Imbuki
www.iaajournals.org
IAA Journal of Biological Sciences 10(2):185-196, 2023. ISSN: 2636-7254

Determinants of Puerperal Sepsis Incidence at Hoima Regional Referral Hospital in Hoima District, Western Uganda

Imbuki Baraka Alvah

Faculty of Clinical Medicine and Dentistry Kampala International University Western Campus Uganda

ABSTRACT

Puerperal sepsis remains a significant health concern in regions with limited access to quality healthcare, contributing to elevated maternal morbidity and mortality rates. Uganda is no exception, where cases of puerperal sepsis lead to higher-than-average percentages of maternal health issues. The prevalence of this condition varies across regions, influenced by patient and healthcare-related factors. However, there is a dearth of information on the specific factors contributing to puerperal sepsis in Ugandan hospitals, including Hoima Regional Referral Hospital. This study aimed to address this knowledge gap by assessing the factors contributing to puerperal sepsis in Hoima Regional Referral Hospital, Hoima district. A descriptive case study involving 335 women of reproductive age at the hospital employed a researcher-administered questionnaire to collect data. The prevalence of puerperal sepsis was found to be 12.48%. Factors significantly contributing to puerperal sepsis included giving birth outside a hospital setting, advanced age, parity, and poor hospital and personal hygiene. These contributing factors are largely preventable, emphasizing the need for collaboration among stakeholders, including patients, communities, and hospitals, to prevent puerperal sepsis. Furthermore, increased research funding from the government can support further investigations in this field, ultimately reducing the burden of puerperal sepsis.

Keywords: Puerperal sepsis, Health service delivery, maternal morbidity and mortality, Quality healthcare, healthcare-related factors.

INTRODUCTION

Puerperal sepsis is an infection of the genital tract occurring at any time between the onset of the rapture of membranes or labour onset and the 42nd day postpartum in which 2 or more of the following are present: pelvic pain, fever, abnormal vaginal discharge, abnormal smell/foul odour discharge or delay in uterine involution [1, 2]. It was referred to as childbed fever and it was generally accepted that Professor Ignaz Semmelweis was the first to identify the mode of transmission of puerperal sepsis. The introduction of pathological anatomy at Allgemeines Krankenhaus Hospital in 1823 was associated with increased mortality. After 1840 maternal mortality was higher in clinic one. This was the clinic which was stuffed by male obstetricians and medical students who attended autopsies, unlike the midwives in clinic two. The introduction of chlorine washing of male clinician hands in clinic one by Semmelweis in 1847 reduced mortality, whereas the cessation of hand washing after Semmelweis left Vienna Hospital in 1850 was associated with increased mortality. This clearly indicated that puerperal sepsis is a contagious disease [3]. Aetiology theory is believed to be the chief science of medicine. The adoption of etiological characteristics for specific diseases had a necessary cause and was therefore quite essential to research of this kind. Epidemiologically, about 358,000 maternal deaths occur during labour and after childbirth and15% of these maternal deaths are related to puerperal sepsis. Puerperal sepsis is ranked as the 6th leading cause of disease burden for women aged 15-44 years [4]. As many as 5.2 million, cases of maternal

puerperal sepsis are annually occurring and an estimated 62,000 deaths also annuallywill result from the condition [5]. Most of the estimated 75,000 maternal deaths occurring worldwide yearly as a result of infection are recorded in low-income countries. In Africa, maternal mortality ratio increased by nearly 5% between the year 2013 and the year 2015, even though planned to have been reduced by ¾ within that same time frame [6]. According to the Millennium Development Goals Report for Uganda 2015, puerperal sepsis contributed 8% of the total maternal mortality between the years 2009 to 2011. This then later increased to 14% of the total maternal mortality between the years 2013 to 2014. The major strategies put in place by the Ugandan Government to reduce mortality were, assistance of childbirth by skilled personnel, access to emergency and newborn care, family planning, village health team visits and an effective referral system.

