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Study On Prevalence, Related Factors And Management Of Puerperal Sepsis

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ABSTRACT

Puerperal sepsis is a big problem, due to its prevalence and morbidity all over the world. Each and every year many women die due to puerperal sepsis. Puerperal Sepsis is an infection of genital tract, which occurs at any time from just after rupture of membranes or time of labor and up to 42nd days from parturition. However the present study has conducted to identify the prevalence of puerperal sepsis, to find out different factors related to puerperal sepsis and to explore the management of puerperal sepsis. The study was documentary analysis type. Information and data were collected from secondary sources. Information and data were collected from books, research reports, journals, different annual reports, different government and non government websites and different websites. From the study it was found that the prevalence of puerperal sepsis varies from place to place, region to region, country to country and continent to continent. The study revealed that the risks factors of puerperal sepsis are general anesthesia, obstructive lung disease multiple catheterization during labor, multiple vaginal examinations during labor, and untreated bacteriuria, emergency cesarean section, prolonged membrane rupture, prolonged labor, and multiple vaginal examinations during labor, diffuse difficult vaginal childbirth and nipple trauma from breastfeeding etc. The management of puerperal sepsis varies from country to country. In developed country the puerperal sepsis is managed properly, effectively and efficiently. But in least developed country, developing country puerperal sepsis is managed less effectively and efficiently than developed country. Print and electronic media can play a very significant role in creating awareness among people specially pregnant women about puerperal sepsis and about techniques and methods to prevent puerperal sepsis.

Key words: *Puerperal sepsis, Factors, Prevalence, Causes, Sign and Symptomes, Management, Treatment, Diagnosis*

INTRODUCTION

Puerperal Sepsis was defined as infection of the genital tract occurring at any time between the onset of rupture of membranes or labor, and the 42nd day postpartum in which two or more of the following are present:

*pelvic pain,
*Fever i.e. oral temperature 380 C or 101.30F or higher on any location,
* Abnormal smell/foul odor of discharge,
* Delay in the rate of reduction of the size of the uterus (involution) (<2cm /day during first 8days).

In Bangladesh population and demographics, total population-164,689.3839(2020) Women of reproductive age (15-49 years) 46,215.591 (2020) Total number of births 2,889.959 (2020), Maternal mortality ratio (Host: UN Maternal Mortality Estimation Inter–agency Group (MMEIG))173.0deaths per 100.000 live births, Stillbirth rate (Host: Blencowe et al. Lancet Glob Health. 2016 Feb;4(2): e98-e108) 25.4 per 1000 total births (2015) Neonatal mortality rate (Host: UN Inter agency Group on Mortality Estimates)17.1 deaths per 1000 live births (2018) Under – Five years mortality rate (Host: UN Inter agency Group on Mortality Estimates)30.2 deaths per 1000 live births (2018). This guideline is to provide recommendations to aid General Practitioners and Obstetricians in the management of Puerperal Sepsis. This management could be initiated in a primary care setting or in centers with advanced facilities. The objective of

management in puerperal sepsis is to make an early diagnosis, treat, prevent complications, and consequently into improve quality of life. (For additional country profiles on maternal, newborn and child health,gotohttp://countdown2030.org/.

Puerperal Sepsis is an infection of genital tract, which occurs at any time from just after rupture of membranes or time of labor and up to 42nd days from parturition. It accompanied with one or more conditions are present: such as- pelvic pains, high body temperature (oral temperature 38.5^0C or above on any occasion, abnormal genital discharge bad smell or foul odor of discharge, sometimes present of pus, delay in the reduction of the uterus size <than 2 cm /day with in the first eight days. It is third leading cause of direct maternal mortality in developing countries. It is also among preventable conditions. Even though multiple interventions were done to overcome these health problems, maternal morbidities and mortality were still significant. If any country doesn't identify causes of maternal morbidities and mortality makes the problem unsolved. The post-partum period or puerperal sepsis refers to the 6 week after child birth. Puerperal sepsis is an infection which arises from bacterial infection of the genital organs during puerperal period. Now a day, puerperal sepsis is a big problem, due to its prevalence and morbidity. According to WHO, 75000of maternal deaths occurs worldwide per years (Belagavi2015)

