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**Post Cesarean Care for Mothers Attending Arua
Regional Referral Hospital Drivers and Challenges**

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ABSTRACT

Cesarean section is a recognized intervention in complicated births when the safety of the mother or baby is compromised. In Uganda, post-operative caesarean care has seen an ascending trend where out of the mothers who deliver by Cesarean section a number of them develop complications like sepsis attributed to a number of demographic and health care system related factors. This study sought to gain a better understanding of drivers and challenges to POC, underlying complications after cesarean section among mothers and staff at ARRH. In total, 328 mothers and 24 staff were recruited for the study. Data was collected, coded, and entered into Epi info version 7, then exported to SPSS version 22.0 for analysis using a structured interviewer/self-administered questionnaire/checklist. To determine factors associated with POC complications, bivariate and multivariate logistic regression analyses were performed. To control for confounding, variables with a p - value of 0.2 in a bivariate analysis were included in a multivariate logistic regression model. To determine the strength of the association, AOR with corresponding 95 percent confidence intervals (CI) were computed, and a p-value of 0.05 was considered statistically significant. The majority of the mothers were aged 21 – 25 years 132 (40.3%), had attained primary level education 187 (57.0%) and had gotten pregnant atleast once 265 (80.8%). The most common minor POC complications observed amongst the mothers was Mild anemia (25.6%), Mild fever 24h after surgery (19.8%) and Wound hematoma or infection (11.6%) whereas the most common severe POC complications observed were severe anemia (11.0%) and Sepsis (6.7%). All (100%) the health care staff were following standard procedures of post-operative care while attending to mothers and had attended recent Continuing medical education. History of C-section birth was a significant factor of POC complications AOR [3.6, 95% CI (1.0–9.4)] p-value 0.042. The most common minor POC complications amongst the mothers receiving POC care were mild anaemia, mild fever 24h after surgery and wound hematoma or infection whereas the most common severe POC complications observed were severe anaemia and Sepsis. All healthcare workers that provide POC to mothers followed an institutionalized standard operating procedure and had updated knowledge through recent continuing medical education. History of delivery by C-section significantly predisposed mothers to post-operative care complications.

Keywords: Cesarean section, Complicated births, Health care system, Mothers, healthcare workers.

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INTRODUCTION

Cesarean section (CS) is an important intervention in complicated births when the safety of the mother or baby is compromised. Worldwide, CS rates have increased tremendously in recent years, especially among high-income countries, raising concerns about the over-utilization of CS without added benefits [1]. However, in Sub-Saharan Africa, two-thirds of the world's 302,000 maternal deaths occur annually, the CS rate is the lowest in the world (7.3%) and women and their newborns often end up dying or sustaining unnecessary injuries due to limited access to and underutilization of CS services [2]. Globally, approximately 15 in 100 pregnant women require CS to prevent poor outcomes for them and/or their newborns [3]. Uganda remains one of the countries with the highest maternal mortality rate of 336 per 100,000 live births [4]. It should be noted that CS is considered essential treatment for antepartum hemorrhage, prolonged or obstructed labor, preeclampsia or eclampsia, and intrapartum fetal distress. It is in these situations that CS can avert major obstetric complications that lead to maternal, neonatal, and/or fetal death [5]. In Uganda, post-operative caesarean care has seen an ascending trend where out of the mothers who deliver by Caesarean section a number of them develop complications like sepsis. Several factors, including weak health systems, a shortage of human resources, inadequate financial resources, long distances to health facilities, poor transport systems, poverty, and low literacy levels have been documented as barriers to obtaining CS [3]. Prolonged duration of surgical procedure (longer than 60minutes) has been found to be associated with post cesarean wound sepsis with a percentage of 75%. This leads to more wound exposure to microorganisms as well as hypothermia that decreases tissue perfusion that may predispose to post cesarean wound infection [6]. Poor postoperative care has also been attributed to limited number of staff attending to the mothers. Mothers after caesarean section have been found to have complications during puerperium [6]. Reports obtained from Arua regional referral hospital showed that 20% of the mothers delivered in hospital experienced Postpartum hemorrhage, deterioration of preeclampsia and metabolic problems [7]. Like with any surgical procedure, it remains the responsibility of the health care workers to ensure the safety of patients exposed to operative deliveries. These safety checks commence in the pre-operative period and extend into the post-operative period. The World Health Organization [8] strongly recommends the use of safety checklists to ensure that all possible is done to maintain patient safety. Basic checklists assist health care workers of all professions to ensure that safety is maintained [9]. This study seeks to determine the mechanisms present for effective outcomes of mothers that have undergone cesarean deliveries at Arua Regional Referral Hospital, and the associated challenges that may hamper positive outcomes of post cesarean care to the mothers. It seeks to find out the root causes of poor post cesarean operative care in Arua regional referral hospital.

Statement of Problem

West Nile has one regional referral hospital based in Arua which manages all maternal cases from all districts of West Nile including 33% referred cases from neighboring health facilities under its department of Obstetrics and gynecology. In 2020, 2318 cesarean sections were performed within a 12-month period. According to [10] (December 2020), about 600 women went to ARRHH for delivery services of which 78% of them deliver normally and 22% underwent cesarean section. Out of these, 2 mothers die per month. Between the month of July 2020 and January 2021, it was noted that 22 women had succumbed to postoperative complications from the post-natal ward as per the hospital records. This has been attributed to a number of factors that include; sepsis, deteriorating medical complications such as preeclampsia, anemia due to PPH, inability to purchase the required medications and limited man power to manage the overwhelming number of patients in the hospital. During the recent visit in October-November 2020, it was physically evidenced that several cesarean deliveries are done per day which results in overwhelming numbers of mothers requiring post cesarean care. Therefore, this study seeks to gain a better understanding of drivers and challenges to POC, underlying complications after cesarean section.

