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# Compliance with Standard Precautions of Infection Control in the Management of Labour by Health Care Workers at Mulago Hospital, Uganda.

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**Abstract**

**Introduction:** Infections acquired during labour are the leading cause of maternal mortality globally. Compliance with Standard Precautions of Infection Control (SPIC) on the side of healthcare workers is crucial in preventing infection transmission during labour. However, lack of training on SPIC in the management of labour and work overload may be associated with non-compliance with SPIC in the management of labour.

**Objective:** The purpose of this study was to determine compliance with standard precautions of infection control in the management of labour and child birth by healthcare workers in Mulago Hospital, Uganda.

**Methodology:** A cross-sectional study utilizing a quantitative approach was conducted among 115 healthcare workers. Consecutive sampling was done to include respondents in the study. Data was collected by direct passive observation across which included; hand hygiene, use of personal protective equipment, disinfection of reusable equipment, management of sharps, waste segregation and disposal and observing the aseptic non-touch technique. It also included researcher administered questionnaires. Data was then coded and entered into the computer using SPSS version 20 with programmed quality control checks. Descriptive data analyses, frequencies and percentages were the major statistical methods used.

**Results:** Data from103 healthcare workers who gave deferred consent were involved in the study were analysed. The study revealed that 74% of the respondents were females and overall compliance was at 52%, although it varied across domains; which include; hand hygiene, use of personal protective equipment, disinfection of reusable equipment, waste segregation and

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disposal and observing the aseptic non-touch technique. The study further revealed that majority of the healthcare workers (95.1%) did not comply with hand hygiene.

**Conclusion:** Overall compliance to standard precautions of infection control was low compared to the Centre for Disease Control (CDC) recommendation.

**Recommendation:** There is an urgent need to put up interventions to improve on compliance with SPIC in management of labour among all healthcare workers.

**Keywords**: Compliance; Standard Precautions of Infection Control; Labour; Healthcare workers.

## Introduction

The "Standard Precautions (SP)," are infection control protocols, which were formulated to be used for the care of all patients regardless of their diagnosis, which replaced the "universal precautions (Abdulraheem, Amodu, Saka, Bolarinwa, & Uthman, 2012; Bowmer et al., 2017).
According to WHO (2016), Standard Precautions for Infection Control (SPIC) include hand hygiene, use of barriers (e.g., gloves, gown, cap, mask), aseptic non-touch technique, disinfection and sterilization of equipment and clothing used during care, environmental control (e.g., surface cleaning), health service waste handling), appropriate waste segregation of sharps, waste segregation excluding sharps, and isolation of patient's in accordance to requirement levels as an infection transmission source.
Compliance with SPIC in the management of labour in all health care facilities and other health service centres is very crucial in preventing maternal peri-partum infections (Abdulraheem et al., 2012; Bedoya et al., 2017). The WHO (2016) highly recommends practice of asepsis in six areas also as known "the six cleans" which include clean delivery surface, clean hands of the birth attendant, clean perineum of the mother, clean cord ligature, clean cord cutting instrument, and clean cord care. In spite of the long period since the introduction of the concept of SP, full adherence is still a matter of concern in many healthcare facilities (Hassan Kasim Haridi, 2016).

Globally, infections acquired during childbirth contributes to one tenth of the maternal deaths annually (Friday et al., 2012; Organization, 2016). Factors predisposing to high risks of puerperal infections include non-compliance with SPIC, unhygienic births by unskilled birth attendants, multiple vaginal examinations, prolonged labour and premature rapture of foetal membranes home (Friday et al., 2012). Other factors also include the flora of the delivery room, and the types of antibiotics used, (Mahmood, Rehman, & Chughtai, 2008).

The situation is worse in developing countries where resources for healthcare delivery are limited (Haile, Engeda, & Abdo, 2017). Sub-Saharan Africa contributes three quarters of the global estimate for maternal sepsis related deaths (Friday et al., 2012; Ngonzi et al., 2016). If death does not occur, these infections have been identified as a leading cause of morbidity, prolonged hospital stay, chronic disability, chronic pelvic pain and secondary infertility (Mehta, Mavalankar, Ramani, Sharma, & Hussein, 2011).