Puerperal sepsis has been a common pregnancy related problem, which could eventually lead to obstetric shock or even death. During the 19th century, it took on epidemic proportions, particularly when home delivery practice changed to delivery is lying in hospitals as there still was a total ignorance of a sepsis. In 1843 Oliver Holmes is Boston, USA, was the first to establish that puerperal fever was contagious and was carried by the unwashed hands of the physician from bed to bed. In 1847 Semmelweis in Vienna, Austria also shows that examiners might transmit infection from live patients as well as the dead and it can be preventing by scrub hand with the chlorine solution before every physical examination. This led to a striking decrease of mortality due to puerperal sepsis from 11% in 1846 to 13% 184Z (Adriaanse,2000). Puerperal Sepsis is a major public health problem and common pregnancy related condition, which could eventually lead to obstetric shock or even death. It is a preventable disease which occurs six weeks of during birth.

According to World Health Organization (WHO), puerperal sepsis is the sixth leading cause of deaths among new mothers while it contributes 15% of total maternal deaths globally among the mothers of the reproductive age. The global incidence of puerperal sepsis is 4.4 per live births. According to World Health Organization (WHO), proportions of maternal deaths due to puerperal sepsis are 9.7%, 11.6% and 7.7% in Africa, Asia, Latin America respectively. On the other hand, puerperal sepsis contributes only 2.2% of maternal mortality in developing countries. It is found as one of the leading cause of maternal deaths in the intensive care unit in the United State of America (USA). In Nigeria, puerperal sepsis is the 3rd leading cause of maternal mortality and contributes 12% of maternal mortality. The incidences of puerperal sepsis in different African countries are 1.7, 0.22, 1.14 and 0.07 per 100 live births in Nigeria, Niger, Uganda and South Africa respectively. Several studies from Pakistan established puerperal sepsis at the 3rd leading cause maternal mortality and the incidence is 10-15 per live births. A study from Senegal demonstrated an incidence of sepsis of 8.7 per 100 live births from home deliveries compared to 1.9 per 100 live births for deliveries in health facilities (Tanjila T 2016).

The study shows that Puerperal sepsis and neonatal sepsis are important causes of mortality and morbidity in low – income countries. They help improve global guidelines on postpartum care by reviewing existing data on microbiologic causes of sepsis among mothers, newborns, and mother-newborn pairs. Using PubMed an extensive literature review of peer reviewed publications. Globally estimates, data vary from 2008 suggest that sepsis contributes to 16% of all maternal death. Worldwide, sepsis causes 26% of all neonatal deaths, with a further 10% of neonatal deaths caused by other infectious diseases, including diarrhea and tetanus. Many deliveries occur at home in low-income countries and community workers and douls play a vital role in delivery of health care providers. In these stages, the importance of early postnatal care of the newborn has long been recognized, with recommendations for home visits made by number of sources, including World Health Organization (7) Miller E. Anne Eer. Mill2013. The term puerperal infection refers to a bacterial infection in genital tract following childbirth. It is also referred as puerperal or post-partum fever or child birth fever. The genital tract particularly the uterus is the most commonly infected site. In some case, infection can spread to other points in the body which condition could eventually lead to obstetric shock or death (H. Lalitha 2016).

OBJECTIVES OF THE STUDY

The Objectives of the study are as follows:

1. To identify the prevalence of puerperal sepsis.
2. To find out different factors related to puerperal sepsis.
3. To explore the management of puerperal sepsis.

METHODOLOGY OF THE STUDY

The study was documentary analysis type. Information and data were collected from secondary sources. Information and data were collected from books, research reports, journals, different annual reports, different government and non government websites and different websites. A literature review was conducted by using the Pubmed and Medline databases with the keywords: factors influencing the teaching learning process, academic performance among nursing students. A hand search was also undertaken to relevant journals identified by the electronic search and additional articles identified from the reference list of the key articles. A number of articles have been found on teaching learning process, academic performance of nursing students, attitude and Practice.

RESULTS AND DISCUSSION

A) Definition of Puerperal Sepsis

Puerperium: Puerperium is the beginning one hour after the removal of the placenta and it will be continued up to 6 weeks or 42days.