Maternal mortality is highest in Sub-Saharan Africa. In Africa, the maternal mortality ratio increased by nearly 5% from 2013 to 2015. In Uganda, the WHO-MDG 5; aimed at reducing maternal mortality by 75% between the years 1990 and 2015. However, this aim has not been attained [7]. Direct causes of mortality accounted for 77.7% of all maternal mortality cases, while indirect causes contributed 22.3% of the total. Of this figure, the most frequent cause of maternal mortality had been identified, Puerperal sepsis with a percentage of 30.9% [8]. There isn't much information on the prevalence rates of puerperal sepsis in this region of Hoima district. Nevertheless, in view of the high maternal mortality rates arising from puerperal sepsis, more research into this matter to describe the epidemiology and microbiology is highly required. Thus knowledge of the common causes and factors associated with mortality and morbidity in these women in puerperium in our setting is key as it will help us tailor our preventive and treatment measures. This is important so that we shall be able to contribute towards the improvement of maternal health outcomes and even the reduction of maternal mortality rates. Therefore, this study will determine the factors contributing to puerperal sepsis in Hoima Regional Referral Hospital in Hoima District, Western Uganda.

METHODOLOGY

Study Design

The study design that was used in this research was a Descriptive Case Study Design [9]. This is a type of design used to observe, describe and document a situation as it occurs naturally. This study design enabled the researcher to obtain information adequately within the set time of the research and also analyze the obtained information to identify and appropriately elicit how the factors mentioned previously contribute to high maternal mortality rates in Hoima Regional Referral Hospital, Hoima District.

Area of Study

Hoima Regional Referral Hospital, also known as Hoima Hospital is a General and Teaching hospital was the study area and is found in Hoima town, Hoima District in the Western part of Uganda. It is the referral hospital of the following mentioned districts; Bulisa, Hoima, Kiryandongo, Kibaale and Masindi. It is one of the 13 referral hospitals in Uganda. Hoima Regional Referral Hospital is located 198 kilometres by road, northwest of Mulago National Referral Hospital, which is Uganda's largest referral hospital. The hospital has a capacity of 280 beds. The dominant tribes in the hospital and this region are Banyoro and Baganda, but other tribes and refugees from nearby camps also are residents of this area.

Target Population

The target population included all mothers who are in puerperium at Hoima Regional Referral Hospital. However, of these, the study population also included mothers who presented with sepsis from the time period between the rupture of membranes till 6 weeks after delivery in Hoima Regional Referral Hospital, Hoima district, Uganda.

Imbuki

Inclusion Criteria

All mothers in the period between rupture of membranes up until 6 weeks after delivery in Hoima Regional Referral Hospital who consented to be part of the study were included.

Exclusion Criteria

All mothers who did not consent to be part of the study and those who were not in the period between the Rupture of membranes till 6 weeks after delivery in Hoima Regional Referral Hospital were excluded.

Sample Size Determination

The sample size was calculated using the formula [10] below:

$n = z^2p (1-p) / e^2$

Where,

n = Estimated minimum sample size required

P= Proportion of a characteristic in a sample (0.321)Z=1.96 (for 95% Confidence Interval)

e = Margin of error set at 5%

$$n = 1.96^{2*}0.321(1-0.321)/0.05^2 \quad n = 335$$

Sampling Technique

This study employed the Simple Random Sampling technique, which is a type of probability/scientific sampling method. This ensured that every individual in the target population had an equal chance to take part in the study. This was be done by obtaining the complete list of the target population from the ward records, and individuals were randomly selected from the list, and consent obtained before proceeding; and these reflected the unit of analysis.

Data Collection Methods

During this research Qualitative data was collected by Observation method and structured interview method (non-directive depth interview). Interviewers read the questions exactly as they appeared on the survey questionnaires for the respondents to answer and this information was obtained correctly recorded for analysis [11]. The tools used in the collection of these data included a structured questionnaire which had closed-ended questions typed in the English language. Also, observation was done by the researcher together with the research assistants.

Data Analysis

The qualitative data gathered were used to answer the research questions and find the themes emerging from the data as well as the meanings attached to those themes and how they relate to the research questions. Logical thought processes were used, while inductive and deductive reasoning played a role in grasping and organizing the data and in generating possible alternate explanations. Also, common sense and good judgment were important parts of the process. The researchers also did data analysis concurrently with the collection of the data. All the data collected were reviewed for content and coding to categorize the data. Data was then organized into tables, charts and matrices to help with the interpretation and identification of emerging topics or issues.

Quality Control

Training of data collection team: The data collection team comprised two research assistants who were university MBChB students with basic knowledge of obstetrics, and they were trained sufficiently by the principal researcher in a three-day training program. Pre-testing of questionnaires: The principal researcher and the data collection team conducted the pre-testing of the questionnaires over a period of three days in the Maternity ward of Hoima Regional Referral Hospital in order to impart practical experience to the team in administering questionnaires as well as giving the researcher an idea of the population characteristics.