Aim

To establish the factors that influence Post cesarean care outcome among mothers attending Arua Regional Referral Hospital.

Specific objectives

- To document factors that contribute to poor Post Cesarean Care for mothers at ARRHH.
- To identify complications that arise from poor post cesarean care.

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- The determine knowledge about Post Cesarean Care among health care professionals attending to post cesarean delivery mothers at ARRH.

Research Questions

- ✚ What are the factors that bring about poor Post Cesarean Care to post cesarean delivery mothers at ARRH?
- ✚ What are the complications that arise from poor post cesarean care?
- ✚ What is the knowledge about Post Cesarean Care of health care professionals attending to post cesarean delivery mothers at ARRH?

METHODOLOGY

Study Design

The study used a cross-sectional design approach. Data for the study was collected once in time without any intervention or follow-up. Quantitative data collections method was used to enable the researcher to collect numerical data and perform quantitative analysis using statistical procedures. Closed form questionnaires were used to generate responses and data for analysis of the drivers and challenges of post cesarean care for mothers attending ARRH.

Area of Study

This was carried out in the Post-natal ward of Arua Regional Referral Hospital. The hospital is referral hospital with regional service capacity servicing eight districts of West Nile region including Adjumani, Arua, Koboko, Maracha, Moyo, Nebbi, Yumbe, and Zombo. The hospital also services the populations of the neighboring communities of South Sudan and the Democratic Republic of the Congo. It's located in Arua city in Arua district, along the coordinates 03°01'10.0"N, 30°54'45.0"E (Latitude: 3.019444; Longitude: 30.912500).

Study Population

The study admitted mothers who had undergone cesarean delivery during the study period and also the health care staff offering postoperative care services to the mothers.

Inclusion criteria

- Mothers that had under gone cesarean delivery and were still admitted at Arua Regional Referral Hospital.
- Health Care professionals attending to mothers that had delivered through cesarean section at ARRH. All must have consented to participate.

Exclusion criteria

- All mothers that had undergone spontaneous vaginal delivery.
- All non-consenting mothers and health care professionals attending to them.
- All mothers that were not stable through post-operative care sessions.

Sampling and Data collection

Since a cross sectional design was used, in a bid to attain a representative with minimal bias within the time frame of the study, all mothers that had under gone cesarean delivery at Arua Regional Referral Hospital and Health Care professionals attending to mothers that had delivered through cesarean section at ARRH for as long as they consented to take part in the study where considered for recruitment into the study. By the end of the six months data collection period, 328 mothers and 24 health care staff had consented to participate in the study and were thus recruited.

Study procedure

The purpose of the study was be explained to the study participants after which they were given opportunities to ask questions which were answered accordingly. Written consent was sought from the study participants. Those who consented to take part in the study were then recruited to participate in the study and were given to complete the study questionnaires. During data collection, face-to-face-interviews were used to collect data from the mothers whereas self-administered questionnaires were used for the healthcare staff.

Data collection tools

The data was gathered using a structured interviewer-administered questionnaire/ checklist for mothers which had sections: (1) socio-demographic characteristics, (2) checklist for minor and sever POC complications. The self-administered questionnaire for the health care staff had a section for the challenges they faced and also suggestions to the challenges. The completed questionnaires were collected by the principal investigator from research assistants and subjects after they had been administered in order to ensure their completeness.

Data Processing and analysis

Questionnaire tools were checked for their accuracy and data completeness, then data was coded and entered into Epi info version 7, then exported into SPSS version 22.0 for analysis. Descriptive statistics was used to summarize the variables. Figures and tables have been used to summarize frequencies and percentages of the variables. Univariate and multivariate logistic regression analysis was computed to determine factors associated POC complications. Variables with a p - value of < 0.2 during a Univariate analysis were incorporated in a multivariate logistic regression model to control for confounding. Adjusted odds ratio (AOR) with corresponding 95% confidence interval (CI) were computed to see the strength of the association and a p-value of < 0.05 was considered statistically significant.

Quality control

The questionnaire was pretested amongst selected willing participants at ARRH however these were not included in the final sample. The collected data was checked for completeness and consistency of information collected immediately after the questionnaire was completed.

Ethical considerations

Ethical approval was obtained from the Faculty of Clinical Medicine and Dentistry at Kampala International University's Western Campus, and an introduction letter was written to seek permission for data collection from ARRH management. Before being recruited for the study, respondents were asked to provide both written and verbal consent.

RESULTS

Socio-demographic characteristics of mothers receiving post-operative care at ARRH

Over the study period, 328 mothers who had given birth by cesarean section were recruited into the study by consent. Majority of the mothers were aged 21 – 25 years 132 (40.3%), had attained primary level education 187 (57.0%), were Ugandans by nationality 285(86.9%), and had gotten pregnant atleast once 265 (80.8%) as shown in Table 2 and Figure 2 below.