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In Uganda, the second leading cause of maternal mortality after haemorrhage is sepsis, where the mortality rate stands at 14% (UDHS, 2016). Many hospitals reports have indicated that a big number of mothers admitted in the hospital receiving care during labour and childbirth, develop puerperal sepsis (Ngonzi et al., 2016). Evidence has suggested that all deaths as a result of sepsis are preventable through hygienic practices and delivery environments and a crucial role antibiotic use has historically been well documented (Graham et al., 2016).

The WHO highly recommends compliance with the standard precautions of infections control during management of labour by all healthcare workers. Compliance with standard precautions on the part of Healthcare workers (HCWs) has been emphasized as fundamental and efficient means of healthcare-associated infections for both patients and healthcare workers (Gammon, Morgan-Samuel, & Gould, 2008). Infections acquired during labour and childbirth process are one of the leading causes of maternal mortality and morbidity, with sepsis accounting for 15% of the 289,000 global maternal deaths annually (Ith, Dawson, & Homer, 2012; Ith et al., 2013).

Mortality rate in Uganda due to sepsis has overwhelmingly increased to almost double from 8% in 2012 to 14 % in 2016 (UDHS, 2016; UDHS, 2012). In Mulago National Referral Hospital, records indicate that every month 11.9% of mothers admitted in post-natal ward, develop puerperal sepsis (HMIS, 2017).

## Methodology

**Research design:** This study utilized a descriptive cross sectional design of quantitative approaches, where the data from a population or a representative of subset is analyzed at specific point of time and the investigator measures the outcome and the exposure in the study participants at the same time (Gordis, 2009). Cross sectional study design is cheap and yet good at estimating the prevalence of the problem because data on the cause and outcome are collected at the same time (Gordis, 2009). This design was used because it is reliable at estimating the magnitude (compliance with standard precautions of infection control) and determinants of the phenomenon.

**Study site:** The study was carried out in Mulago National Referral hospital, department of Obstetrics and Gynecology located in Kawempe Division, approximately 5km from Kampala city center. It is the National Referral Hospital for the country and it handles all issues concerning women's health including prenatal care, postnatal, immunization, family planning, oncology and gynecology. The hospital conducts approximately 80 deliveries per day, 2400 deliveries per month and 28,800 deliveries per year (HMIS, 2017).

The clinical services delivered in this department (labour suite) per month are offered by Health Care Workers (HCWs) of different professional cadres, which include 73 midwives, 19 obstetricians 42 Senior House Officers (SHO's), and 28 medical interns (total 163). This makes a total of 163 HCWs who work in labour suites as per monthly duty roster. (Hospital, 2017). There are two units in this department that deal with deliveries these include, low risk labour suite,

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high-risk labour suite. The mothers after delivery are transferred to post-natal unit and of these, a bigger proportion develop puerperal sepsis (HMIS, 2017).

**Study population:** The study population comprised of HCWs (midwives, nurse midwives, intern nurses and midwives, senior house officers, obstetricians) who are 163 in total as per monthly duty roster (Hospital labour suite, statistics) at Mulago hospital working in the department of obstetrics and gynecology in labour suite units.

**Inclusion criteria:** The study included HCWs available on duty at the time of data collection (Nurses, midwives, intern nurses, nurse/midwives, intern doctors, obstetricians and Senior House Officers (SHOs)) involved in the care of mothers in labour.

**Exclusion criteria:** The study excluded healthcare workers who were sick, those on leave and those who were busy with administrative work.

**Sampling procedure:** The study utilized non probability quota sampling proportionate to size using convenience sampling technique. A fair representation of all cadres was considered by selecting a participant from all cadres in each quota to be included in the study. The first respondent was picked on as she/he commences on her shift and the next respondent was picked from the commencement of the next shift. No respondent declined in participating in the study if they met the inclusion criterion until the desired sample size was achieved.