Ethical Considerations

We obtained an introductory letter from the Dean of Clinical Medicine and Dentistry Kampala International University. This letter was introduced to Authorities of Hoima Regional Referral Hospital and permission was also sought from the District health officer before undertaking this research. The researcher and team members explained the purpose of the study to each of the participants after which each respondent was free to decide to either or not to participate in the study. In a bid to ensure confidentiality, the personal identity of respondents was written down taken or

Imbuki revealed [12]. Furthermore, for the trust and to safeguard the privacy of respondents, the interviews were done privately and in secured areas of the health centres.

RESULTS

Demographic Characteristics of the Participants

Table 1: Socio-Econo-Demographic Characteristics of Respondents (N=335).

Variable	Frequency (N)	Percentage (%)
Age Clusters (Yrs.)		
15 – 19	40	11.94
20 – 24	55	16.42
25 – 29	89	26.57
30 – 34	62	18.51
35 – 39	67	20
40 - 44	22	6.57
45 - 49		
	335	**100**
Parity		
Primiparous	100	29.85
Para 2-3	180	53.73
Para 4-6	5	41.79
Others	50	14.93
	335	**100**
Marital Status		
Single	42	12.54
Married	232	69.25
Widowed	42	12.54
Separated / Divorced	19	5.67
	335	**100**

The majority of the respondents fell between the ages of 20 and 39 years with the mean age being 29.02 years. Only 22 (6.57%) were above 39 years of age while about 40 (11.94%) were between 15 and 19 years. Most of the women within the reproductive age were Para 2-3 (53.73%%). Para 4-6 followed closely with 29.85% and next were those with other parity with 14.93%. Primiparous were 29.85% of the respondents. on the marital status, 232 (69.25%) of the respondents were married, 42 (12.54%) were either single or widowed respectively, and 19 (5.67%) were either separated or divorced. Most of the respondents had a digital vaginal exam performed on them 38.51% had more than 5 exams, 18.51% had a vaginal exam performed once, 12.54% twice, 10.15% thrice while 68 (20.30%) of the women had never had any form of vaginal examination performed on them. The majority of the women interviewed were not formally employed. Only 64 (19.11%) were in a sort of formal employment. Most of them were either traders/business people (29.85%) while the rest were either farmers (23.885), housewives (20.60%) or dealt in handicrafts (6.57%).

Knowledge & Knowledge Source On Peurperal Sepsis

232 (69.25%) of the respondents were aware of the existence of puerperal sepsis while 103 (30.75%) lacked any knowledge

concerning puerperal sepsis. The various sources of information cited by those who knew were radio, television, health workers, family and friends.

Parity in Relation to Peuperal Sepsis

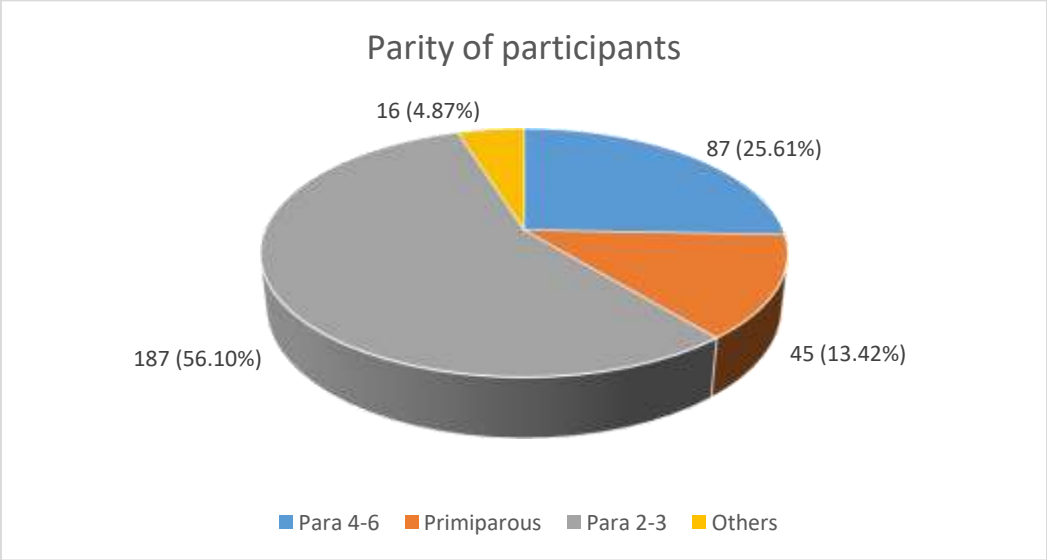


Figure 1: The different parity of participants (N=82)