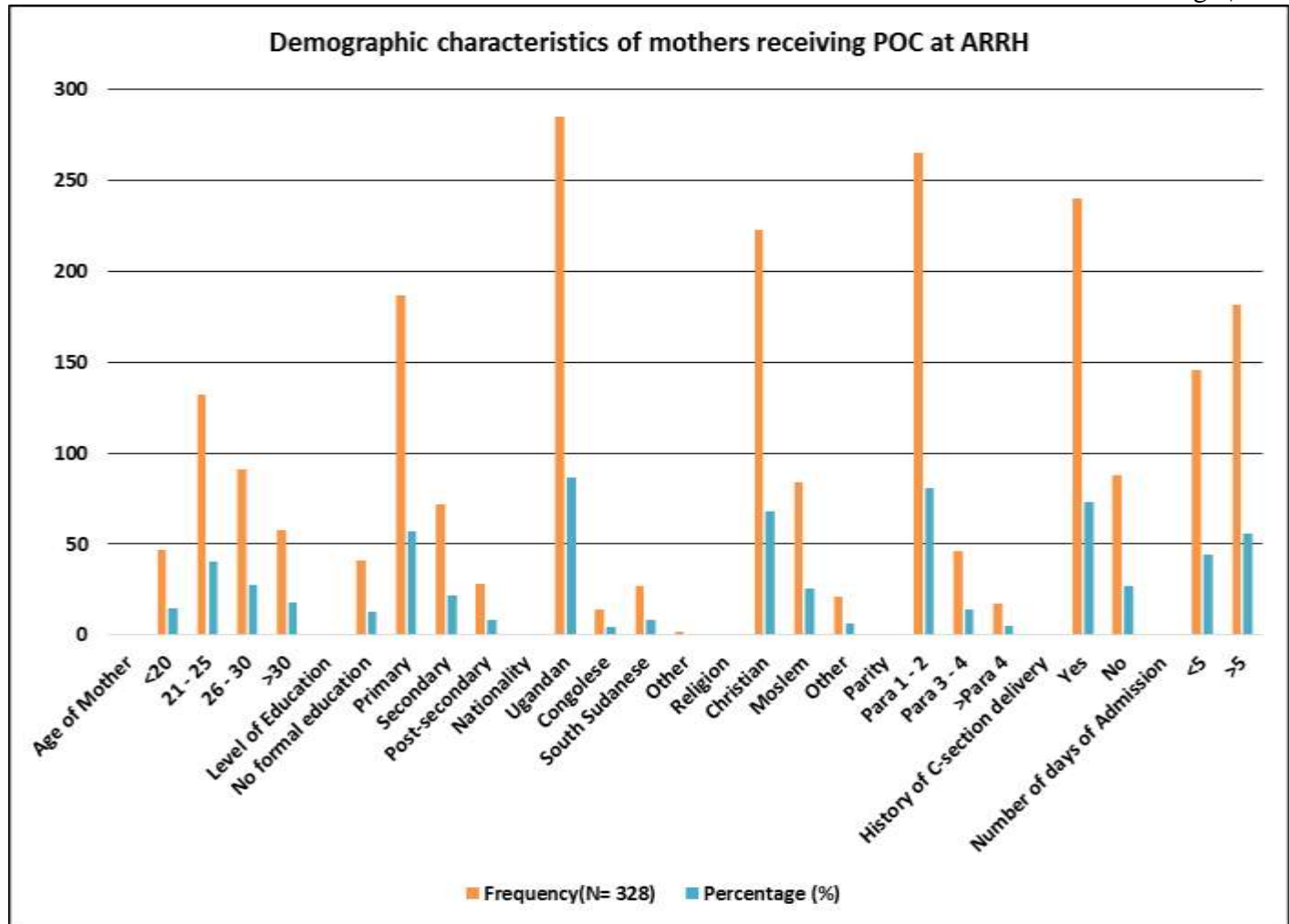
Table 1: Demographic characteristics of mothers receiving POC at ARRH

Characteristic	Category	Frequency(N= 328)	Percentage (%)
Age of Mother	<20	47	14.3
	21 - 25	132	40.3
	26 - 30	91	27.8
	>30	58	17.7
Level of Education	No formal education	41	12.5
	Primary	187	57.0
	Secondary	72	22.0
	Post-secondary	28	8.5
Nationality	Ugandan	285	86.9
	Congolese	14	4.3
	South Sudanese	27	8.2
	Other	2	0.6
Religion	Christian		68.0
	Moslem	84	25.6
	Other	21	6.4
Parity	Para 1 - 2	265	80.8

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Figure 1: Column graph showing demographic characteristics of mothers receiving POC at ARRH