Sepsis: The presence of viable bacteria in the blood or body tissues.

Puerperal Sepsis: Puerperal sepsis is an infection of the genital tract at any time after rupture of membranes and the 42 days following delivery or abortion in which two or more the following are present:

*Pelvic pain.
*Fever of 38.450 C or more measured orally on any occasion.
*Abnormal vaginal discharge.
*Abnormal smell, foul odors of the discharge.
*Delay in the rate of reduction of the size of the uterus.

Puerperal sepsis or postpartum infections, also known as childbed fever and puerperal fever, are any bacterial infections of the female reproductive tract following childbirth or miscarriage. Signs and symptoms usually include a fever greater than 38.0 °C (100.4 °F), chills, lower abdominal pain, and possibly bad-smelling vaginal discharge. It usually occurs after the first 24 hours and within the first ten days following delivery. The most common infection is that of the uterus and surrounding tissues known as puerperal sepsis, postpartum metritis, or postpartum endometritis. Risk factors include Caesarean section (C-section), the presence of certain bacteria such as group B streptococcus in the vagina, premature rupture of membranes, multiple vaginal exams, manual removal of the placenta, and prolonged labour among others. Most infections involve a number of types of bacteria. Diagnosis is rarely helped by culturing of the vagina or blood. In those who do not improve, medical imaging may be required. Other causes of fever following delivery include breast engorgement, urinary tract infections, infections of an abdominal incision or an episiotomy, and atelectasis.

Due to the risks following Caesarean section, it is recommended that all women receive a preventive dose of antibiotics such as ampicillin around the time of surgery.[1] Treatment of established infections is with antibiotics, with most people improving in two to three days. In those with mild disease, oral antibiotics may be used; otherwise intravenous antibiotics are recommended. Common antibiotics include a combination of ampicillin and gentamicin following vaginal delivery or clindamycin and gentamicin in those who have had a C-section. In those who are not improving with appropriate treatment, other complications such as an abscess should be considered.

In 2015, about 11.8 million maternal infections occurred. In the developed world about 1% to 2% develops uterine infections following vaginal delivery. This increases to 5% to 13% among those who have more difficult deliveries and 50% with C-sections before the use of preventive antibiotics. In 2015, these infections resulted in 17,900 deaths down from 34,000 deaths in 1990. They are the cause of about 10% of deaths around the time of pregnancy. The first known descriptions of the condition date back to at least the 5th century BCE in the writings of Hippocrates. These infections were a very common cause of death

around the time of childbirth starting in at least the 18th century until the 1930s when antibiotics were introduced.

In 1847, Hungarian physician Ignaz Semmelweiss decreased death from the disease in the First Obstetrical Clinic of Vienna from nearly 20% to 2% through the use of handwashing with calcium hypochlorite.

B) History of Puerperal sepsis

Although it had been recognized from as early as the time of the Hippocratic corpus that women in childbed were prone to fevers, the distinct name, "puerperal fever" appears in historical records only from the early 18th century. The death rate for women giving birth decreased in the 20th century in developed countries. The decline may be partly attributed to improved environmental conditions, better obstetrical care, and the use of antibiotics. Another reason appears to be a lessening of the virulence or invasiveness of Streptococcus pyogenes. This organism is also the cause of scarlet fever, which over the same period had declined but has seen a rise in last decade worldwide especially in Asia with smaller outbreaks in US and Canada. UK had reported 12,906 cases between September 2015 and April 2016 which is the largest outbreak since 1969.

"The Doctor's Plague"

In 1861 book, Ignaz Semmelweis presented evidence to demonstrate that the advent of pathological anatomy in Vienna in 1823 (vertical line) was correlated to the incidence of fatal childbed fever there. Onset of chlorine handwash in 1847 marked by vertical line. Rates for Dublin maternity hospital, which had no pathological anatomy, is shown for comparison (view rates). His efforts were futile, however. From the 1600s through the mid-to-late 1800s, the majority of childbed fever cases were caused by the doctors themselves. With no knowledge of germs, doctors did not believe hand washing was needed.

