likely than women at the comparison site to demand a service in the continuum of care (RR = 1.5). Actual service provision was increased at the intervention site across all elements of the continuum, including laboratory testing, clinical examination of mothers and newborns and provision of essential interventions such as oxytocin for prevention of postpartum haemorrhage, chlorhexidine for umbilical cord care and vitamin K.

Conclusion: The intervention positively contributed to increased knowledge on care practices, attitudes towards demand, actual demand for care practices, services provision and service satisfaction.

Keywords: Antenatal; Care Practices; Continuum Of Care; Demand; Delivery; Service Provision; Labour; Postnatal; Quality Of Care

List of Abbreviations: AEHO- Assistant Environmental Health Officer; ANC- Antenatal Care; BCG- Bacille Calmette-Guerin; BP- Blood Pressure;

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EDD- Expected Days of Delivery; EENT- Ear, Eye, Nose and Throat; FGD- Focus Group Discussion; FHR- Fetal Heart Rate; GBV- Gender-based Violence; Hb- Haemoglobin; HHFA- Harmonised Health Facility Assessment; HR- Heart Rate; HAS- Health Surveillance Assistant; IPTp- Intermitted Preventive Treatment in Pregnancy; ITN- Insecticide Treated Net; KII- Key Informant Interviews; LLIN- Long-lasting Insecticide Treated Net; MDHS- Malawi Demographic and Health Survey; MNCAH- Maternal Neonatal Child and Adolescent Health; MUARC- Middle-Upper Arm Circumference; PNC- Postnatal Care; RDL- Radio Distance Learning; SP- Sulfadoxine-Pyrimethamine; SPA- Service Provision Assessment

Background

In developing countries suboptimal care has been identified as one of the major contributors to maternal and infant mortality [1,2,3]. A review of 15 studies conducted in 9 African countries alluded poor quality to heavy service provider workload, unavailability of essential medicines and supplies, lack of policy, and inequitable distribution of staff [4]. In addition to lack of equipment and supplies researchers have reported poor teamwork, inadequate knowledge of standards, as well as and lack of motivation, and disrespect from health professional staff as contributors to poor quality of care [5,6]. In Malawi, the 2018 Harmonised Health Facility Assessment (HHFA) report indicated that on average, health facilities had 75% of basic equipment items available and 31% of the facilities had all basic equipment items. The items included adult weighing scale, child weighing scale, thermometer, stethoscope, blood pressure apparatus, and light source [7]. 6% of facilities had the capacity to conduct all basic diagnostic tests for pregnancy, haemoglobin, blood glucose, malaria, urine protein and glucose, HIV, and syphilis. Only 38% of the facilities had essential medicines and no facilities had all 24 essential medicines [1]. Only 17% of ANC clients reported receiving at least eight ANC components, which included weighing, examination of uterine height, assessment of blood pressure and administration of iron/folic acid, information/inquiry on Tetanus vaccine, and counselling on HIV, exclusive breastfeeding and diet [8]. During labour, service provision has equally been reported as substandard. In a study on documentation of the partograph in South-west Zone of Malawi, it was found that that 58.6% of partographs had no recording of maternal blood pressure and 65.3% had no temperature documentation. Moulding was not recorded in 25.4% of the partographs while fetal heart rate was not recorded in 14.9% and descent was not recorded in 12 % of them [9]. A study assessing the quality of care in three maternity waiting homes in Mulanje found that factors that were perceived to compromise quality included lack of 24-hour nursing care [10]. This can be alluded to staff availability at the health centres; either as a result of inadequacy of human resources, attitude or managerial factors. On early postpartum care, the 2015-2016 Malawi Demographic and Health Survey reported slow progress in postnatal checks within 48 hours after childbirth; with only 42% of mothers checked in 2016 against 41% in 2010 [11]. This is one of the critical periods as most of the maternal deaths (439: 100,000 [12]) occur during the first 48 hours [13] and 60% of maternal deaths within 24 hours after childbirth [14]. Studies show that routine and emergency postnatal care services are compromised by factors that include unavailability of basic equipment and job aids to reinforce midwives' knowledge and practice. Furthermore, provider workload leads to prioritisation of services in labour and delivery [15,16]. In 2018, only 4% of under-five child visits received all seven service components while on average, children received 40% of the components; with only 58% of the children having been weighed and 14% having their height measured. Only 27% of children had their weight or height plotted and 50% of the visits reported having a physical exam [17]. Literature demonstrates that poor quality of care is partly influenced by service provider negligence and fatigue. This study aimed to investigate how a community intervention promoting client demand can influence provision of care during ANC, labour and the first postanal contact. Its specific objectives were to (i) assess improvement in terms of mothers' knowledge on care practices (ii) assess improvement in terms of mothers' demand for the care practices, and (iii) measure effectiveness of the intervention in terms of actual provision of the care practices by health workers.

Methodology

Design

This was a quasi-experimental study (implementation science research) that aimed to observe effects of an intervention [18] designed to generate demand for care practices in antenatal, intrapartum and early postnatal care.

The Intervention

Mothers at the intervention site were exposed to a package of materials for improving demandable services at the point of care. These included checklists for mothers, health facility posters and a Radio Distance Learning (RDL) program.

Lead mothers were trained at village level to identify and mentor pregnant women on care practices they were expected to receive and demand. Four Radio Distance Learning programs were produced to facilitate discussion on demandable services between lead mothers and pregnant women. The programs featured a community health worker (lead mothers), a pregnant woman, her family and friends, and a nurse at the health centre. The story walks the woman from pregnancy to postnatal period. Through her interactions

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with a trained volunteer, friends, and the nurse, the woman learns about demandable services, which she starts to demand. The radio programs had interludes where the host asks some questions to mothers about some of the care practices. Lead mothers encouraged mothers to answer the questions and discuss different ways of demanding care practices. The lead mothers distributed a checklist to pregnant women, which included care practices that can be demanded during ANC, labour and delivery and PNC. Mothers were advised to keep the checklist at home and regularly check it, especially when going to the health centre so that they had fresh memory about the care practices. They were advised to mark if a service was provided or not after each contact. To reinforce the messages, posters were pasted at the heath centre as cues of information for mothers at the point of care.