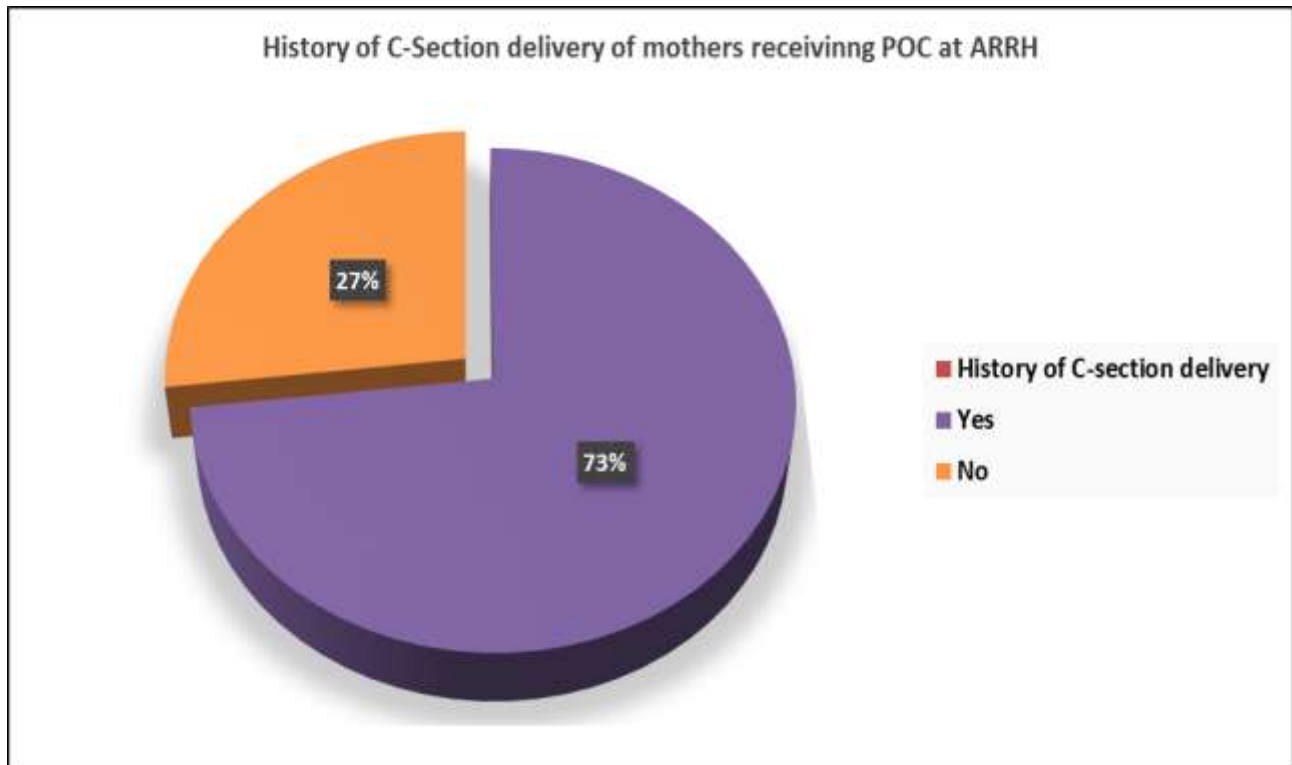
History and post-operative care complication of mothers at ARRH

Of the mothers who were recruited in the study, 240 accounting for 73.2% had ever had ever given birth through a cesarean section and majority had been admitted for more than five (5) days 182 (55.5%) at the maternity ward at the time of the study. The most common minor POC complications observed amongst the mothers was Mild anemia 84 (25.6%), Mild fever 24 h after surgery 65 (19.8%) and Wound hematoma or infection 38 (11.6%). whereas the most common severe POC complications observed were severe anemia 36 (11.0%) and Sepsis 22 (6.7%) as shown in Table 3 and Figures 3 & 4 below.

Table 2: History and POC complications of mothers at ARRH

Characteristic	Category	Frequency(N= 328)	Percentage (%)
History of C-section delivery	Yes	240	73.2
	No	88	26.8
Number of days of Admission	<5	146	44.5
	>5	182	55.5
Minor complication	Mild anemia	84	25.6
	Mild fever 24 h after surgery	65	19.8
	Urinary tract infection	27	8.2
	Wound hematoma or infection	38	11.6
	Endometritis	06	1.8
Major post-operative complication	Severe anemia	36	11.0
	Peritonitis	2	0.6
	Sepsis	22	6.7
	Disseminated intravascular coagulation	1	0.3
	Vesicovaginal fistula	3	0.9