**Sampling size determination:** The number of study subjects was estimated using Kish Leslie (1965) formula for homogeneous population.

$$N = \frac{z^2 p q}{d^2}$$

Where:

N = the required sample size.

z= the z score corresponding to 95% confidence level (1.96).

p= compliance with standard precautions of infection control among healthcare workers in Kenya.

q= 1-p (the expected proportion of the study population who do not meet the inclusion criterion.

d= degree of precision in the study.

This formula was used to calculate N for this study, basing on the following evidence from studies carried out before.

The confidence level of the researcher in this study was at 95% (Hence z = 1.96).

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Compliance among healthcare workers in Tanzania stands at 49.7% (Jones et al., 2014)

Hence p=0.497, The proportion, q (1-p) will be1- 0.479= 0.503 hence q=0.503 in this study

The degree of precision in the study was estimated at 5% (Hence d= 0.05),

Substituting in the above formula, therefore:

$$N = \frac{1.96^2 x 0.497 x 0.503}{0.05^2}$$

$$= 384$$

Since the sample size was higher than the number of the healthcare workers who are on a monthly roster of the two labour suites of Mulago hospital

The required sample size was calculated using a formula for small finite populations. Considering the finite population correction factor;

$$n = \frac{n_0 . N}{n_0 + (N - 1)}$$

Where n= required sample size, $n_{0=384 \text{ and } N=163,}$ therefore by substituting in the above formula, the required sample size n= 163 respondents

$$N = \frac{384x163}{384+(163-1)}$$

**=115**

Hence the sample size was 115 participants.

For equal representation of all cadres, Probability Proportionate to Size (PPS) was considered

| **Cadres** | **Calculations by sample size** |
|---|---|
| Midwives 73 | $\frac{73}{163}$X115=52 |
| Obstetricians 19 | $\frac{19}{163}$X115=13 |
| Senior house officers 42 | $\frac{42}{163}$X115=30 |

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| | |
|---|---|
| Medical interns 28 | $\frac{58}{163}$X115=30 |
| **TOTAL= 163** | **TOTAL=115** |

**Definition and Measurement of variable:** The outcome was compliance with Standard precautions of infection control in management of labour. This was measured as a categorical variable using an observation checklist modified from observation checklist for CDC (2008) and a modification from the validated observation checklist (Bedoya et al., 2017).

Assessment of compliance was by passive direct observation based on indication and corresponding action. An indication refers to a situation in which an infection prevention and control practice must be undertaken to prevent the risk of a pathogen being transmitted from one surface to another. Actions occur in response to indications, such that each indication has a corresponding action.

Compliance means that the correct action has been taken on each item under each domain giving a complete score. For example, for the domain of hand hygiene (Table 1 of the observation checklist), the indication "Before touching the patient" indicates the possibility that physical contact could lead to microbial transmission. The correct action corresponding to this indication is: "health-care worker washed his or her hands with soap and water or used an alcohol-based hand rub).

**Data collection methods:** After administrative clearance, permission to collect data from the ward managers was sought and the study was explained to them and healthcare workers were identified by use of a duty roster before a shift. Since the study was unobtrusive (covert) direct observation.

Data were collected by the use of observation checklist and researcher administered questionnaire containing closed ended questions.

**Data collection procedure:** This was a non-intrusive passive direct observation where the healthcare workers were left to do what they usually do while practicing infection control measures in labour suite unless there is a life-threatening event that forces the observer to intervene. If this happened, then that case would be dropped, but this never happened throughout the study. During the passive direct observation, the principal investigator created a rapport with the study participant to pave a way to ask the few questions in the questionnaire indirectly in a manner that the respondent never considered this an observation study on their SPIC practices. The observed data were entered on the checklist immediately to avoid recall bias. This method was adopted from a study which was done in Nigeria (Friday et al., 2012).

Every day, at least 3 study participants were observed and administered to a questionnaire. Data were collected between February and April 2018.

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One respondent was observed at a time throughout the three procedures in each shift. The four main procedures considered included; physical examination, vaginal examinations, invasive procedures and conducting delivery. The six SPIC domains were observed across these procedures. These domains have been identified as crucial for the safety of patients and HCWs by World Health Organization (WHO), Centre for Disease Control (CDC) and the Ugandan Ministry of Health infection control and prevention guidelines (2012) and these are:

(i) Hand hygiene;

(ii) Use of personal protective equipment;

(iii) Disinfection of reusable equipment and cleaning of delivery surfaces

(iv) Waste segregation of sharps

(v) Waste segregation excluding sharps and,

(vi) The aseptic non-touch technique.