Study Setting

The research was conducted in Kasungu district of Malawi at Kaluluma Rural Hospital (Intervention site) and Santhe Health Centre (comparison site. The criteria for selecting health centres was based on similarities in availability of minimum required technical staff (at least 1 MA, 4 nurses involved in obstetric care, 1 lab technician, and 1 AEHO with at least 10 support staff i.e. HSAs), availability of basic equipment and supplies [2], and population of ANC/labour/PNC mothers (70-80 mothers per month). Two facilities qualified using the systematic approach (Kaluluma and Santhe) and the intervention site was selected by simple alphabetical randomisation that identified the health centre of which name appeared first in the alphabet i.e., Kaluluma.

Study Population

The study included mothers from pregnancy stage up to first 3 months of lactation. These were thought to be mothers who would have fresh memory of pregnancy, delivery and early PNC experiences. A total of 1040 mothers participated in individual interviews i.e. 260 from each site during both baseline and endline surveys. For the qualitative component, 8 FGDs were conducted with 64 mothers at both baseline and endline. Each FGD had 8 women as one of the recommended numbers for Focus Group Discussions [19]. 8 Key Informant Interviews were conducted with health workers at the two sites (nurse midwives or those operating as such) at both baseline and endline.

Statistical Power

OpenEpi Sample Size Calculator [3] was used to come up with the required sample for the study and level of significance. With a minimum of 260 mothers the intervention site and 260 mothers at the comparison site, the study had 95% power to detect a change of at least 12 % points in knowledge, demand and provision of care practices and a 5 % significance level. Other studies were used to certify the rationality of 12% or less percentage points difference as having clinical significance [20-24].

Data Collection

The research used mixed methods (qualitative and quantitative). These included a structured questionnaire for mothers to quantitatively establish the extent to which they were exposed to the intervention, if they demanded various services at the point of contact and if such services were provided by health worker. An attempt was made to triangulate information on service provision by checking health passports. In addition to health passports checklists for mothers were used during the endline survey at the intervention site. A Questionnaire for Key Informant Interviews (KIIs) was used to gather health workers' insights on successes and challenges of client demand while a Focus Groups Discussion (FGD) guide was used to find out about mothers' experiences and insights during their contacts with services providers. Finally, simulation/vignettes were used to assess service provider compliance to standards.

Consent

All research participants signed consent forms which conformed to the standards by the Research and Ethics Committee of the Kamuzu University of Health Sciences.

Data Analysis

Quantitative data were prepared in the Stata 16.0. The cleaning process involved checking if there are any outliers, missing data and inconsistency checks; after which analysis commenced. The first step involved generation of descriptive statistics. For categorical data, the summaries were done by producing proportions with associated confidence intervals while for continuous data, measures of central tendency such as mean for normally distributed and skewed data were generated. These were also calculated with their associated measures of dispersion such as standard deviation for mean and interquartile range (IQR) for median. Binomial regression was utilised for single variables, e.g., BP, to calculate significance of difference between comparison and intervention sites in terms of p values, Confidence Intervals and Risks Ratio. For mean scores, the researchers utilised the two-sample proportion test at a confidence level of 95% to measure significance of changes between the two groups e.g., mean difference in demand or service provision. In cases where the endline results were similar but the percentile change for a single cohort was clinically significance, the study used ttest-mean comparison test to measure if the change within the group (from baseline to endline) was significant, at a hypothesised percentile change of 12 points from baseline. For the qualitative component, all transcripts

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were read through for familiarization and entered into NVivo 12 to facilitate organization and processing of data. The process to familiarize with the data considered the fact that the study was conducted at two sites. Thematic analysis using templates was then employed. This followed development of a coding template, which was initially based on a subset of the data. Where necessary, the process involved modification of the template by deleting, merging, or creation of new codes. For instance, child node 'ease in demanding service' was added to 'services demanded' to gauge participants' perceptions of the ease with which they could demand services. This child node was also later modified to become 'ability to demand services'.

Findings

Assessing Improvement in Mothers' Knowledge of Care Practices offered during ANC, Labour and PNC

In terms of knowledge on ANC demandable services, there was a significant increase at the impact site in comparison with the comparison site with a mean score of 45.2% (34.3% to 56.1%, p<0.001); including knowledge level differences on measurement of blood pressure (23.7%), haemoglobin test (24.4%), urinalysis (20%), height measurement (21.7%), abdominal assessments (29.9%) and syphilis test (15.7%). At the intervention site, major shifts from baseline to endline were noticed on knowledge around demand for urine test (60.6%), height measurement (68.3%), abdominal examination (61.3%), dipstick to diagnose infections (64.7%), demand for information on diabetes (60.2%) and intimate relationship/ gender-based violence (64.1%), and information on demand for deworming tablets (60%). Refer to Table 1 for more details on knowledge on demandable services during ANC.

Knowledge of Demandable Services during Labour and Delivery

Equally, at the intervention site, there was higher increase in knowledge of demandable services during labour and delivery (52%, 41.8% to 62.4%, p=0.0031) with 24% points higher in EENT examination, 20.5% higher in assessment of heart rate and respiration, 15.2 % in abdominal and vaginal examination, and 25.8% higher in syphilis test. From delivery to discharge the intervention site maintained higher scores on examination of vital signs (17.8%), abdominal and vaginal examination (20.19%, 26.25% respectively) as well as administration of oxytocin (29.30%). Refer to Table 2 for more details on knowledge on demandable services for the mother during labour and delivery.

Regarding services for the child, the mean difference between the intervention and comparison sites was at 55.81% (47% to 64.5%, p=0.0039) with remarkable differences in knowledge about demand for chlorhexidine (23.2%), antiseptic for the eyes (18.7%), and head-to-toe assessment 19.2% and respiration (23%). Refer to Table 3 for more details on knowledge on demandable services for the neonate after delivery.

Knowledge of Demandable Services Offered during Postnatal Care

At both sites there was remarkable increase in knowledge on maternal assessments during PNC (weighing, BP, Hb, abdominal and vaginal examination) with a mean score increase of 56.6% at comparison site and 60% at intervention site. No significant difference was observed at the intervention site in relation to the comparison site (p= 0.62). Refer to Table 4 for more details on knowledge of demandable services for the mother during first PNC visit.