The most common parity was Para 2-3 (56.10%) followed by Para 4-6 (25.61%) and primiparous (13.42%). Others (multiparous) were the least at (4.87%) as shown in Figure 1 above. The multiparous women were the least affected, probably since experience with multiple births made them aware of the many ways to protect themselves from puerperal sepsis. Those who had multiple births were also more likely to seek medical attention and know when something was off as opposed to those with fewer births.

Marital Status and Puerperal Sepsis

A total of 82 women within the reproductive age had at a point gotten puerperal sepsis. These consisted of 28 (66.67%) of the singles, 49 (21.12%) of the married, 1 (2.38%) of the widowed and 4 (21.05%) of the separated or divorced. This gave an overall prevalence of puerperal sepsis of 24.48%. This is clearly shown in Figure 3 below.

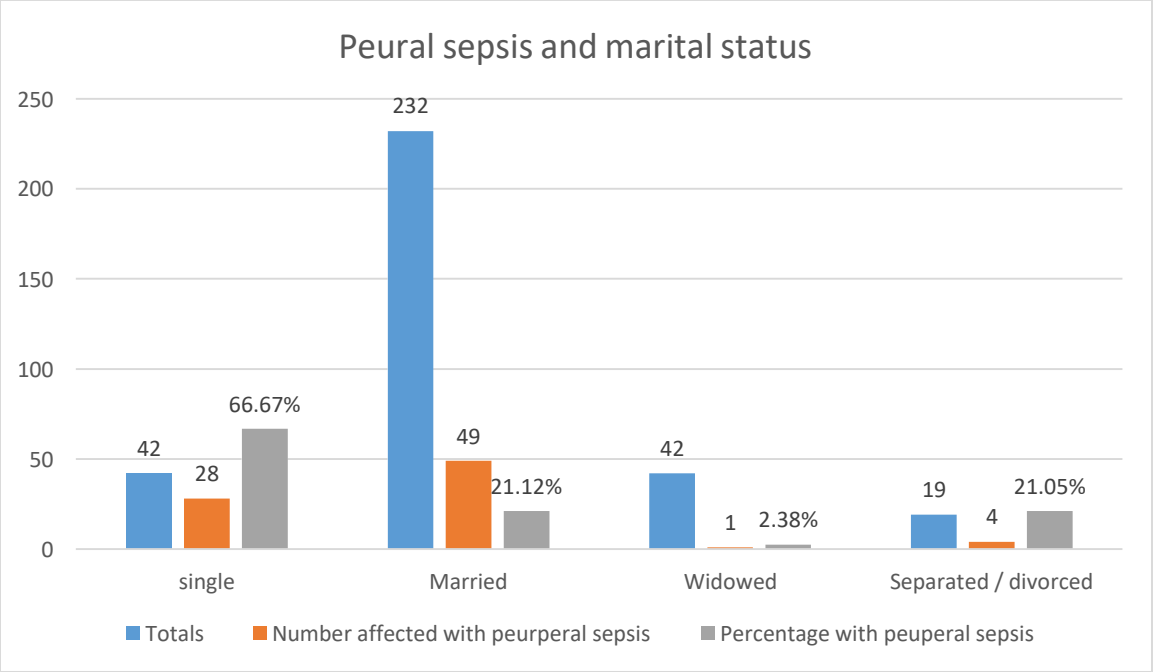


Figure 2: puerperal sepsis by marital status (N=335)

Being single increases the woman's chances of developing puerperal sepsis at a point while being widowed drastically reduces those chances. Being married, separated or divorced hadalmost an equal chance of developing puerperal sepsis. It is evident that not being in some formal union, whether at present or in the past, increased a woman's chances of developingpuerperal sepsis.