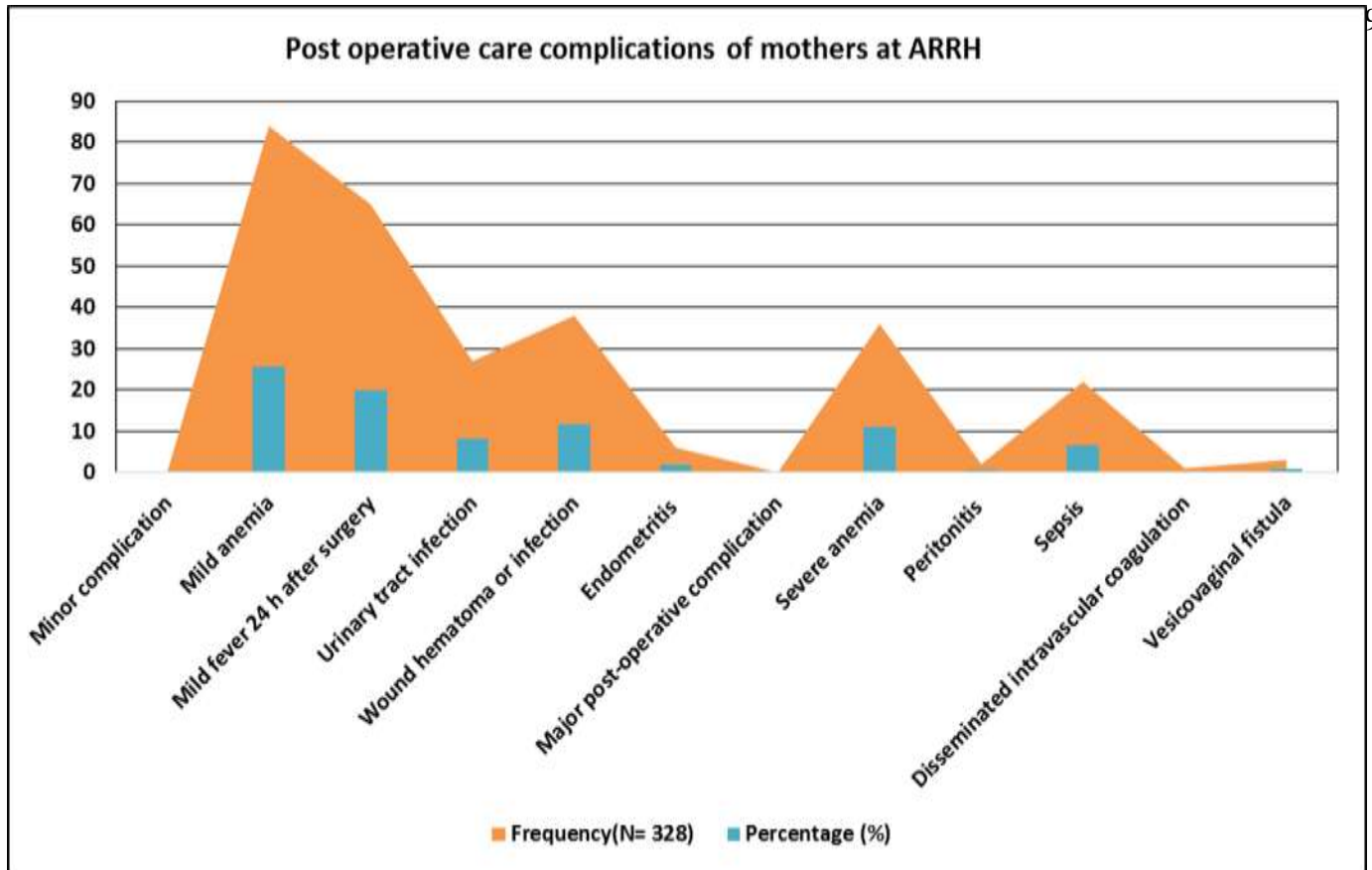
Figure 2: A pie chart showing the history of cesarean birth among mothers POC at ARRH



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Figure 3: A clustered column graph showing POC complications experienced by mothers at ARRH



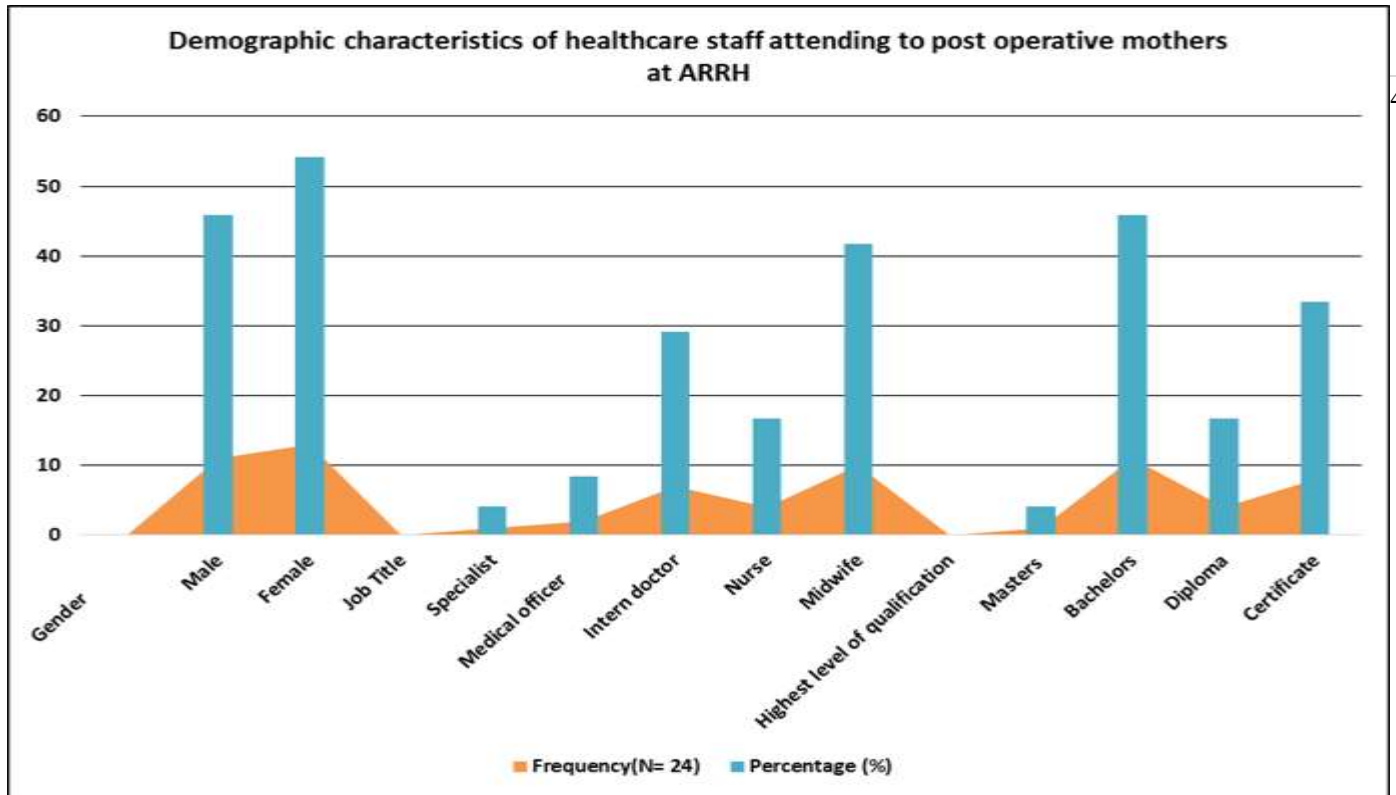
Demographic characteristics of healthcare staff offering POC to mothers at ARRH