Equally, at both sites, there was increased knowledge of services for the child during postnatal; 66.4% increase at intervention site against 60.7% at the comparison site with no significant difference was detected between the sites (p=0.1366). Table 5 contains a detailed outlook on knowledge of demandable services for the neonate during first PNC Visit.

Assessing Improvements in Mothers' Demand for Care Practices

Self-efficacy, an individual's perception of competence of perform a certain task/behavior [25], is an intermediate indicator of behaviour as higher self-efficacy predicts probability of practising a behavior [26-28]. Compared to its own baseline, there was higher self-efficacy for women at the intervention site (by the end of the implementation as more women believed they were capable of requesting for services during ANC, delivery or PNC (12.5%, 82.3 to 94.8%, p<0.001). However, no significant difference was observed at the comparison site (0.6%, 90.4% to 91%, p= 0.1139). There was a dimension of social norms influencing demand. Social norms are context-dependent, externally derived rules of obligatory, appropriate, and acceptable behaviour shared by people in the same group or society [29,30]. Everyone wants to belong to a group/society [31] and is influenced by what they believe others do (descriptive norms) and what they think other would approve or disapprove (injunctive norms) [32,33]. More women at the intervention site believed that other women were capable of demanding services (31%, 49.6% to 81.3%, p<0.001) and more women believed it was an appropriate practice to demand a service (14.4%, 79.2% to 93.6, p<0.001). Mothers were asked if at some point there were able to ask for a service when it was not provided through word, gesture or any other way they regarded as demand. Generally, women at the intervention site were 50% more likely than women at the comparison site to demand a service in the continuum of care (RR = 1.5, p=0.0151). Refer to Table 6 for more details on self-efficacy, norms and demand for care practices.

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During FGDs, mothers at the intervention site were observed to be more assertive compared to those in the comparison community. This was evident from how forthcoming they were in suggesting ways for improving demand for services, which might have stemmed from an advantaged position of knowledge on care practices and experiences in demanding such. For instance, mothers from the intervention site, showed eagerness to share relevant information with others. Most mothers at the intervention site indicated that it was always necessary to demand for services when needed. On the contrary, responses at the comparison site were highly mixed in their assessment of the necessity to demand services from health workers as some women felt it was shameful and unnecessary to remind a doctor of a service s/he hasn't provided while others felt it was necessary. Commonly cited services reported to have been demanded during ANC included mosquito nets, assessment of blood pressure and haemoglobin, height and weight, STIs and HIV tests, assessment of general health history (asthma, hypertension, diabetes, and epilepsy), abdominal examination (fetal position and movement), oedema and administration of antimalaria prophylaxis. Women also cited demand for information on diet, family planning methods, contents of birth certificate, preparedness for delivery, labour signs and danger signs. In many instances women were able to demand services where they felt they need to access such services or where health workers had missed such.

"During my antenatal visits I was not being given Tetanus Vaccine…so I asked the doctor why I was not given. He gave me the vaccine." Woman, Santhe FGD

"I asked the doctor to check my abdomen because I couldn't feel the movements and the doctor did as asked." Woman, Kaluluma FGD

Services commonly reported as demanded during labour and delivery included monitoring labour pain, examining the abdomen, genitalia and cervical dilation, guidance on physical exercises, assessment of blood pressure, testing for STIs, breast examination, urine test, administration of oxytocin, counselling on labour process, and HIV/AIDS counselling for positive mothers. For the baby women reported that they demanded weighing, eye drops, vaccines (BCG and polio), vitamin A, examination of genitals, feet, head, and umbilical cord, and assisted breathing in cases where the baby had difficulty in breathing. Lead mothers supported women demand services:

"I was approached by a woman soon after she attended her checkup. She reported to have not received a bed net. When asked why she did not ask for it, her response was that she was shy. I escorted her to the nurse who eventually gave her a mosquito net." Kaluluma Lead Mothers FGD

During postnatal care, mothers commonly cited demand for vaccines for the baby, physical examination of both child and mother, weighing, and measurement of temperature.

Measuring Effectiveness of the intervention in Provision of Care Practices

Service Provision during ANC

For all services offered during ANC, there was a higher average increase at the intervention site with 16.4 % (57.7% to 74.1%, p= 005) and women at the intervention site were 20% more likely to be offered ANC services than were at the comparison site (RR= 1.2,). The differences between the intervention and comparison sites included haemoglobin test (31.9%), urinalysis (10%), syphilis test (8.4%), height measurement (23.7%), and information on diabetes (29.8%), GBV (44.4%) and EDDs (21.4%). Refer to Table 7 for extracts of care practices offered during ANC.

The final ANC contact is crucial for determining the health of the mother prior to her delivery. Mothers were asked if some observations were made at their final visit before labour/ delivery. On average women were 40% more likely to receive a service at the intervention site than were at the comparison site (p= 0.02, RR=1.4). Some care practices that increased remarkably in comparison with the comparison site included measurement of blood pressure (20%), haemoglobin test (28.7%), information on breastfeeding (14.4%) and syphilis test (10.3%). Table 8 provides a detailed analysis for extracts of care practices offered during the final ANC visit.

Service Provision during Labour

There were significant improvements in both the comparison and intervention sites on care practices offered between labour and delivery. However, comparing endline results, there was higher increase at the intervention site with an average of 15.6% (47.5% to 63.1%, p= 0.0081) in relation to the comparison site. Mothers at the intervention site were 30% more likely (RR= 1.3) to receive services than mothers at the control site. Refer to Table 9 for more details on care practices offered during labour.

With an average increase of service provision at 13% (42.1% to 55.2%, p= 0.04), the mother at the intervention site was 30% more likely to receive intrapartum services than the mother at the comparison site (RR= 1.3). Major comparative changes were observed in measurement of temperature (16.5%), respiration (27.3%) and heart rate (27.3%). See Table 10 for more details on maternal care practices offered from delivery to discharge.

