

Associated Factors with Puerperal Sepsis among Reproductive Age Women in Nandi County, Kenya

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ABSTRACT

Background & aim: Studies have shown that puerperal sepsis is a major cause of maternal morbidity and the second cause of maternal mortality in the developing world. This study aimed to determine the incidence and management of puerperal sepsis among the women of reproductive age (i.e., 15-49 years) attending to two hospitals in Nandi County, Kenya.

Methods: This descriptive, cross-sectional study was conducted on 215 women who were diagnosed with puerperal sepsis and referred to two hospitals in Nandi County. Four health care providers in charge of these patients were also included in the study. The sampling was performed using the purposive sampling technique. The data were collected using a structured interview administered by the researcher. Data analysis was performed through SPSS version 20 using the Chi-square test and logistic regression.

Results: According to the results of the study, there was a statistically significant relationship between antenatal care attendance and labor duration (OR=0.35, 95% CI: 0.15-0.80). The mothers who had a short labor were 0.35 times more likely to have attended health care facilities to receive antenatal care as compared to those with a long labor. In addition, the food availability showed a significant relationship with duration of labor (OR=5, 95% CI: 1.8-14.28). The mothers with adequate food were five times more likely to experience a short labor compared to those with food shortage. The results also revealed that there was a lack of knowledge on the etiology of infection in the area under investigation. Moreover, the health care facilities were short of the adequate prerequisites to perform puerperal sepsis awareness both in the clinics and community.

Conclusion: The findings of the present study underscored the necessity of supplying funds by the Ministry of Health to raise the individuals' awareness on puerperal sepsis and provide them with hygiene education in the investigated area. The integration of hygiene education and puerperal sepsis awareness into antenatal care services should be performed as a strategy to prevent and control the infection.

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Introduction

According to the World Health Organization (1), puerperal sepsis is a genital tract infection occurring at any time within the rupture of extra placental membranes or labor and the 42nd day postpartum. This disease is characterized by two or more of such symptoms as pelvic pain, fever (i.e., oral temperature of 38.5°C or higher on any occasion), abnormal vaginal discharge (e.g., the presence of pus and abnormal smell/foul odour),

and delay in the reduction of the uterus size. Almost 80% of maternal mortality, resulting from pregnancy complications, are brought about by the causes, which are preventable as they strongly depend on the quality of the provided care. Puerperal sepsis is among the preventable causes of maternal death.

The most significant long-term complication of puerperal sepsis is infertility resulting from

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tubal occlusion, which annually affects 450,000 females (2, 3). In Kenya, puerperal sepsis accounts for approximately 15% of maternal deaths. According to Kenya Demographic Health Survey, Kenya is one of the countries in sub-Saharan Africa that still experiences high maternal mortality. For instance, in September, 2008, the maternal mortality ratio was estimated to be 488 cases per 100,000 live births. According to the literature, the predisposing factors to puerperal sepsis include anemia in pregnancy, prolonged labor, frequent vaginal examination, premature rupture of membranes, and use of unsterilized/unwashed instruments during delivery (4).

Despite the improvement of hospital deliveries in Nandi County, the postpartum infections are still occurring in this region. There are several studies investigating the causes of puerperal sepsis; however, a few of them have focused on the association between the respective risk factors. With this background in mind, the present study was conducted to determine the incidence and management of puerperal sepsis among the women of reproductive age (i.e., 15-49 years) referring to two hospitals in Nandi County, Kenya.

Materials and Methods

This descriptive, cross-sectional study was conducted on all the women of reproductive age (i.e., 15-49 years) who were diagnosed with puerperal sepsis in two hospitals of Nandi and Kapsabet districts and visited the hospital for receiving health care services during January to April 2014. Four health care providers in charge of these patients were also included in the study. Based on 15% prevalence rate of puerperal sepsis in Nandi County, the sample size was calculated to be 215 cases using the Fischer's formula ($n = (Z^2pq)/d^2$). This sample size was proportionately divided among the two hospitals serving as the only major county referral hospitals.