For the period of the study, 24 healthcare staff attached to the maternity ward of ARRH consented and were recruited to participate in the study. Majority were female 13 (54.2%), intern doctors 7 (29.2%), and had attained a bachelor’s degree 11 (45.9%) with 100% of all the staff indicating they had ever followed any standard protocol while attending to a mother that has undergone C-section as well as attended Continuing Medical Education (CME) about Post-operative care of mothers that have undergone a C-section as shown in Table 4 and Figure 5 below.

Table 3: Characteristics of health care staff at ARRH attending to POC mothers

Characteristic	Category	Frequency (N=24)	Percentage (%)
Gender	Male	11	45.9
	Female	13	54.2
Job Title	Specialist	1	4.2
	Medical officer	2	8.3
	Intern doctor	7	29.2
	Nurse	1	16.7
	Midwife	9	41.7
Highest level of qualification	Masters	1	4.2
	Bachelors	11	45.9
	Diploma	3	16.7
	Certificate	5	33.4
Ever followed any standard protocol while attending to a mother that has undergone C-section?	Yes	20	100.0
	No	0	0.0
Attended any Continuing Medical Education (CME) about Post-operative care of mothers that have undergone a C-section?	Yes	20	100.0
	No	0	0.0

Figure 5: A stacked column graph showing Characteristics of staff at ARRH



Factors affecting provision of post cesarean care to post cesarean delivery mothers at ARRH

Health care staff who took part in the study were asked a series of questions to ascertain the challenges they face while giving POC services to mothers who have given birth by caesarian section. Majority of the staff 11 (58.4%) agreed that they were satisfied with the available theater operation facilities however equally the same number was in agreement that there is inadequate staff to provide the needed services to the mothers. 75.1% of the staff noted that it's rare to have all the required staff to carry out a C-section in theater at the same time and equally the same number responded that there aren't enough equipment to carry out that function. 95.9% acknowledged lack of equipment as the most challenging factor where as 91.7% majority recommended recruitment of staff as the solution as shown in Table 5 and Figure 6 below.

Figure 6: Line graph showing Challenges that may hinder effective provision of post cesarean care to post cesarean delivery mothers at ARRH