For neonatal services, the intervention site registered an average difference of 23.2% higher (58.3% to 75.94%, p=0.0007) and the neonate had 30% more chances (RR= 1.3) to be offered services; with major differences

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observed in provision of Chlorhexidine (35.1%), Vitamin K (36.8%), and head-to-toe assessment (20%). See Table 11 for an outlook of neonatal care practices offered from delivery to discharge.

Services Offered during Postnatal Care

During PNC, mothers at the intervention site were 78% more likely to be offered services than were mothers at the comparison site (p=0.0103, RR =1.78). For the neonate, there was a significant difference between the comparison and intervention sites, with 30% more chances for children at the intervention site (RR= 1.3). Refer to Table 12 for more details on PNC services for the neonate and the mother.

Service provision in the Continuum of Care

On average services provision was 16.3% higher (38.5% to 51.7%, p= 0.04) at the intervention site for all services from ANC to PNC. The greatest difference was observed in service delivery from labour to discharge (24.9%), followed by PNC services for the neonate (16.62%), labour (15.6%%), Final ANC visit (15.5%), PNC for the mother (14%) and finally general ANC services (13.9%). Refer to Table 13 for an outlook on service provision in the continuum of care from ANC to PNC.

On average 27.5% of services at the intervention site and 18.1% at the comparison site were recorded in the health passport, representing 9.4% higher incidents detected through health passports, against 16.3% higher incidents reported by mothers. Mothers' checklists at the intervention site showed that on average 55.7% of services were offered in the continuum of care while verbally they reported 51.7% of care practices being offered.

Service Satisfaction

The percentage of mothers who viewed services as good was high at both baseline and endline at the intervention site. On the contrary, levels of satisfaction consistently dropped at the comparison site and comparatively there was higher satisfaction at the intervention site for services provided during ANC, labour and delivery and PNC. The highest difference was observed in postnatal care with 22% mothers perceiving services as good and 10.5% perceiving as very good. See Table 14 for more details on service satisfaction during ANC, Labour and PNC.

Challenges in Demand and Service Access

Participants highlighted a number of challenges that affected access to services on both supply side and the demand side suggested ways of dealing with the challenges. From the supply side, supplies stock-outs, shortage of equipment and health workers' workload were cited as key challenges. At times women would mobilise themselves to buy some supplies, e.g. batteries for the weighing scale and in some cases, essential drugs like pain killers would be out of stock:

"And also in labour ward you find that you have delivered and you are bleeding and when you ask for medicine that stops bleeding…they told you that the drug is not available." (Santhe FGD)

"As a clinic we are out of iron tablets so some women ask why they have not been given and we explained to them that those pills you were supposed to be given are not available at the moment…we will give them to you when they are in stock." Kaluluma KII

Health workers' workload was highlighted by women and health workers partly because of increasing demand for services:

"Demand is increasing. It's like there is workload. A woman in labour needs a full-time nurse but sometimes we leave them and maybe attending antenatal and OPD cases. More women come here than in neighbouring health centres. So, there is more workload." Health Worker, Kaluluma KII

"If you do short cuts women will demand for the service… 'What about this and that?' But in the past, you would choose to release them once we test pregnancy but now they even fail to enter the examination room. They would demand to be weighed if you missed it. So, there is workload, but it is good because at least mothers are receiving almost a full package." Health worker Kaluluma KII

A number of challenges were reported for the demand side. Shyness or lack of assertiveness was the most common, mediated by literacy. Shyness and lack of assertiveness vis-à-vis literacy levels was mostly raised by Lead Mothers.

"Generally, mothers are able to demand services. However, there are some who get pregnant out of wedlock who are shy and do not ask for services." Kaluluma Lead Mother FGD

As some participants opined, lack of education could be implicated in failure of mothers to be assertive:

"Mothers with low education level have difficulties in asking for a service than their counterparts who at least got up to senior primary classes or secondary." Lead Mother, Kaluluma

In such cases some participants felt that involvement of husbands would be key. While Lead Mothers pledged to continue encouraging mothers to demand services, there was a feeling that husbands needed to be empowered on the need to seek or demand services.

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Table 1: Knowledge on Demandable Services during ANC

	Comparison Site		Intervention Site		%age Change (Baseline vs. Endline)			
	Baseline (n=260)	Endline (n=260)	Baseline (n=260)	Endline (n=260)	Comparison	Intervention	Mean	Difference
Expected Days of Delivery	26.54	41.67	20.38	75	15.13	54.62	34.875	39.49
Blood Pressure	54.23	83.33	43.85	96.61	29.1	52.76	40.93	23.66
Haemoglobin	33.85	68.33	33.08	91.95	34.48	58.87	46.675	24.39
Urine Test	31.15	71.67	20.77	81.36	40.52	60.59	50.555	20.07
Height Measurement	23.46	70	16.92	85.17	46.54	68.25	57.395	21.71
Abdominal Assessment	46.15	77.5	35.77	97.03	31.35	61.26	46.305	29.91
Weight	41.15	84.17	37.69	96.19	43.02	58.5	50.76	15.48
Dipstick to diagnose infections	31.92	69.17	23.85	88.56	37.25	64.71	50.98	27.46
HIV Test	57.31	89.17	53.08	96.61	31.86	43.53	37.695	11.67
Nutrition for information for mother	45.38	80	40.38	94.49	34.62	54.11	44.365	19.49
Information on breastfeeding	43.08	78.33	42.31	92.37	35.25	50.06	42.655	14.81
MUARC Measurement	14.62	69.17	17.69	75.85	54.55	58.16	56.355	3.61
Information on Diabetes	15.38	64.17	21.15	81.36	48.79	60.21	54.5	11.42
Information/assistance on GBV	20	65	22.31	86.44	45	64.13	54.565	19.13
Information on Danger Signs	43.46	74.17	38.46	92.37	30.71	53.91	42.31	23.2
Tetanus vaccination	57.31	81.67	42.69	95.45	24.36	52.76	38.56	28.4
Iron and Folic Acid	60.77	88.33	49.23	98.76	27.56	49.53	38.545	21.97
Deworming tablets	44.62	70.83	32.69	94.63	26.21	61.94	44.075	35.73
SP (antimalarial prophylaxis)	60	84.17	44.23	96.28	24.17	52.05	38.11	27.88
LLIN	63.85	89.17	54.62	97.52	25.32	42.9	34.11	17.58
Mean	40.71	75.00	34.56	90.70	34.29	56.14	45.22	21.85
Syphilis Test		74.17		89.83				15.66