The sampling was performed using the purposive sampling technique. The patients who had been diagnosed with puerperal sepsis and willing to participate in the study were interviewed when leaving the hospital. The data were collected using a questionnaire and key informant interview. The exclusion criteria

included unwillingness to participate in the study, being in critical condition, and mentally ill. The permission to carry out the study was obtained from the Kenyatta University board of graduate studies and National Council for Science Technology and Innovation.

In order to ensure the validity of the research instrument, a pre-test was carried out in the Uasin-Gishu District Hospital, and the appropriate corrective measures were implemented. The research assistants passed a comprehensive training and were involved in the pretest so as to bring the element of consistency in data collection. Data collection was performed on working days (i.e., from Monday to Friday) for three months. The data were analyzed through the SPSS version 20 using the Chi-square test (to test the association between the variables) and logistic regression (to test the strength of associations between the variables showing statistical significance).

Results

Out of the 215 participants enrolled in this study, the age range of 57.2% of the respondents was within 20-29 years. According to the results, 72% of the participants had delivered their babies, and 28% of them had undergone unsafe abortions. The mean age of the subjects was 25.2 ± 6.5 years. Regarding the demographic characteristics, 62.8% of the respondents were married, and 60% of them had low education levels. Furthermore, 64% of the participants were of low socioeconomic status (unemployed) and 56.2% of them had low parity status.

Incidence of puerperal sepsis

Out of the delivery cases (71.6%), 38.1% and 33.5% of them had given birth to their babies in a healthcare facility and at home, respectively. The majority of these women (66.5%) had delivered through spontaneous vaginal delivery. However, 4.7% and 0.5% of this group had caesarean-section and instrumental delivery, respectively. It was evident that 46% of the participants had experienced several vaginal examinations prior to delivery. Accordingly, 12.6% and 7.4% of the subjects had vaginal examination twice and once, respectively. In addition, 4.7% of the participants had not been

examined completely, and 0.9% of them did not know if they were examined.

Table 1. Socio-demographic data of the participants

| Variables | Frequency | Percentage (%) |
|-------------------|-----------|----------------|
| Age range (years) | | |
| 15-25 | 127 | 59.1 |
| 26-35 | 69 | 32.1 |
| 36-46 | 19 | 8.8 |
| Parity status | | |
| Primipara | 45 | 20.9 |
| Multipara | 115 | 53.5 |
| Grand multipara | 25 | 11.6 |
| Nullipara | 30 | 14.0 |
| Educational level | | |
| Illiterate | 21 | 9.8 |
| Primary | 108 | 50.2 |
| Secondary | 61 | 28.4 |
| Tertiary/college | 25 | 11.6 |
| Occupation | | |
| Self-employed | 45 | 20.9 |
| Employed | 33 | 15.4 |
| Unemployed | 137 | 63.7 |

Upon the investigation of abortion as an associated risk factor, it was observed that about 28% of the respondents had undergone unsafe abortions at home. The majority of the subjects (56.7%) had irregular or no antenatal care attendance. About 15% of the respondents referred for antenatal visits before delivery. Furthermore, 60% of the participants did not have adequate food during their pregnancy.

Factors associated with puerperal sepsis

The relationship between the risk factors was investigated using the cross tabulation and Chi-square test (Table 2).

Subsequently, as shown in Table 3, odds ratios were used to estimate the strength of association between the investigated combinations.

As the findings revealed, there was a statistically significant association between the duration of labor and antenatal care attendance. Accordingly, the mothers who had short labor were 0.35 times more likely to have attended the antenatal care visits as compared to those with longer labor (OR=0.35, 95% CI, 0.15-0.80). Additionally, the duration of labor and availability of food

during the pregnancy were observed to have a statistically significant relationship. In other words, the mothers with adequate nutrition were five times more likely to experience short labor, compared to those with food shortage (OR=5, 95% CI, 1.8-14.28). There was no statistically significant association between other variables.

Management strategies and challenges of puerperal sepsis

The management strategies were evaluated based on the observations of the respondents during delivery (Figure 1). Accordingly, 113 participants reported that their delivery assistant used gloves. Furthermore, 22 respondents noted that they observed their assistants washing their hands before the delivery procedure. Additionally, 11 subjects did not observe any hygienic method, while 4 participants did not have any idea on such matters. According to the findings, the use of gloves was a common practice.