Residence and Puerperal Sepsis

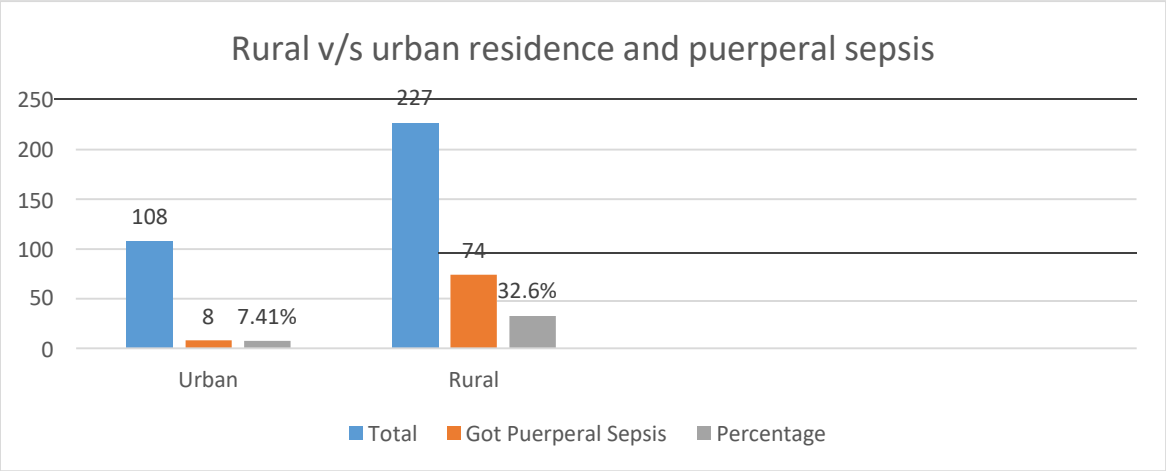


Figure 3: Puerperal sepsis by place of residence (N=335)

More of the rural dwellers were affected by puerperal sepsis compared to the rural folk. 74 (32.6%) of the rural women were affected by puerperal sepsis at appoint in their lives compared to only 8 (7.41%) of those from the urban areas. A woman within the reproductive age and who hailed from a rural setup was about 6 times more likely to get puerperal sepsis after birth compared to their urban counterpart (OR = 6.05).

Level of Education and Puerperal Sepsis

Table 2: Respondents' Education Level and Puerperal Sepsis (N=335)

Education Level	got Puerperal Sepsis at a Point (Or Know Someone)	Never Got Puerperal Sepsis	Total
Primary	32 (51.61%)	30	62
Secondary	4 (11.77%)	30	34
Tertiary	2 (2.94%)	123	129
Still In School	6 (4.65%)	36	42
None	38 (90.48%)	30	68
Totals	**82 (24.48%)**	**253**	**335**

From Table 2 above, the influence of education level on the development of puerperal sepsis is evidently significant. The higher the level of a woman's education, the less likely they are to develop puerperal sepsis post-partum with the likelihood increasing and becoming more likely if thewoman had no formal education at all.

Labour Characteristics and Puerperal

Table 3: Association between Characteristics and Puerperal Sepsis (N=82)

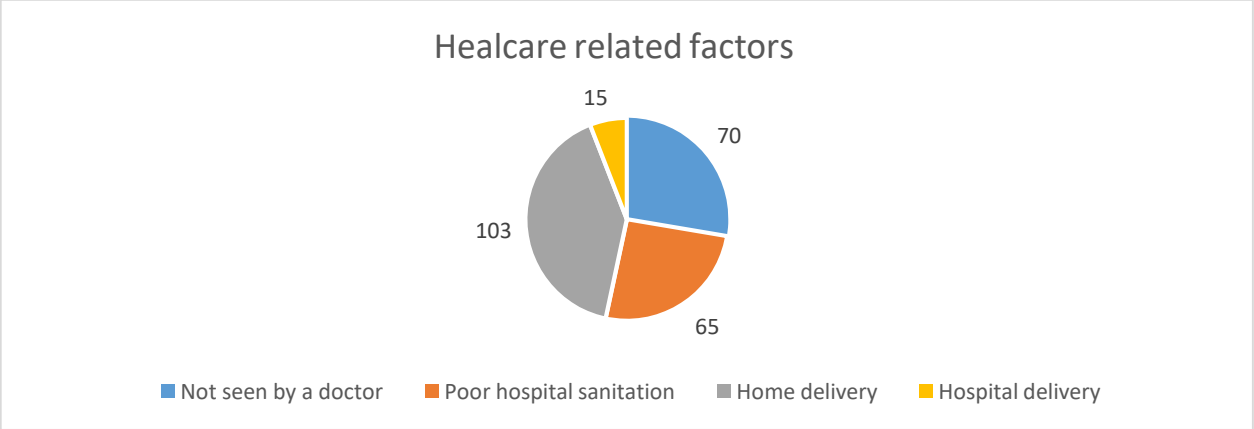
Labour characteristics	*n*	*%*
Spontaneous labour	8	9.76
Induced labour	22	26.83
Absent membranes	32	39.02
Intact membranes	20	24.39
Total	**82**	**100**