Table 2: Knowledge on Demandable Services for the Mother during Labour and Delivery

	Comparison Site		Intervention Site		%age Change (Baseline vs. Endline)			
	Baseline (n=260)	Endline (n=260)	Baseline (n=260)	Endline (n=260)	Comparison	Intervention	Mean	Difference
Check EENT & Limbs	15.32	53.88	12.24	74.87	38.56	62.62	50.59	24.07
Respiration	28.46	71.55	25.38	91.56	43.09	66.18	54.64	23.09
Heart Rate	30.38	75.00	30.00	92.44	44.62	62.44	53.53	17.82
Mean (Res & HR)	29.42	73.28	27.69	92.00	43.86	64.31		20.46
Abdominal Examination	36.92	86.21	31.92	96.43	49.29	64.51	56.90	15.22
Vaginal Examination	26.92	82.76	22.69	93.78	55.84	71.09	63.47	15.25
Abdominal & Vaginal Examination	31.92	84.49	27.31	95.11	52.57	67.80		15.24
Urinalysis	21.15	70.69	16.15	71.56	49.54	55.41	52.48	5.87
Syphilis Test	24.62	62.93	20.38	84.44	38.31	64.06	51.19	25.75
Delivery to Discharge							0.00	
Temperature	36.54	73.28	28.08	84.00	36.74	55.92	46.33	19.18
Respiration	31.92	72.41	30.77	84.89	40.49	54.12	47.31	13.63
Heart Rate	34.62	70.69	30.38	87.11	36.07	56.73	46.40	20.66
Mean Vital Signs	34.36	72.13	29.74	85.33	37.77	55.59		17.82
Abdominal Examination	35.00	73.28	27.31	85.78	38.28	58.47	48.38	20.19
Vaginal Examination	32.69	75.00	20.77	89.33	42.31	68.56	55.44	26.25
Oxytocin	43.46	78.45	30.38	94.67	34.99	64.29	49.64	29.30
Mean for Maternal Services	29.77	71.57	23.55	85.90	41.80	62.35	52.07	20.55

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Table 3: Knowledge on Demandable Services for the Neonate after Delivery

	Comparison Site		Intervention Site		%age Change (Baseline vs. Endline)			
	Baseline (n=260)	Endline (n=260)	Baseline (n=260)	Endline (n=260)	Comparison	Baseline	Mean	Difference
Head-to-Toe								
Head	35	78.1	26.92	90.58	43.1	63.66	53.38	20.56
Eyes	33.46	74.29	26.54	91.48	40.83	64.94	52.885	24.11
Nose	23.46	70.48	18.46	83.41	47.02	64.95	55.985	17.93
Throat	25.38	71.43	20	88.79	46.05	68.79	57.42	22.74
Limbs	25.38	70.48	20.77	82.51	45.1	61.74	53.42	16.64
Abdomen	27.69	79.05	21.92	88.34	51.36	66.42	58.89	15.06
Cord Stump	52.31	90.48	38.85	96.41	38.17	57.56	47.865	19.39
Genitalia	26.15	74.29	23.46	92.38	48.14	68.92	58.53	20.78
Legs	23.85	72.38	16.92	84.75	48.53	67.83	58.18	19.3
Toes	21.54	72.38	17.31	83.86	50.84	66.55	58.695	15.71
Vital signs							0	
Temperature	32.69	82.86	30.38	91.93	50.17	61.55	55.86	11.38
Respiration	37.69	79.05	29.23	93.72	41.36	64.49	52.925	23.13
Weigh and Record							0	
Weight	41.15	87.62	37.31	97.31	46.47	60	53.235	13.53
Recording Weight	33.46	85.71	36.92	94.62	52.25	57.7	54.975	5.45
Medicines & Vaccines							0	
Eye Antiseptic/antibiotic	24.62	75.24	20.38	89.69	50.62	69.31	59.965	18.69
Vitamin K	30.38	79.05	27.31	90.58	48.67	63.27	55.97	14.6
Vaccines (BCG & Polio)	38.85	90.48	35	98.65	51.63	63.65	57.64	12.02
Chlorhexidine	28.08	75.24	21.54	91.93	47.16	70.39	58.775	23.23
Mean	31.17	78.26	26.07	90.61	47.08	64.54	55.81	17.46

Table 4: Knowledge of Demandable Services for the Mother during First PNC Visit

	Comparison Site		Intervention Site		%age Change (Baseline vs. Endline)			
	Baseline (n=260)	Endline (n=260)	Baseline n=260)	Endline (n=260)	Comparison	Intervention	Mean	Difference
Weighing	24.39	81.44	19.53	74.11	57.05	54.58	55.82	-2.47
Check BP	21.95	74.23	20.31	79.02	52.25	58.71	55.48	6.46
Check Hb	19.51	76.29	17.97	73.66	56.78	55.69	56.24	-1.09
Abdominal Examination	20.73	79.38	16.41	76.79	58.65	60.38	59.52	1.73
Vaginal Examination	23.17	81.44	12.89	83.93	58.23	71.04	64.64	12.81
Mean	21.95	78.56	17.42	77.50	56.59	60.08	58.34	3.49

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Table 5: Knowledge of Demandable Services for the Neonate during First PNC Visit

	Comparison Site		Intervention Site		%age Change (Baseline vs. Endline)			
	Baseline (n=260)	Endline (n=260)	Baseline (n=260)	Endline (n=260)	Comparison	Intervention	Mean	Difference
Head-to-toe (EENT, head, espiration, abdomen, cord stump, genitalia, limbs)	21.77	82.00	18.79	85.59	60.23	66.81	63.52	6.57
Temperature	24.8	85.57	20.7	85.71	60.77	65.01	62.89	6.09
Weighty	34.55	95.88	29.69	95.09	61.33	65.40	63.37	5.44
Record weight in health passport	26.42	92.78	27.73	90.18	66.36	62.45	64.41	5.59
Antiseptic for eyes	20.73	79.38	14.84	85.71	58.65	70.87	64.76	4.96
Vaccines (BCG & Polio)	31.71	92.78	29.69	94.2	61.07	64.51	62.79	4.64
Chlorhexidine	23.98	80.41	17.58	87.05	56.43	69.47	62.95	4.17
Mean	26.28	86.97	22.72	89.08	60.69	66.36	63.53	5.35