For each of these domains, compliance with Standard Precautions of Infection control (SPIC) as practiced by the healthcare workers was scored as either "Yes" for complied or "No "not complied after the respondent has scored all in each item under each domain. The direct observation was done without the knowledge of the study participants in order to minimize on the Whathorne's effect.

**Data collection tools:** An observation checklist was modified from CDC (2008) infection control assessment tool and a validated observation checklist of a study, which was done in Kenya, to assess compliance by practices of the HCWs on SPIC (Bedoya et al., 2017). The structured questionnaire with closed four questions on individual and hospital related factors was used.

The data collected tools were pretested on 10 healthcare workers.

**Quality control measures:** The Principal Investigator collected data in order to avoid bias by other researchers and directly observed the performance of HCWs to avoid change of behavior of HCWs during performing of routine procedures.
The data collection tools were pretested on 10 HCWs from Naguru hospital since it has similar characteristics as Mulago national referral hospital.
To improve validity/reliability of data collection on observational studies, the principal investigator through passive direct observation healthcare worker performing the procedure. Quality of data collected was ensured by cross checking completeness of the data checklist and the questionnaire, which was used to assess the individual and facility factors. The principal investigator also crosschecked all filled data collection tools at the end of each data collection shift. None of the checklists and questionnaires were found to be incomplete.

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**Data management and Analysis:** Data collected was entered, cleaned and analyzed using SPSS version 20 to generate descriptive statistics.
Overall compliance and non-compliance was calculated by adding up all percentages from each domain then divided by the total number of domains which was 6 this method was obtained from different studies which were conducted on compliance with infection control practices (Bedoya et al., 2017).
A binary score of yes (performed) and no (not performed) were used for the domains of SPIC.
In addition, to generate descriptive statistics, categorical variables were described in form of frequencies, percentages and texts. Data was analyzed to yield percentages of compliance of respondents and was be presented in form of a table and pie chart.

**Ethical considerations:** Approval to do the study was sought from the School of Health Sciences Research and Ethics Committee/institutional review board (SHREC: REF: 2017:057.) An administrative clearance was obtained from Mulago Hospital research and ethics committee. The approval letters from the School of Health Sciences REC and administrative clearance from Mulago hospital were presented to the clinical head of and of obstetrics and gynecology directorate of Mulago National Referral Hospital. Labour suite managers were informed about the study and permission to conduct the study was sought from them.
Differed consent was sought after the passive observation where the principal investigator debriefed the participants about the study and the findings and asked them whether they would allow their findings be used for data analysis. Those who objected this their findings were not included for data analysis. These were identified retrospectively on the duty roster by time and date as indicated on the data collection tool.

## Results

### Univariate Analysis

***Social Demographic Characteristics/ individual factors*** *of the respondents*

The study involved 115 but only data for 103 were analyzed since the rest did not give differed consent. Majority of the participants were females 76(74%). Majority of the health care workers were midwives (44%), most of the respondents (47%) were bachelor's degree holders as a level of academic qualification. Half of the study participants (51%) worked in multiple places. Other characteristics are presented in Table 1.

**Table 1**: **Social Demographic Characteristics/ individual factors of the respondents**

| Characteristics | Frequency (n=103) | Percentage (%) |
|---|---|---|
| **Gender** | | |
| Male | 27 | 26 |
| Female | 76 | 74 |

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| | | |
|---|---|---|
| **Professional cadre** | | |
| Midwife | 45 | 44 |
| Obstetrician | 34 | 33 |
| Medical Intern | 24 | 23 |
| **Qualification level** | | |
| Master's degree | 11 | 11 |
| Bachelor's degree | 49 | 47 |
| Diploma & Certificate | 43 | 42 |
| **Work experience (in years)** | | |
| 2–4 | 13 | 13 |
| 5–10 | 39 | 38 |
| >10 | 29 | 28 |
| **Work in other facilities** | | |
| Yes | 53 | 51 |
| No | 50 | 49 |