From Table 3 above having intact membranes (24.39%) or spontaneous labour (9.76 %) at the time of visiting a hospital were associated with fewer incidences of puerperal sepsis than those with absent (ruptured) membranes at the time of birth (39.02%).

Healthcare Contributing to Puerperal Sepsis Related Factors

We further sampled and reviewed 253 (75.52%) women who got puerperal sepsis at a certain point during their life to ascertain the possible factors that exposed them to an infection at that time. Healthcare factors also played a major role in their condition, ranging but not limited to early attention by doctors, judicial use of antibiotics, place of delivery and whether or not they were admitted to the hospital for monitoring after childbirth.

Figure 4: Healthcare-related factors contributing to puerperal sepsis (N=253)



Most of those who got puerperal sepsis delivered outside the hospital setting, with a far lower number compared to women who delivered in the hospital. In addition, sanitation as well as being attended to by a doctor during the time the woman was at the hospital, contributed massively to whether or not a woman got sepsis while at the hospital after delivery. This was evident by the high number of women who were not seen by a doctor (70) and those who had a situation of poor sanitation (65) during their hospital stays.

DISCUSSION

Puerperal Sepsis among Women at Hoima Regional Referral Hospital

69.25% of the respondents had knowledge about puerperal sepsis, with (12.48%) of the women ever experiencing puerperal sepsis personally at a point in their lives. Single women had the highest rates of puerperal sepsis compared to the others and urban dwellers' prevalence of puerperal sepsis was lower than that of rural folk. 32.6% of women in the rural setup had at a point gotten puerperal sepsis as compared to only 7.41% of the urban women. The women who were multiparous had the highest prevalence of puerperal sepsis (56.10%), followed by those of para 4-6(25.61%), then the para 2-3 (13.42%) and lastly by other primigravid women (4.87%). Previous experience, knowledge of puerperal sepsis and earlier seeking of healthcare were some of the factors that are understood to lead to a reduction of puerperal sepsis among those that had not previously given birth as compared to those who had birth, and older age at pregnancy and lower immune status seem to predispose women to puerperal sepsis. Puerperal sepsis prevalence in our study was significantly high. It was higher than the 11.4% in Uganda [8] and the knowledge about contributors to and how to avoid puerperal sepsis was lower in our study. The difference could be attributable to differences in population size, duration of study or even cultural and religious beliefs that exist between the two study populations and study areas. Our findings were however lower than those by [13] who reported a prevalence of 15.6% prevalence of puerperal sepsis among women in a rural area in Tanzania. That higher result in that particular study could be due to the limitation of the study to just involve adolescents in an area with poor education, sanitation and lack of access to adequate medical care superimposed on traditional birthing methods which could have been unhygienic, whereas in our study all women within the reproductive age were involved as well as urban and rural populations. Work by [14] in Ethiopia reported a value of 13.7%, a value slightly higher than ours. This may be due to a specific population studied as lack of access to healthcare is a major contributor. Published, statistics from specific villages in Uganda have had values as high as 12.1% sometime back in 2011 [15]. Even by that time, these values were still very high, and with the awareness creation campaigns that have been going on since then, the value should be going lower, not higher.

Maternal Factors Associated with Puerperal Sepsis

Age, marital status, area of residence and level of education were found to be significantly associated with the development of puerperal sepsis. Married women residing in urban areas and with post-primary education were found to have fewer incidences of puerperal sepsis. Having given birth several times, being older and hailing from rural areas were found to be associated with higher incidences of developing puerperal sepsis. The findings agree with similar studies conducted in the past such as those of [15, 16, 17] among others.