Table 6: Self-efficacy, Norms and Demand for Care Practices

	Comparison Site		Intervention Site		%ge Difference (Baseline vs. Endline)			
	Baseline (n=260)	Endline (n=260)	Baseline (n=260)	Endline (n=260)	Comparison	Intervention	Mean	Difference
Self-Efficacy	90.38	91.07	82.31	94.76	0.69	12.45	6.57	11.76
Descriptive Norm	68.46	58.08	49.62	81.27	-10.38	31.65	10.635	42.03
Belief in Appropriateness of Practice	88.08	89.69	79.23	93.63	1.61	14.4	8.005	12.79
Demand-General	22.44	34.26	0.97	51.13	11.82	50.16	30.99	38.34

Table 7: Extracts of Care Practices Offered during ANC

	COMPARISON SITE			INTERVENTION SITE			DIFFERENCE BETWEEN SITES
Care Practice	Baseline (n=260)	Endline (n=260)	Difference	Baseline (n=260)	Endline (n=260)	Difference	Endline vs Endline
EDDs	29.62	35	5.38	38.85	56.42	17.57	21.42
Haemoglobin Test	33.85	35	1.15	40.77	66.93	26.16	31.93
Urinalysis	23.85	29.62	5.77	20.77	39.69	18.92	10.07
Syphilis Test		53.08	53.08		61.48	61.48	8.40
Height	32.31	32.31	0	22.31	56.03	33.72	23.72
Abdominal Examination	26.54	44.62	18.08	33.08	57.59	24.51	12.97
Information on Diabetes	20.38	26.54	6.16	27.31	56.42	29.11	29.88
Information on GBV	34.23	33.08	-1.15	32.69	77.43	44.74	44.35
Mean for all services	56.74	60.14	3.4	57.69	74.13	16.44	13.99

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Table 8: Extracts of Care Practices Offered during the Final ANC Visit

	COMPARISON SITE			INTERVENTION SITE			DIFFERENCE BETWEEN SITES
Blood Pressure (BP)	72.76	46.54	-26.22	72.27	66.54	-5.73	20.00
Haemoglobin	18.7	16.54	-2.16	23.83	45.28	21.45	28.74
Urinalysis	10.57	10.38	-0.19	8.59	14.17	5.58	3.79
Syphilis Test		18.08			28.35		10.27
Abdominal Examination	88.62	90	1.38	90.63	95.28	4.65	5.28
FHR	85.77	91.15	5.38	92.58	92.52	-0.06	1.37
Information on Breastfeeding	69.11	58.08	-11.03	62.5	72.44	9.94	14.36
Mean for all services	42.68	36.42	-6.26	40.78	51.92	11.14	15.50

Table 9: Care Practices Offered during Labour

	COMPARISON SITE			INTERVENTION SITE			DIFFERENCE BETWEEN SITES
Care Practice	**Baseline (n=260)**	**Endline (n=260)**	**Difference**	**Baseline (n=260)**	**Endline (n=260)**	**Difference**	**Endline vs Endline**
Mean: EENT & Limbs	2.65	52.86	50.21	1.76	64.25	62.50	11.40
Respiration	6.91	6.99	0.08	4.3	71.49	67.19	64.50
Heart Rate	6.5	59.05	52.55	4.69	72.85	68.16	13.80
Abdominal Examination	15.45	88.57	73.12	4.3	93.21	88.91	4.64
Vaginal Examination	6.91	53.805	46.90	2.735	68.55	65.82	14.745
Urinalysis	3.25	39.05	35.80	0.39	29.86	29.47	-9.19
Syphilis	4.47	32.38	27.91	1.56	41.63	40.07	9.25
Mean for all services	6.59	47.53	40.94	2.82	63.12	60.30	15.59

Table 10: Maternal Care Practices Offered from Delivery to Discharge

	COMPARISON SITE			INTERVENTION SITE			DIFFERENCE BETWEEN SITES
Care Practice	**Baseline (n=260)**	**Endline (n=260)**	**Difference**	**Baseline (n=260)**	**Endline (n=260)**	**Difference**	**Endline vs Endline**
Temperature	9.35	31.54	22.19	3.13	48.06	44.93	16.52
Respiration	5.69	25.77	20.08	3.52	53.1	49.58	27.33
Heart Rate	6.1	31.54	25.44	5.86	58.91	53.05	27.37
Abdominal Examination	7.32	58.46	51.14	3.52	60.08	56.56	1.62
Vaginal Examination	4.88	51.54	46.66	3.13	52.71	49.58	1.17
Oxytocin	9.76	53.85	44.09	6.25	62.02	55.77	8.17
Mean for all services	**7.43**	**42.1**	**34.93**	**4.58**	**55.15**	**51.58**	13.05

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Table 11: Neonatal Care Practices Offered from Delivery to Discharge

	COMPARISON SITE			INTERVENTION SITE			DIFFERENCE BETWEEN SITES
Care Practice	**Baseline (n=260)**	**Endline (n=260)**	**Difference**	**Baseline (n=260)**	**Endline (n=260)**	**Difference**	**Endline vs Endline**
Head-to-Toe	5.84	49.48	43.64	3.73	69.52	65.79	20.04
Temperature	5.28	55.77	50.49	3.91	67.44	63.53	11.67
Weighing	8.13	94.62	86.49	5.47	94.96	89.49	0.34
Recording Weight	5.28	77.31	72.03	5.47	91.86	86.39	14.55
Eye antiseptic ointment	4.88	40.77	35.89	3.91	50.78	46.87	10.01
Vitamin K	4.47	41.15	36.68	5.08	77.91	72.83	36.76
Provide vaccines (BCG & Polio)	7.32	74.23	66.91	10.55	87.21	76.66	12.98
Chlorhexidine	3.25	32.69	29.44	3.13	67.83	64.70	35.14
Mean	**5.56**	**58.25**	**52.70**	**5.16**	**75.94**	**70.78**	23.24