According to the findings obtained from the key informant interview, the hospitals used disinfectants and administered antibiotics after delivery in order to prevent and manage the occurrence of infections. Regarding the challenges of the prevention and management of puerperal sepsis, it was reported that most women who developed the infection after hospital deliveries may have failed to maintain their hygiene at their homes. sepsis were found to be visiting the health facilities when the infection had already dominated their bodies.

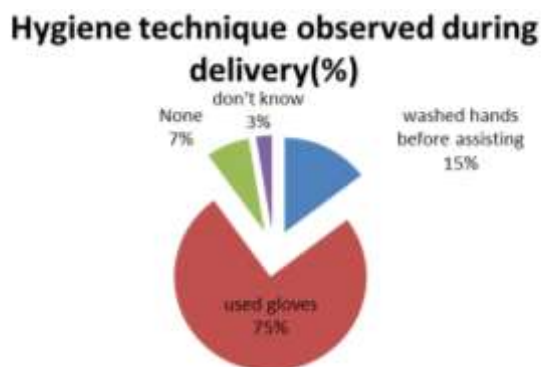
Based on the key informant interview, it was found that the health care facilities in the area under investigation faced staff shortage, financial challenges, and poor infrastructure; furthermore, it was difficult for the health care providers to access the area. Additionally, low socioeconomic status and little involvement of the males in reproductive health issues added to the challenges faced in the prevention and management of this disease in the respective area.

Table 2. Relationship between the risk factors associated with puerperal sepsis among the participants

| Variables | Category | Antenatal care attendance (n=154) | | Df | P-value |
|-------------------------------|---------------------|-----------------------------------|-------------|----|---------|
| | | Yes | No | | |
| Level of education | Literate | 116 (75%) | 29 (19%) | 1 | 0.87 |
| | Illiterate | 7 (5%) | 2 (1%) | | |
| Occupation | Employed | 62 (40%) | 61 (40%) | 1 | 0.17 |
| | Unemployed | 23 (15%) | 8 (5%) | | |
| Marital status | Married | 92 (60%) | 20 (13%) | 1 | 0.25 |
| | Single | 31 (20%) | 11 (7%) | | |
| Mode of delivery | Spontaneous vaginal | 113 (73%) | 30 (20%) | 1 | 0.83 |
| | Others | 9 (6%) | 2 (1%) | | |
| Knowledge on puerperal sepsis | Yes | 37 (24%) | 2 (1%) | 1 | 0.08 |
| | No | 86 (56%) | 28 (19%) | | |
| Duration of labor (n=154) | | | | | |
| | | Short | Extended | | |
| Availability of food | Yes | 56 (36%) | 74 (48%) | 1 | 0.001 |
| | No | 19 (12%) | 5 (3%) | | |
| Mode of delivery | Spontaneous vaginal | 70 (12%) | 73 (47%) | 1 | 0.82 |
| | Others | 5 (4%) | 6 (4%) | | |
| Distance to hospital | <10 km | 19 (12%) | 23 (15%) | 1 | 0.59 |
| | >10km | 56 (36%) | 56 (36%) | | |
| Antenatal care visits | Yes | 53 (34%) | 69 (45%) | 1 | 0.01 |
| | No | 22 (14%) | 10 (7%) | | |
| Vaginal examinations (n=154) | | | | | |
| | | 0-1 | 2 and above | | |
| Occupation | Employed | 16 (10%) | 69 (45%) | 1 | 0.82 |
| | Unemployed | 12 (8%) | 57 (37%) | | |
| Knowledge on puerperal sepsis | Yes | 8 (5%) | 31 (20%) | 1 | 0.66 |
| | No | 20 (13%) | 95 (62%) | | |
| Education level | Literate | 25 (16%) | 120 (78%) | 1 | 0.23 |
| | Illiterate | 3 (2%) | 6 (4%) | | |
| Marital status | Yes | 20 (13%) | 92 (58%) | 1 | 0.87 |
| | No | 8 (5%) | 34 (22%) | | |
| Continuous of Table 2. | | | | | |
| | | Place of delivery (n=154) | | | |
| | | Health facility | At home | | |
| Education | Literate | 129 (84%) | 16 (10%) | 1 | 0.05 |
| | Illiterate | 6 (4%) | 3 (2%) | | |
| Occupation | Employed | 72 (47%) | 13 (8%) | 1 | 0.21 |
| | Unemployed | 63 (41%) | 6 (4%) | | |
| Marital status | Married | 100 (65%) | 12 (8%) | 1 | 0.32 |
| | Single | 35 (23%) | 7 (4%) | | |
| Antenatal care visits | Yes | 109 (71%) | 14 (9%) | 1 | 0.47 |
| | No | 26 (17%) | 5 (3%) | | |
| Knowledge on puerperal sepsis | Yes | 32 (21%) | 7 (5%) | 1 | 0.21 |
| | No | 103 (67%) | 12 (7%) | | |
| Mode of delivery (n=154) | | | | | |
| | | Spontaneous | Others | | |
| Antenatal care visits | Yes | 113 (73%) | 10 (6%) | 1 | 0.34 |
| | No | 30 (20%) | 1 (1%) | | |
| Education | Literate | 135 (88%) | 10 (6%) | 1 | 0.63 |
| | Illiterate | 8 (5%) | 1 (1%) | | |
| Marital status | Married | 105 (68) | 7 (5%) | 1 | 0.48 |
| | Single | 38 (25%) | 4 (2%) | | |
| Knowledge on puerperal sepsis | Yes | 37 (24%) | 2 (1%) | 1 | 0.57 |
| | No | 106 (69%) | 9 (6%) | | |