Healthcare-Associated Factors of Puerperal Sepsis

Giving birth outside the hospital setting, several digital vaginal exams done and poor sanitation as well as not being attended to by a doctor during the period of delivery were associated with higher

levels of developing puerperal sepsis. Women who had experienced these factors during their first visits to the hospitals during their first pregnancies experienced a drastic reduction in the incidences of puerperal sepsis during their subsequent pregnancies when they were adequately seen by a doctor or two during their time of delivery. This was also coupled with proper sanitation that led to a drastic reduction in the prevalence of puerperal sepsis in their subsequent pregnancies. Other factors that impacted negatively on puerperal sepsis were the location of the health center whether rural or urban, adequacy of medication in the hospital, level of expertise of medics as well as availability of nurses. Similar findings have been recorded in various studies conducted elsewhere in the past despite different population dynamics. [18] in India, [13] Ghana, [19] in Ethiopia and [20] in Kenya all reported similar associated factors.

CONCLUSION

The frequency of common preventable risk factors was high, and this entailed low standard hospital and personal hygiene, inadequate obstetrics care, area of residence (associated with economic standards of living), lack of knowledge of utilization of health care facilities available, marital status signifying possible planned or unplanned pregnancies, unnecessary induction and delivery by un-skilled personals. These all lead to puerperal sepsis which results in severe life- threatening complications such as septicemia, disseminated intravascular coagulation as well as maternal death.

Recommendations

Take an active role in prevention of puerperal sepsis through seeking medical care during pregnancy and have planned deliveries in the hospital. Embrace and encourage their spouses to seek medical attention and delivery from hospitals, take an active role in providing proper hygiene for their delivering partners. Create more awareness on the existence of puerperal sepsis through medical education of all women attending antenatal care and how to avoid this condition. Also, there should be a reduction in the number of digital vaginal examinations that are done when a woman comes to deliver at the hospital. In addition, there should be an action plan developed by and tailored to the hospital that should always be applied and constantly reviewed, hence putting in place active and practical ways to avoid puerperal sepsis. Allocate more funds to scale-up awareness creation and sensitization through all avenues possible such as electronic, print and social media, seminars and campaigns. Empower health workers with more knowledge concerning current trends in puerperal sepsis as well as the current management guidelines and put-up opportunities through which they can pass this information to the women as required. Additional funding should also be allocated for research into factors contributing to puerperal sepsis in different hospitals and ways to prevent them.

REFERENCES

1. WHO, UNICEF, UNFPA, the World Bank and United Nations Population Division. Trends in maternal mortality: 1990 to 2015. Geneva; 2015. Access at: http://apps.who.int/iris/bitstream/10665/194254/1/9789241565141_eng.pdf?ua=1
2. Ezimah, A. C., Obeagu, E. I., Ahmed, H., Ezimah, U. A., & Ezimah, C. O. (2016). The prognostic significance of neutrophil polymorph and band counts in under-five children with sepsis in Umth. *Int J Adv Res Biol Sci*, *3*, 68-74.
3. Garland J, Little D. Maternal Death and Its Investigation. Acad Forensic Pathol. 2018 Dec;8(4):894-911. doi: 10.1177/1925362118821485. Epub 2018 Dec 19. PMID: 31240079; PMCID: PMC6491542.
4. Alobo G, Reverzani C, Sarno L,

Imbuki
Giordani B, Greco L. Estimating the Risk of Maternal Death at Admission: A Predictive Model from a 5-Year Case Reference Study in Northern Uganda. Obstet Gynecol Int. 2022 Mar 17;2022:4419722. doi: 10.1155/2022/4419722. PMID: 35342429; PMCID: PMC8947917.