Table 12: PNC Services for the Neonate and the Mother

CARE PRACTICE	COMPARISON SITE	INTERVENTION SITE	DIFFERENCE BETWEEN SITES
	Endline (n=260)	**Endline (n=260)**	**Endline vs Endline**
Care Practices for Neonate			
Head-to-Toe	32.99	48.93	15.94
Temperature	43.08	55.04	11.96
Weighing	77.69	89.15	11.46
Recording Weight	70.38	86.05	15.67
Polio Vaccine	57.31	63.18	5.87
Mean for all Practices (Neonate)	66.14	84.98	18.85
Care Practices for the Mother			
Weighing	26.92	35.04	8.12
Blood Pressure	16.15	35.43	19.28
Haemoglobin	12.69	29.53	16.84
Abdominal Examination	22.69	38.58	15.89
Vaginal Examination	11.70	21.66	9.96
Mean or all Practices (Mother)	18.03	32.05	14.02

Table 13: Service provision in the Continuum of Care from ANC to PNC

	COMPARISON SITE			INTERVENTION SITE			DIFFERENCE BETWEEN SITES
Care Practice	**Baseline (n=260)**	**Endline (n=260)**	**Difference**	**Baseline (n=260)**	**Endline (n=260)**	**Difference**	**Endline vs Endline**
Mean for ANC	56.74	60.14	3.4	57.69	74.13	16.44	13.99
Mean for ANC Final Visit	42.68	36.42	-6.26	40.78	51.92	11.14	15.50
Mean for Labour	6.59	47.53	40.94	2.82	63.12	60.3	15.59
Mean: Delivery to Discharge (Mother)	7.43	42.1	6.35	4.58	55.15	14.65	13.05
Mean: Delivery to Discharge (Neonate)	14.18	23.27	5.55	13.23	30.54	12.82	24.99
Mean: PNC (Neonate)		41.89			54.97		16.62
Mean: PNC (Mother)		18.03			32.05		14.02
Mean for ANC to PNC		**38.48**			**51.70**		**16.25**

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Table 14: Service Satisfaction during ANC, Labour and PNC

	COMPARISON SITE			INTERVENTION SITE			DIFFERENCE BETWEEN SITES
	Baseline (n=260)	Endline (n=260)	Difference	Baseline (n=260)	Endline (n=260)	Difference	Endline vs Endline
ANC							
Very Good	16.15	6.92	-9.23	13.85	13.08	-0.77	6.16
Good	71.92	76.54	4.62	76.15	85	8.85	8.46
Labour and Delivery							
Very Good	11.79	6.92	-4.87	11.33	13.19	1.86	6.27
Good	79.27	68.08	-11.19	81.25	80.23	-1.02	12.15
PNC							
Very Good	11.79	4.23	-7.56	11.33	14.73	3.4	10.50
Good	79.27	56.15	-23.12	81.25	79.07	-2.18	22.92

Discussion

The results indicate that the intervention positively contributed to increased knowledge on care practices, attitudes towards demand, actual demand for the care practices, services provision and service satisfaction. Studies do not seem to establish the link between client demand for care practices and service provision. Mostly, they investigate supply side interventions as predictors of quality of care e.g., trainings for service providers. The demand side studies have mainly been centred around client health seeking behaviour e.g., the contribution of community health worker checklists to increased knowledge on postnatal problems and timely care-seeking [34], counselling on self-care as a contributor of improved knowledge, attitudes and practices towards safe motherhood [35,36] and prevention of gestational diabetes [37], [38]. However, some supply-side interventions have demonstrated results related to this study i.e., improvement in service delivery. A post only intervention and comparison design of 11 health facilities implementing the Standards Based Management and Recognition (SBM-R) [4] in Ethiopia showed impact at intervention sites in intrapartum (11.9% points higher, $p=0.002$) and immediate postnatal care[1] (22.2% points higher, $p=0.001$). However, there was no significant difference in ANC care practices (2.4% points difference, $p=0.650$ [39]. This study demonstrated results in antenatal care. In India, training of doctors and program managers on evidence-based care coupled with supervision visits for feedback and action improved adherence to care practices during labour, delivery and immediate postpartum care; including administration of oxytocin after delivery ($p=0.0001$) and listening foetal heart sounds during labour ($p=0.0001$) [40] while in Mali and Senegal, training of staff (physicians, midwives, nurses, and administrators) in obstetrical best practices and sexual and reproductive health rights combined with regular monitoring service provision by health centre audit committees generated higher mean scores (by 5 points) in clinical examination (Uterine height, Uterine height, Pulse, Blood Pressure, Temperature, Foetal Presentation, Foetal Heartbeat, Cervical dilation) [41].

Results of this study also indicate positive results in comparison with national level assessments. At the intervention site, service provision at endline was higher than the levels reported nationally in the SPA 2013 in the areas of haemoglobin test (1% vs. 45.3), provision of ITN/LLIN (60% vs. 96%) and IPTp (65 vs. 84.3%), urinalysis (0% vs. 14.2) and weight measurement (89% vs 98.9%) and listening to fetal heart rate (82% vs. 92.5%) [42]. Similarly, some services were higher than levels reported in the HHFA 2018; namely, measurement of uterine/fundal height (78 vs. 95.3), and weigh measurement (90% vs. 98.9%), Received iron/folic acid pills (80% vs. 83%) and Blood Pressure checked (66% vs. 66.5%) [43]. Since 2013, there has been a reduction on provision of iron/folic acid pills with 87% reported in 2013 SPA and 80% in 2018 HHFA. However, the intervention site reported a 3% improvement from the 2013 HHFA. Equally, assessment of blood pressure declined from 69% in 2013 SPA to 66% in 2013 HHFA. The intervention site did not report a major improvement from the decline (66.54%). However, assessment of blood pressure continued to decline at the comparison site (46.4%), indicating that the slight change at the intervention site was not insignificant. For the child, the intervention site reported higher scores on weighing and recording weight than were reported in the 2018 HHFA i.e., 92.8% vs. 55% (weighing) and 89.8% vs. 26% (weight plotting). Equally, a higher score at the intervention was reported against the 2013 SPA on administration of oral polio vaccine at birth (86% vs. 71%). there

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was a reduction of score on head-to-toe assessment (62.5% vs. 94%). it is not known if there was a historical decreasing/increasing trend at national level, since the 2018 HHFA did not report on this indicator. Such a trend would provide better understanding of intervention results against national trends.