Hospitals for childbirth became common in the 17th century in many European cities. These "lying-in" hospitals were established at a time when there was no knowledge of antisepsis or epidemiology, and women were subjected to crowding, frequent vaginal examinations, and the use of contaminated instruments, dressings, and bedding. It was common for a doctor to deliver one baby after another, without washing his hands or changing clothes between patients.

The first recorded epidemic of puerperal fever occurred at the Hôtel-Dieu de Paris in 1646. Hospitals throughout Europe and America consistently reported death rates between 20% to 25% of all women giving birth, punctuated by intermittent epidemics with up to 100% fatalities of women giving birth in childbirth wards.

In the 1800s Ignaz Semmelweis noticed that women giving birth at home had a much lower incidence of childbed fever than those giving birth in the doctor's maternity ward. His investigation discovered that washing hands with an antiseptic, in this case a calcium hypochlorite solution, before a delivery reduced childbed fever fatalities by 90%. Publication of his findings was not well received by the medical profession. The idea conflicted both with the existing medical concepts and with the image doctors had of themselves. The scorn and ridicule of doctors was so extreme that Semmelweis moved from Vienna and, after suffering a breakdown, was eventually committed to a mental asylum where he died.

Semmelweis was not the only doctor ignored after sounding a warning about this issue: in Treatise on the Epidemic of Puerperal Fever (1795), ex-naval surgeon and Aberdonian obstetrician Alexander Gordon (1752–1799) warned that the disease was transmitted from one case to another by midwives and doctors. Gordon wrote, "It is a disagreeable declaration for me to mention, that I myself was the means of carrying the infection to a great number of women."

Thomas Watson (1792–1882), Professor of Medicine at King's College Hospital, London, wrote in 1842: "Wherever puerperal fever is rife, or when a practitioner has attended any one instance of it, he should use most diligent ablution." Watson recommended hand washing with chlorine solution and changes of clothing for obstetric attendants "to prevent the practitioner becoming a vehicle of contagion and death between one patient and another."

C) Signs and symptoms of Puerperal sepsis:

Signs and symptoms usually include a fever greater than 38.0 °C (100.4 °F), chills, low abdominal pain, and possibly bad-smelling vaginal discharge. It usually occurs after the first 24 hours and within the first ten days following delivery.

D) Causes of Puerperal sepsis

After childbirth, a woman's genital tract has a large bare surface, which is prone to infection. Infection may be limited to the cavity and wall of her uterus or it may spread beyond to cause septicaemia (blood poisoning) or other illnesses, especially when her resistance has been lowered by long labour or severe bleeding. Puerperal infection is most common on the raw surface of the interior of the uterus after separation of the placenta (afterbirth), but pathogenic organisms may also affect lacerations of any part of the genital tract. By whatever portal, they can invade the bloodstream and lymph system to cause sepsis, cellulitis (inflammation of connective tissue), and pelvic or generalized peritonitis (inflammation of the abdominal lining). The severity of the illness depends on the virulence of the infecting organism, the resistance of the invaded tissues, and the general health of the woman. Organisms commonly producing this infection are Streptococcus pyogenes; staphylococci (inhabitants of the skin and of pimples, carbuncles, and many other pustular eruptions); the anaerobic streptococci, which flourish in devitalized tissues such as may be present after long and injurious labour and unskilled instrumental delivery; Escherichia coli and Clostridium perfringens (inhabitants of the lower bowel); and Clostridium tetani.

E) Risk factors of Puerperal sepsis

Causes (listed in order of decreasing frequency) include endometritis, urinary tract infection, pneumonia/atelectasis, wound infection, and septic pelvic thrombophlebitis. Septic risk factors for each condition are listed in order of the postpartum day (PPD) on which the condition generally occurs.

- PPD 0: atelectasis risk factors include general anesthesia, cigarette smoking, and obstructive lung disease.
- PPD 1–2: urinary tract infections risk factors include multiple catheterizations during labor, multiple vaginal examinations during labor, and untreated bacteriuria.
- PPD 2–3: endometritis (the most common cause) risk factors include emergency cesarean section, prolonged membrane rupture, prolonged labor, and multiple vaginal examinations during labor.
- PPD 4–5: wound infection risk factors include emergency cesarean section, prolonged membrane rupture, prolonged labor, and multiple vaginal examinations during labor.
- PPD 5–6: septic pelvic thrombophlebitis risk factors include emergency cesarean section, prolonged membrane rupture, prolonged labor, and diffuse difficult vaginal childbirth.
- PPD 7–21: mastitis risk factors include nipple trauma from breastfeeding.