*Proportions of compliance with standard precautions* ***of infection control in management of labour by healthcare workers.***

Table 2, shows proportions of compliance with SPIC by health care workers in management of labour in the six domains which were hand hygiene, personal protective equipment, equipment processing and surfaces, waste segregation of sharps, waste segregation excluding sharps and the non-touch technique**.** Study results show that the majority (95.1%) of the HCWs did not comply with hand hygiene compared to other domains of SPIC in the management of labour. However, the observation tool captured that majority (94.2%) of the HCWs complied with use of PPE and 77.7% complied with waste segregation of sharps.

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**Table 2: Proportions of compliance with standard precautions of infection control in the management of labour by healthcare workers**

| Variables | Frequency | % (95% Confidence Interval) |
|---|---|---|
| **Hand hygiene** | | |
| Compliance | 5 | 4.9 (2-11) |
| Non compliance | 98 | 95.1 (89-98) |
| **Use Personal Protecting Equipment** | | |
| Compliance | 97 | 94.2 (88-97) |
| Non compliance | 6 | 5.8 (3-12) |
| **Equipment processing of non-re-usable equipment & cleaning delivery surfaces** | | |
| Compliance | 26 | 25.2 (18-34) |
| Non compliance | 77 | 74.8 (66-82) |
| **Waste segregation of sharps** | | |
| Compliance | 80 | 77.7 (69-85) |
| Non compliance | 23 | 22.3 (15-31) |
| **Waste segregation excluding sharps** | | |
| Compliance | 62 | 60.2 (51-69) |
| Non compliance | 41 | 39.8 (31-49) |
| **Non touch technique** | | |
| Compliance | 52 | 50.6 (41-60) |
| Non compliance | 51 | 49.4 (40-59) |

**The results in a pie chart below indicate overall compliance with SPIC in management of labour by healthcare workers.**

The overall compliance was 52% which was calculated using adding up the percentages from each domain of SPIC and the same was done for non-compliance this method was utilized in pertinent studies (Bedoya et al., 2017; Haile et al., 2017)

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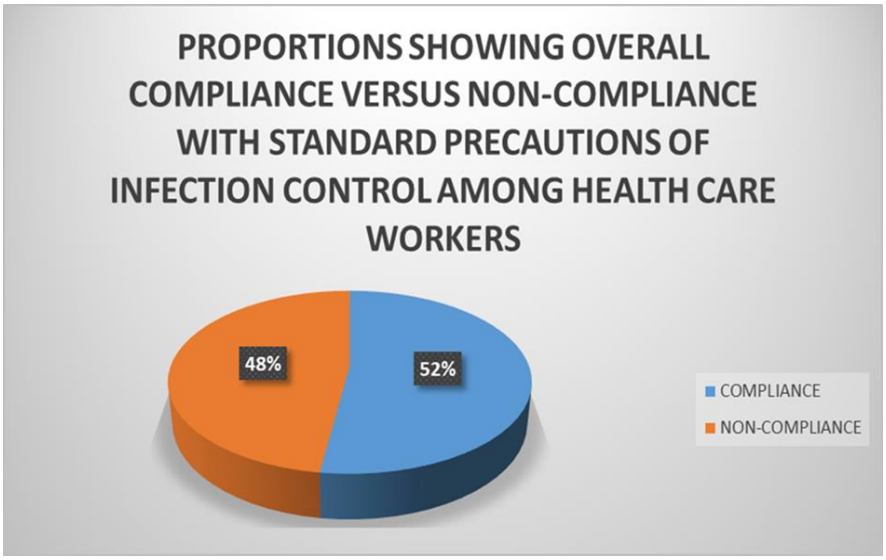


**Figure 1: Pie chart showing the percentage of respondents on compliace and non compliance to SPIC.**

## Discussion

### Social demographic characteristics/ individual factors

The social demographic characteristics in this study were also regarded as individual factors. Data from 103 study participants were analysed. Results indicate that the majority of the study participants were females at 74%, this could have been due to the fact that majority according to professional cadre were midwives (48%). According to the Ugandan training system in midwifery education, entry requirements suggest that one should be a female in order to be enrolled in the training program. According to Kopolo et al (2005) females are seen to be more in the clinical practice of the healthcare system and the males in administrative and policy levels.