While the intervention achieved results in increasing demand, the downside had been a strain on health workers, many of whom were already overstretched prior to the intervention. Balizan and colleagues note in a Latin American study [44] as does LeFevre in Tanzania [45] that for sustainable change to happen in quality of care, multi-level interventions must be adapted that include improving human and material resources. Similarly, a multicounty study in 12 African countries by Sharma and colleagues recommends improved human resource planning, training and task shifting [46]. Therefore, client demand for care practices needs to be tied to service level and policy level interventions [47]. Future interventions need to guarantee augmented human resources, capacity building and supplies to adequately accommodate demand for care practices.

Despite the differences in both sites, there were some similarities across the two sites. Some services were not provided to mothers because the health facilities did not have the resources or the capacity to provide the demanded services such as lack of iron tablets. The most common challenge was the inability to administer the measles vaccine if the babies were less than 12 in number. Mothers were discharged and asked to come at a later date with the hope that there would be 12 babies on that day. Some mothers indicated that they were not motivated to come back to the health centre for the vaccine at a later day. Participants did not propose a tangible solution to this challenge and further ideation has to be conducted to address the challenge. The second similarity is that mothers from both sites indicated that they were exposed to messages on demandable services. However, mothers from the comparison site indicated that such exposure was attributed to information from health workers. Since the study did not intervene in this site, we can attribute this exposure to Hawthorne or observer effect which is the tendency of people who are subjects of a study to change or improve the behaviour which is being studied primarily because it is under study and not because of changes in the experiment (McCambridge, et al. 2014) [48]. Therefore, the effect at the comparison site can be attributed to the contact with researchers during the baseline study. For instance, mothers were asked if they were aware that they could ask for different services during ANC, delivery and post-natal. Health workers were asked if mothers demanded and if they provided certain services. There is high chance that such questions created awareness in the catchment area which may have resulted in mothers being indirectly empowered to demand services or health workers to provide services in absence of demand. The consistent higher level of service satisfaction at the intervention site is testament to improved service utilisation. This is in tandem with a study in Malawi that found that perceived and actual quality of care is associated with service utilisation and satisfaction [49]. In a multi country study in developing countries, client satisfaction was largely thought to be associated with higher levels of service provision coupled with courteous behaviour and encouragement to women in labour [50]. While PNC is commonly neglected, especially as a result of high workload for nurses [51], the major increase in satisfaction during PNC is an indicator of significant results of the intervention. The drop in satisfaction at the comparison site might have been partly induced by the baseline survey exposure to standards of care i.e., after scantily knowing some of their entitlements, the women at the comparison site became conscious of services skipped by providers.

Limitations

Health passports were used to triangulate mother responses. However, there was inadequate completion of the tool by health workers. It would be more significant if more health passports provided clear data. Even though this was the case, data from health passports indicated increased service provision at the intervention site, which was in agreement with conclusions from mother responses. Observation of care through vignettes did not yield much result quantitatively to compare comparison to intervention. Mostly health workers said they skipped a practice because they had forgotten about it during the simulation and in some circumstances, they said the equipment was not available. Only a large sample of observations would help quantify differences between intervention and comparison sites e.g., the research would measure how many times a certain practice was skipped and compare the proportions between the sites.

Conclusion

This study aimed to investigate how a community intervention promoting client knowledge and demand can influence provision of care during ANC, labour and the first postanal contact by specifically assessing improvements in mothers' knowledge on care practices and demand for the care practices as well as measuring effectiveness of the intervention in actual provision of the care. The results showed that at the intervention site there was higher increase in knowledge of demandable services in ANC, intrapartum services for the mother and neonatal services within the first 48 hours (before discharge). For PNC, no significant difference was observed on knowledge levels when comparing the intervention and comparison. However, compared it its own baseline, the

intervention site presented improvements. Mothers at the intervention site had increased demand for care practices and services provision was higher across all contacts from ANC to PNC. The study observed that encouraging mothers to demand services at health facilities empowers them with knowledge and assertiveness to demand services during ANC, delivery and post-natal care. However, it also partly leads to increased workload among health workers. Therefore, scaling up of such interventions should consider supporting health centres with adequate human resources and equipment/supplies.

Declarations

Ethical Approval and Consent to Participate

This study was approved by the College of Medicine Research and Ethics Committee (COMREC) which is one of the research ethics regulatory bodies established under sections 18 and 48 of the Science and Technology Act No.16 of 2003 of the republic of Malawi (https://www.ncst.mw/research-clearance/). All methods were carried out in accordance with guidelines and regulations of the College of Medicine Research and Ethics Committee (COMREC) of the Kamuzu University of Health Sciences (KUHES), formally known as the University of Malawi. There were no experimental protocols involving human participants, human materials or human data in the research. Informed consent was obtained from all subjects. Researchers read a consent form to the participants to explain the purpose and procedure of the research, potential benefits for the community, assurance of confidentiality and voluntary participation. Upon agreement to participate, the subjects signed the consent form.

Consent for Publication

Not applicable

Availability of Data and Materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request. The data can be requested from: chancymauluka77@gmail.com/ m201980015215@stud.medcol.mw.

Competing Interests

The authors declare that they have no competing interests.

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Authors' Contributions

CM designed research protocol, wrote the manuscript, carried out field work and analysed data. LM carried out field work, analysed data and wrote parts of the manuscript. IKC and WS provided guidance on development of protocol, interpretation of results and writing of the manuscript. All researchers contributed to the review of the manuscript.

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Consent for Publication

Not applicable

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