5. Hussein, J., Mavalankar, D.V., Sharma, S. *et al.* A review of health system infection control measures in developing countries: what can be learned to reduce maternal mortality. *Global Health* **7**, 14 (2011). https://doi.org/10.1186/1744-8603-7-14
6. Fehling M, Nelson BD, Venkatapuram S. Limitations of the Millennium Development Goals: a literature review. Glob Public Health. 2013;8(10):1109-22. doi: 10.1080/17441692.2013.845676. Epub 2013 Nov 25. PMID: 24266508; PMCID: PMC3877943.
7. Atuheire, E.B., Opio, D.N., Kadobera, D. *et al.* Spatial and temporal trends of cesarean deliveries in Uganda: 2012–2016. *BMC Pregnancy Childbirth* **19**, 132 (2019). https://doi.org/10.1186/s12884-019-2279-6
8. Ngonzi, J., Tornes, Y.F., Mukasa, P.K. *et al.* Puerperal sepsis, the leading cause of maternal deaths at a Tertiary University Teaching Hospital in Uganda. *BMC Pregnancy Childbirth* **16**, 207 (2016). https://doi.org/10.1186/s12884-016-0986-9
9. Ugwu, Chinyere. N., & Eze Val, H. U. Qualitative Research. IDOSR JOURNAL OF COMPUTER AND APPLIED SCIENCES, 2023, 8(1) 20-35. https://www.idosr.org/wp-content/uploads/2023/01/IDOSR-JCAS-8120-35-2023.docx.pdf
10. Kish, L.: Survey Sampling. John Wiley & Sons, Inc., New York, London 1965, IX + 643 S., 31 Abb., 56 Tab., Preis 83 s.
11. Val Hyginus Udoka Eze, Chidinma Esther Eze, Asiati Mbabazi, Ugwu Chinyere N, Ugwu Okechukwu Paul-Chima, Ogenyi, Fabian Chukwudi, Ugwu Jovita Nnenna, Alum Esther Ugo and Obeagu Emmanuel I. (2023). Qualities and Characteristics of a Good Scientific Research Writing; Step-by-Step Approaches. IAA Journal of Applied Sciences 9(2):71-76. https://www.iaajournals.org/wp-content/uploads/2023/08/IAA-JAS-9271-76-2023.docx.pdf
12. Ugwu Chinyere Nneoma, Eze Val Hyginus Udoka, Ugwu Jovita Nnenna, Ogenyi Fabian Chukwudi and Ugwu Okechukwu Paul-Chima (2023). Ethical Publication Issues in the Collection and Analysis of Research Data. NEWPORT INTERNATIONAL JOURNAL OF SCIENTIFIC AND EXPERIMENTAL SCIENCES (NIJSES) 3(2): 132-140. https://nijournals.org/wp-content/uploads/2023/07/NIJSES-32-132-140-2023.pdf
13. Nyarko, S.H. (2015) Prevalence and Correlates of Contraceptive Use among Female Adolescents in Ghana. BMC Women's Health, 15, 60. https://doi.org/10.1186/s12905-015-0221-2
14. Worku A, Mekonnen Abebe S, Wassie MM. Dietary practice and associated factors among type 2 diabetic patients: a cross sectional hospital-based study, Addis Ababa, Ethiopia. Springerplus. 2015 Jan 13;4:15. doi: 10.1186/s40064-015-0785-1. PMID: 25635244; PMCID: PMC4306673.
15. Andi JR, Wamala R, Ocaya B, Kabagenyi A. Modern contraceptive use among women in Uganda: An analysis of trend and patterns (1995-2011). Etude Popul Afr. 2014 Jul;28(2):1009-1021. doi: 10.11564/28-0-553. PMID: 25530666; PMCID: PMC4269974.
16. Eliason, S., Awoonor-Williams, J.K., Eliason, C. *et al.* Determinants of modern family planning use among women of reproductive age in the Nkwanta district of Ghana: a case–control study. *Reprod Health* **11**, 65 (2014).

Imbuki
https://doi.org/10.1186/1742-4755-11-65
17. Afolabi MO, McGrath N, D'Alessandro U, Kampmann B, Imoukhuede EB, Ravinetto RM, Alexander N, Larson HJ, Chandramohan D, Bojang K. A multimedia consent tool for research participants in the Gambia: a randomized controlled trial. Bull World Health Organ. 2015 May 1;93(5):320-328A. doi: 10.2471/BLT.14.146159. Epub 2015 Mar 23. PMID: 26229203; PMCID: PMC4431516.
18. Pandey, S.K., & Singh, H. A Simple, Cost-Effective Method for Leaf Area Estimation. Journal of Botany, 2011, 1-6. https://doi.org/10.1155/2011/658240
19. Bogale, B., Wondafrash, M., Tilahun, T. *et al.* Married women's decision-making power on modern contraceptive use in urban and rural southern Ethiopia. *BMC Public Health* **11**, 342 (2011). https://doi.org/10.1186/1471-2458-11-342
20. Ochako, R., Temmerman, M., Mbondo, M. *et al.* Determinants of modern contraceptive use among sexually active men in Kenya. *Reprod Health* **14**, 56 (2017). https://doi.org/10.1186/s12978-017-0316-3.

CITE AS: Imbuki Baraka Alvah (2023). Determinants of Puerperal Sepsis Incidence at Hoima Regional Referral Hospital in Hoima District, Western Uganda. IAA Journal of Biological Sciences 10(2):185-196.