Table 3. Strength of association between the significant combinations

| Cross-tabulated variables | Odds ratio | 95% confidence intervals |
|---|------------|--------------------------|
| Antenatal care attendance and duration of labor | 0.35 | 0.15-0.80 |
| Duration of labor and food availability | 5 | 1.8-14.28 |

**Figure 1.** Hygiene practices observed by the participants performed by the delivery assistant

Discussion

Incidence of puerperal sepsis: As the findings of the present study indicated, most of the mothers, who developed puerperal sepsis, were within the age of 20-29 years and of lower parity (primipara) (57.2% and 56.2%, respectively). Perhaps, this may have resulted from the fact that the young inexperienced mothers tend to seek services of the traditional birth attendants. They mostly deliver outside health facilities due to the lack of knowledge on the benefits of health care services, antenatal care, and delivery in adequately equipped medical facilities.

They also have poor pregnancy spacing tendency. Upon the birth of the closely spaced second child, these mothers are overwhelmed with duties, hence forgetting about their health (5). This finding is in line with those obtained by Khaskheli et al. (6), concluding that this group of women suffer from the infectious morbidities caused by poverty, illiteracy, and malnutrition. This population carry their pregnancy in very poor settings and have low resistance to the infection; in addition, these women are usually ignorant in seeking antenatal check-ups or contraceptive advice.

Young mothers are unfamiliar with the process of labor, its length, and complications. Mostly, primigravida mothers take a long course of labor and trials in various hands before reaching to the

health facility. Similarly, in another study carried out by Sham shad et al. (7), 70% and 77% of the women suffering from puerperal sepsis were < 30 years old and para \leq 2, respectively.

In this study, the majority of the women (64%) had a low socioeconomic status. The probability of sepsis incidence is higher in the poor females delivering in unhygienic conditions. This might have compromised their health-seeking behavior. Most of these women (50.2%) had attained only primary school education rendering them jobless. Therefore, they lacked the adequate resources to afford the cost of health facility. The poverty and cultural constraints that construct a social barrier constrain the access of many women to health services (8).

Poor socioeconomic status hinders the women from acquiring adequate food during antenatal period. In this regard, several studies have reported high rate of sepsis (65.2%) in the low socioeconomic group. Poor social setting is associated with illiteracy, poor hygiene, ill health, poor antenatal care, prolonged labor, delayed referrals, and pre-labor rupture of membranes all of which set the scene for the occurrence of sepsis (7).

Regarding the delivery location, the majority of our participants (38.1%) had delivered in the health facilities. However, in another study, most of the participants (73.8%) were reported to give

birth to their babies at home (6). In addition, the strong association of puerperal sepsis with nosocomial infections and increasing antibiotics resistance has posed a significant challenge to the overburdened health care systems (9).