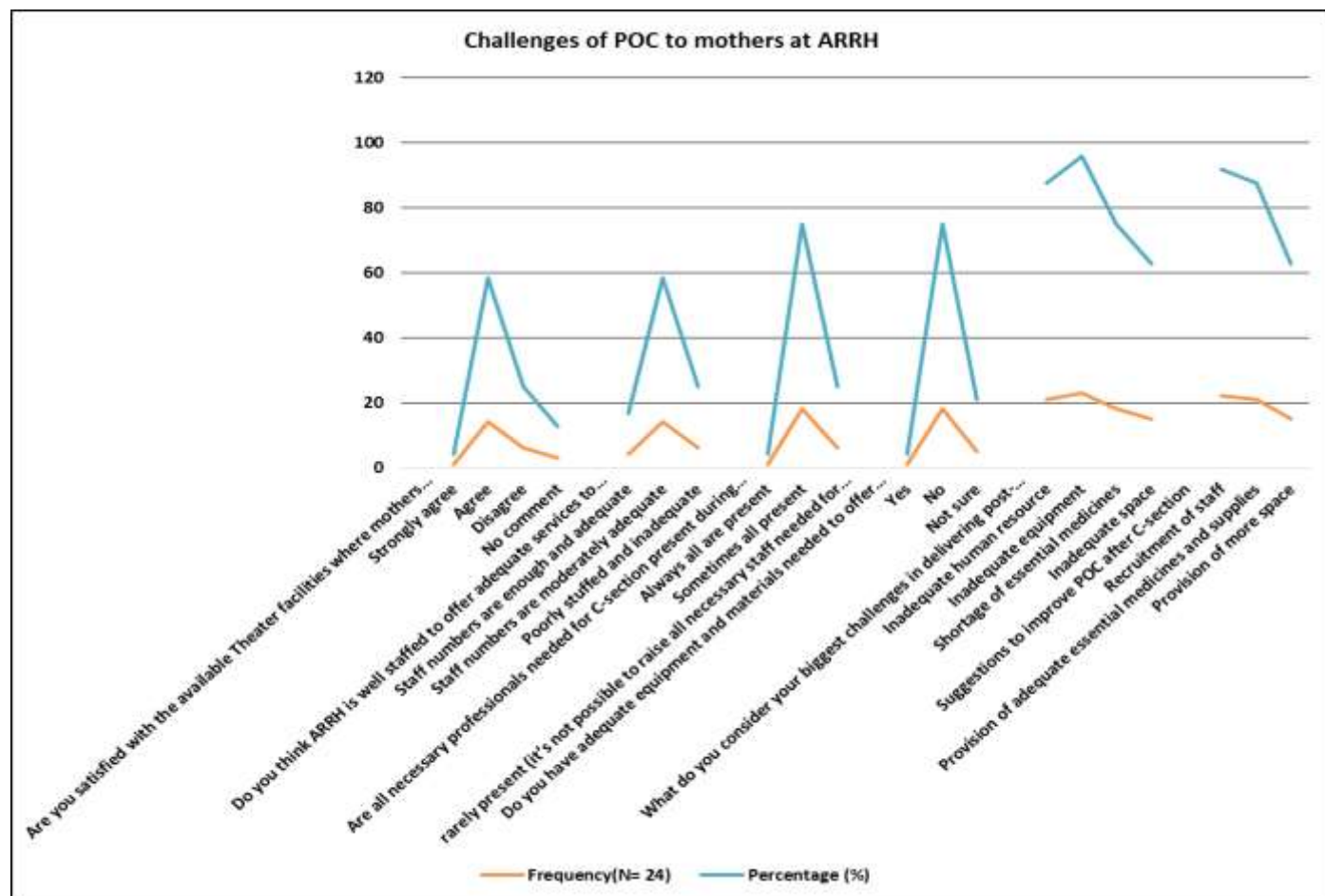


Table 5: Challenges that may hinder effective provision of post cesarean care to post cesarean delivery mothers at ARRH

Challenges of POC at ARRH	Answer	Frequency (N=24)	Percentage (%)
Are you satisfied with the available Theater facilities where mothers are operated to deliver by C-section?	Strongly agree	1	4.2
	Agree	11	58.4
	Disagree	5	25.0
	No comment	3	12.5
Do you think ARRH is well staffed to offer adequate services to mothers that have delivered by C-section?	Staff numbers are enough and adequate	4	16.7
	Staff numbers are moderately adequate	13	58.4

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	Poorly stuffed and inadequate	3	25.0
Are all necessary professionals needed for C-section present during operations?	Always all are present	1	4.2
	Sometimes all present	16	75.1
	Rarely present (it's not possible to raise all necessary staff needed for an operation)	4	25.0
Do you have adequate equipment and materials needed to offer post-operative care to mothers who have delivered by C-section?	Yes	1	4.2
	No	16	75.1
	Not sure	3	20.9
What do you consider your biggest challenges in delivering post-operative care to mothers that have had C-section? (Please give any three)	Inadequate human resource	17	87.6
	Inadequate equipment	19	95.9
	Shortage of essential medicines	14	75.1
	Inadequate space	11	62.6
suggestions are most welcome to add value while working to improve POC after C-section	Recruitment of staff	20	91.7
	Provision of adequate essential medicines and supplies	20	87.6
	Provision of more space	11	62.6

Factors associated with POC complications among mothers receiving attending ARRHH

In a bivariate analysis logistic regression model, having a secondary education, having been pregnant utmost twice and having a history of a C-section where significant factors of POC complications, however when the confounders where controlled in the adjusted multivariate model, only having a history of C-section birth remained significant AOR [3.6, 95% CI (1.0–9.4)] p-value 0.042 as shown in Table 6 below.

Table 5: Univariate and multivariate analysis for factors associated with post-operative care complications among mothers at ARRHH

DISCUSSIONS

Demographic characteristics of mothers receiving post-operative care at ARRHH

By demographic distribution, majority of the mothers were aged 21 – 25 years 132 (40.3%), had attained primary level education 187 (57.0%) and had gotten pregnant atleast once 265 (80.8%). This demographic pattern of mothers is similar to that of earlier studies in Rwanda and Ethiopia [11]; [12])This similarity of demographic patterns of communities may be due to the similar nature of the populations of the three countries as profiled by [13] and [8].

Factors that contribute to poor Post Cesarean Care for mothers at ARRHH

Demographic factors were analyzed against the post-operative care complications using bivariate and multivariate logistic regression model analysis. Having a secondary education, having been pregnant utmost twice and having a history of a C-section where significant factors of POC complications, however when the confounders where controlled in the adjusted multivariate model, only having a history of C-section birth remained significant AOR [3.6, 95% CI (1.0–9.4)] p-value 0.042. This finding is in tandem with other studies in Rwanda and Uganda [14]; [12]; [15])This finding also agrees with systematic review studies about the same topic that having a history of C-section delivery predisposed one to post-operative care complications [16]; [17]; [18]).However other studies both

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real time and systematic have been able to report statistical significant relationships of other factors that were not seen to be so in this study like age of the mother, economic status of the household, staffing status of the health care system and knowledge of mothers about post-operative care [1]; [6]; [19]; [20]).