### Compliance with standard precautions of infection control in management of labour

The findings in this study about compliance were obtained from an observation checklist through direct observation. The absence of the Hawthorne effect is encouraging because many researchers use the direct observation as a gold standard to measure compliance, which was equally utilized in this study.

Labour and child birth, is a period where women are at a greatest risk of acquiring iatrogenic infections which are also known to be life threatening (Acosta et al., 2013). Therefore, healthcare workers have a fundamental role in observing compliance with standard precautions of infection control while managing labour. Uganda is one of the resource limited countries in Sub-Saharan Africa hence compliance with SPIC strategies are the cheapest means to consider in the prevention of sepsis related mortalities (Friday et al., 2012; Haile et al., 2017) such that less expenditure is put on the outcomes of these infections.

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The findings from this study showed that the overall compliance with the standard precautions of infection in the management of labour among healthcare workers was low at 52% when compared with the recommended 98% (CDC, 2016).

International studies which assessed compliance to infection control and prevention, suggested high scores compared to those in this study. For instance, a study done in Saudi Arabia (Haridi, Al-Ammar, & Al-Mansour, 2016) demonstrated high compliance scores of 75% among dental health care workers. Although these findings were obtained from self-reported compliance, which may represent an overestimate, they are higher than those from our study are.

These findings are in congruent with results from the systematic review of compliance by healthcare practitioners by Gammon et al., (2008) which concluded that compliance with SPIC is internationally sub-optimal.

In our study compliance varied across domains, it was almost complete with the use of personal protective equipment (94.2%) but very low for hand hygiene (4.9%). This overall compliance proportion is lower than that of a study which investigated compliance with SPIC by observation in 958 health facilities in Kenya (Bedoya et al., 2017) which showed overall compliance of 74%. Comparison of compliance with SPIC between studies is fraught with many obstacles including study design, study settings and measurement of compliance as well as the differences in sample size.

Use of personal protecting equipment is barriers used to protect healthcare workers from majorly exposure to body fluids and also give them protection from recognized and un recognized sources of infection (WHO, 2000). In this study compliance for use of PPE was high, this could be explained by the fact that healthcare workers are cautious about prevention of occupational health hazards (Ndejjo et al., 2015)

Hand hygiene is regarded as a major component of SPIC by WHO when they launched world alliance patient safety in 2004, because it is standardized, low cost, simple measure based on scientific evidence that 99% of microorganisms are eliminated with simple methods like use of running water and soap (Chen et al., 2011). In this study hand hygiene was low at 4.9% which was contrary with hand hygiene in an Ethiopian study which was found at 92.2% (Haile et al., 2017). Non-compliance with hand hygiene indicated in this study, calls for a need to put a strict infection control program that regularly orients the HCWs on SPIC with emphasis on hand hygiene.

Disinfection of re–usable equipment is a core component of SPIC which is a procedure used to kill microorganisms and endospores (Wilson & Nayak, 2016). In management of labour disinfection of re-usable equipment, is crucial because of the nature of procedures carried out and exposure to high volumes of body fluids. However, in this study, disinfection of re-usable equipment and cleaning of delivery surfaces was significantly associated with gender with p value 0.049. This could have been related to gender issues in health practice where females are seen to have household responsibilities like cleaning (Witter, et al, 2017).

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**Study limitations**

Compliance was measured by direct observation which brings about the Hawthorne effect among the study participants, to minimize on this the researcher utilized direct unobtrusive observation when the healthcare workers performed their procedures in care for mothers in labour.

**Conclusion**

This study concluded that the overall compliance to standard precautions of infection control was low at 52% although it varied across domains.

**Recommendations**

There is an urgent need to put up interventions to improve on compliance with SPIC in management of labour among all healthcare workers because mothers in labour are at very high risk to acquisition of infections during this course of childbirth.

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