The mothers and their newborns are discharged from the hospital six hours after delivery; however, the symptoms of puerperal sepsis take up to 42 days to manifest. Hospital delivery by itself cannot reduce the probability of getting the infection if there are no proper antiseptic techniques in the respective health care facility. The new mother may acquire the infection before leaving the healthcare facility, and thereafter developing the disease.

According to the results of the current study, sepsis was more prevalent among the hospital deliveries (38.1%), compared to that in the home deliveries (33.5%). These results are inconsistent with those of a study carried out by Sham shad et al. (7). In the mentioned study, the sepsis prevalence was higher in the home deliveries (37.9%), compared to that in the hospital deliveries (26.1%). There are multiple factors involving in the high maternal morbidity due to sepsis. These factors include deliveries assisted by unskilled personnel in unhygienic conditions, late referral to hospital, poor socioeconomic status, prolonged labor, induced abortion, and other chronic illnesses, such as anemia (10).

Women with lower parity status seem to be more prone to infection. Most of the respondents (62.8%) in the current study were married. Theoretically, they seem to lack adequate time to uphold the proper hygiene practices due to the responsibilities that await them. Possible risk factors among these women include lack of knowledge on puerperal sepsis, lack of adequate experience in motherhood, and poor pregnancy spacing (11).

The lack of knowledge on puerperal sepsis among the women is a major problem in Nandi County. The induced abortions that accounted for 28.1% of the study cases were conducted in unsafe settings and unhygienic conditions by untrained personnel. These unsafe abortions may lead to death resulting from hemorrhage or puerperal sepsis. The lack of knowledge on puerperal sepsis can expose these women at the risk of infection, and eventually endanger their lives.

In the developed countries, the concept of

unsupervised deliveries without aseptic measures is part of the past and the incidence of induced abortion is very low due to the legalization of abortion (12). Although in the developed countries, the single most contributing factor for puerperal sepsis is caesarean section (10), in this study, only 4.7% of the participants had puerperal sepsis after undergoing a caesarean delivery.

Factors associated with puerperal sepsis: There was a strong association between the food availability and duration of labor. Those with adequate food experienced shorter labor, compared to those with food shortage. Regarding this, it could be stated that nutrition can determine the duration of labor. This finding is in line with that obtained by Singata et al. (13), concluding that poor nutritional balance may be associated with longer and more painful labors.

In addition, prolonged labor leads to several vaginal examinations, which directly results in sepsis. Prolonged state of an open cervix, often occurring with ruptured membranes, during lengthy labor allows the infection to ascend from the vagina. According to Momoh et al. (4), puerperal sepsis can be prevented through the consumption of adequate nutritive food or supplements, especially those rich in proteins and vitamins during pregnancy. The availability of proper food boosts the body immune system to fight infections when they occur (14). This will help reduce the puerperal sepsis resulting from prolonged labor.

This study showed that the patients who had a poor obstetric history during pregnancy were at a higher risk of experiencing long labor. Those with poor obstetric profile were mothers who did not attend antenatal clinics in the health care facilities. Based on the key informant interview, they either patronized quacks or did not visit health facilities at all. This finding is in line with that of Utoo et al. (15), reporting that puerperal sepsis was more prevalent among the unbooked mothers (8.7%) than the booked ones (1.9%).

In the present study, no association was observed between the knowledge of puerperal sepsis and parity status among the mothers. Mothers lacking knowledge on the importance of hygiene and its consequences are at a high

risk regardless of their parity status. This finding is supported by a study performed by Rinku (16), which reported no significant association between the knowledge of the primi postnatal mothers on puerperal sepsis and their demographic variables, such as age, educational status, occupation, family income, type of family, place of residence, and source of information.

The present study also revealed that the mode of delivery could not be a product of antenatal care attendance. Puerperal sepsis is principally the consequence of poor hygiene. Therefore, if a mother attends a health care facility during pregnancy in order to receive the antenatal care, but does not receive such care during delivery or postpartum period, she may encounter bacterial contamination and is likely to be infected.