Post cesarean care complications of mothers at ARRH

This study has found that the most common minor POC complications observed amongst the mothers was Mild anemia (25.6%), Mild fever 24h after surgery (19.8%) and Wound hematoma or infection (11.6%) whereas the most common severe POC complications observed were severe anemia (11.0%) and Sepsis (6.7%). This finding study is consistent with two other studies conducted in hospitals in western Uganda where mild and severe anemia were reported as the most prevalent POC complications followed by fever [14]; [15]). Other studies conducted outside Uganda have also concluded that mild and severe anemia coupled with fever after 24 hours of delivery are prevalent POC complications in sub Saharan African countries thus consistent with our findings [20]; [21]; [12]). However, other studies have reported other complications to be more prevalent that what we found in ARRH. Studies and

Variables	POC Complications		Unadjusted		Adjusted	
	No	%age	OR (95% CI)	p value	OR (95% CI)	p value
Age of Mother						
<20	47	14.3	1.4 (0.7–2.5)	0.316		
21 - 25	132	40.3	1.7 (0.9–3.3)	0.184		
26 - 30	91	27.8	0.1 (0.0–0.8)	0.034		
>30	58	17.7	1			
Mother's Education						
No formal education	41	12.5	0.4 (0.2–1.0)	0.061		
Primary	187	57.0	1.5 (0.8–2.9)	0.179		
Secondary	72	22.0	4.3 (1.2–15.0)	0.025	2.5 (0.4–13.3)	0.294
Post-secondary	28	8.5	1			
Parity						
Para 1 - 2	265	80.8	3.0 (1.4–6.1)	0.001	1.4 (0.6–3.2)	0.463
Para 3 - 4	46	14.0	0.7 (0.3–1.2)	0.223		
>Para 4	17	5.2	0.7 (0.3–1.8)	0.476		
History of C-section delivery						
Yes	240	73.2	3.8 (1.3–11.1)	0.016	3.6 (1.0–9.4)	0.042
No	88	26.8				
Number of days of Admission						
<5	146	44.5	1.1 (0.6–2.1)	0.694		
>5	182	55.5	1			
Staff Job Title (N=24)						
Specialist	1	4.2	0.6 (0.2–1.7)	0.368		
Medical officer	2	8.3	1.4 (0.7–2.5)	0.333		
Intern doctor	7	29.2	1.7 (0.9–3.3)	0.166		
Nurse	1	16.7	0.1 (0.0–0.8)	0.064		
Midwife	9	41.7	1			
Staff level of qualification (N=24)						
Masters	1	4.2	0.3 (0.1–1.1)	0.080		
Bachelors	11	45.9	4.1 (0.7–23.6)	0.104		
Diploma	3	16.7	2.0 (0.4–10.1)	0.367		
Certificate	5	33.4	1			

reviews on the same topic in similar communities of resource limited settings have shown that Wound hematoma or infection, Endometritis, Severe anemia, Peritonitis and Sepsis are very prevalent POC complications where it was not the case in ARRH [4]; [11] [5]; [22]; [6]). This inconsistency may be attributed to the diverse human resource staffing which was reported as limited in all the cited studies yet other studies have reported it as a protective factor before [2]; [23]; [24]; [18])

Practice of Post Cesarean Care among health care professionals attending to post cesarean delivery mothers at ARRH

All (100%) the health care staff at ARRH that were recruited in this study reported to have been following standard procedures of post-operative care while attending to mothers and had attended Continuing medical education about the subject which indicated that the practice was good. Other studies have shown that up-to-date education and practice following standard operating procedures is significantly related to a good outcome of post-operative care [14]; [25]; [26] [15]; [27]. However, this study has found out that even though the health care workers practice is based on standard operating procedures and facilitated by updated knowledge, they report a marriage of short comings like inadequate human resource (87.6%), inadequate equipment (95.9%), shortage of essential medicines (75.1%) and inadequate space (62.6%). All this aspects of limitations raised by the health care workers have been found to significantly impact the outcome of POC services in previous studies in Rwanda and reviews [20]; [5]; [22]; [24]. Similar studies have also conquered that inadequate address of these short comings raised by the health care workers can lead to reversal of any achievements gained in this area of health service provision thus predisposing mothers and neonates serious negative outcomes [5]; [7]; [28]; [8].

CONCLUSION

The most common minor POC complications amongst the mothers receiving POC care at ARRH were mild anemia, mild fever 24h after surgery and wound hematoma or infection whereas the most common severe POC complications observed were severe anemia and Sepsis. All health care workers that provide POC to mothers followed an institutionalized standard operating procedure and had update knowledge through recent continuing medical education. History of delivery by C-section significantly predisposed mothers to post-operative care complication.

LIMITATIONS

Despite the fact that our study tried to limit the impact of any limitations by design, our findings may have been limited by some limitations that we could not control, such as;

- Not all the staff attached to the maternity ward of ARRH consented to take part in the study thus presumably depriving the study of some significant findings.
- Even though many mothers consented and willfully participated in the study, their ability to comprehend some of the questions could have affected the way they answered since they were still going through post-operative management.

RECOMMENDATIONS

History of delivery by C-section significantly predisposed mothers to post-operative care complication which forms the basis of our recommendation;

- We recommend that the standard operating procedure used by ARRH staff for provision of POC to mothers be revised to account for a better approach of handling mothers with a history of delivery by C-section.
- We also recommend another study that can exclusively cover majority of the staff attached to the maternity ward of ARRH to better understand the nexus between their competences, limitations visa vie POC outcomes.

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