Management of puerperal sepsis: Currently, increasing concerns of controlling nosocomial infection has been recorded in many medical disciplines, even in the developed countries. This issue has led to an increasing trend of referring to health facilities for the prevention and control of infection. Regarding this, the proper implementation of the established infection control programs at all health facilities in Kenya is of paramount importance. In order to control the infection, some measures are necessary to perform, including proper education, employment of various technologies, as well as improvement and introduction of new clinical guidelines (6).

As the results indicated, most of the deliveries were performed using gloves. The use of gloves was expected to reduce the infection cases; however, this was not the case in this study. The gloves might not have been sterile enough to remove the bacterial contamination. Furthermore, there might have been cases of gloves recycling for economic reasons. The study found out that mothers who came to deliver were requested to purchase gloves to be used in the delivery procedure. In this regard, those with prolonged labor are likely to be subjected to glove recycling due to frequent check-ups. This finding is similar to that obtained by Khaskheli et al. (6) revealing a relationship between the use of hand hygiene products and reduction in nosocomial infections.

Management of puerperal sepsis by the health care facilities: Understaffing in the healthcare facilities was found to be a major problem. All the key informants, who participated in this study, strongly agreed that the facilities did not have adequate staff. The lack of enough staff makes the patient management a tedious process leading to the development of infections. Accordingly, there will be a poor attendance to mothers during labor; this exposes the mothers to longer labor and puts them at high risk of puerperal sepsis (15).

Educating the mothers on personal hygiene and increasing their awareness about puerperal sepsis could be effective in the eradication of this menace. The poor infrastructure and topography of this area (i.e., having steep hills and valleys) have made it difficult for the few available community health workers to access deep into the community to create awareness on the condition.

In addition, the health care facilities lack the adequate funds to carry out initiatives (e.g., education of the community on puerperal sepsis, male involvement on family planning issues, and enhancement of awareness on the consequences of unsafe abortions) that could help reduce the chances of puerperal sepsis in this area.

Management of puerperal sepsis by patients: It was reported that the women in Nandi County lacked adequate information on puerperal sepsis and delayed in seeking for health care services. Poor health-seeking behavior among the women is brought about by high levels of poverty and ignorance. In addition, some of these women lacked funds to seek early treatment on the onset of the symptom manifestation. The lack of funds prompts these women to try cheap forms of treatment including herbs or hide their health status from their partners for the fear of stigmatization. Based on the findings, these women reported to have tried other possible treatments on their own; however, they ended up with failure. This puts them at the risk of developing other complications, which endanger their health.

This study facilitated the identification of the relationships between several factors and puerperal sepsis. Furthermore, we could identify the challenges faced in the management of the infection in the selected hospitals in Nandi

County. However, our results were limited to two referral hospitals in Nandy County; therefore, they cannot be generalized to the whole population of this region.

Conclusion

Education and knowledge plays an important role in the prevention of puerperal sepsis. Young mothers and women of lower parity status need to be informed of puerperal sepsis and its preventive strategies. The women need to be encouraged to utilize antenatal care services through which they can receive counseling on their hygiene and nutrition. The integration of hygiene education and puerperal sepsis awareness into antenatal care services should be performed as a strategy to prevent and control the infection.

Additionally, male involvement in family planning issues should be encouraged. This can help to boost decision making and health-seeking behavior in the community. Furthermore, hospitals need to improve their infection control practices. Moreover, adequate resources should be provided for better service provision and prevention of puerperal sepsis.

Health care providers should develop programs targeting towards the enhancement of awareness on puerperal sepsis and consequences of unsafe abortions as well as hygiene education. The County Ministry of Health should support such initiatives by providing the necessary financial support, improving the infrastructure, and enabling the health care staff to access the region. Additionally, the family planning programs should strengthen the level of male involvement in reproductive issues to facilitate proper decision making among the couples and handle the issues of contraceptive failure when they arise. The results of the present study are limited to only the hospital environment. The nature and extent of the impact of this disease could be different in various settings. Therefore, further community-based studies are recommended to be conducted on the same issue.

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Conflicts of Interest

The authors of the present study declared no conflicts of interest.

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