F) Diagnosis of Puerperal sepsis

Puerperal fever is diagnosed with:

- A temperature rise above 38 °C (100.4 °F) maintained over 24 hours or recurring during the period from the end of the first to the end of the 10th day after childbirth or abortion. (ICD-10)
- Oral temperature of 38 °C (100.4 °F) or more on any two of the first ten days postpartum. (USJCMW)

Puerperal fever (from the Latin *puer*, *male child (boy)*), is no longer favored as a diagnostic category. Instead, contemporary terminology specifies:

1. The specific target of infection: endometritis (inflammation of the inner lining of the uterus), metrophlebitis (inflammation of the veins of the uterus), and peritonitis (inflammation of the membrane lining of the abdomen).
2. The severity of the infection: less serious infection (contained multiplication of microbes) or possibly life-threatening sepsis (uncontrolled and uncontained multiplication of microbes throughout the blood stream).

Endometritis is a polymicrobial infection. It frequently includes organisms such as *Ureaplasma*, *Streptococcus*, *Mycoplasma*, and *Bacteroides*, and may also include organisms such as *Gardnerella*, *Chlamydia*, *Lactobacillus*, *Escherichia*, and *Staphylococcus*.

G) Differential diagnosis

A number of other conditions can cause fevers following delivery including: urinary tract infections, breast engorgement, atelectasis and surgical incisions, among others.

H) Epidemiology of Puerperal sepsis

In developing countries, the maternal mortality rate is more than 407 per 1000,000 live births pregnancy related puerperal sepsis. In Bangladesh puerperal sepsis is most common conditions responsible for life threatening complication 4.5 per hundred (100) live births (Source: International Journal of Community and Family Planning Medicine Volume 1, 2016). Puerperal sepsis is a common public health problem that contributes a lot in the maternal mortality and morbidity in Bangladesh; ultimately have an impact in achieving the target 3 of sustainable development goals (TanjilaT. 2016).

A cross sectional study was conducted by Dr. Salma Ahmed, 2007 shows that puerperal sepsis is an important cause of maternal morbidity and mortality in developing countries. This study was undertaken to isolate and identify the aerobic and anaerobic bacteria agents of puerperal sepsis among patient admitted in Mymenshingh Medical College Hospital during the period from July 2006 to June 2007. Puerperal sepsis is an important cause of hospitalization due to its clinical morbidity as high fever with chill, tachycardia, sub involution of uterus, lower abdominal pain, profuse and foul smelling lochial discharge. Usually, the infection is of poly-microbial in origin with a mixture of both aerobic and anaerobic organisms (Dennis, 2006).

A study done by Good Burn et al (2000)in rural area of Bangladesh found that the key features for diagnosis of maternal post-partum genital tract infection by a symptoms complex of any two out of three symptoms, e.g. Foul smelling discharge, lower abdominal pain, and fever. Different predisposing factors in relation to puerperal sepsis were also observed.

In India, maternal mortality rate due to puerperal sepsis is 1, 36, 000(25.7%) out of globally 5,29,000 maternal deaths occur each year (Rajwant K.2012). Studies done in Liaquat University Hospital, Hyderabad, Sindh it was found that Over the study period 230 patients presented with puerperal sepsis representing 6.28% of 3658 admissions. All patients were anemic, in 228 translating to 99% patients no aseptic measures were taken, 209 equivalent to 90.86% patients were un-booked, 56.08% patients had frequent vaginal examination, 126 equivalent to 54.78% patients had home delivery, 48.26% patients had prolong rupture of membrane, 46.52% patients had prolong labor and 9.13% patients had unsafe miscarriage (Chandra et al., 2011).A study on Maternal Intensive Care and Near-miss Mortality' in Canada, showed sepsis to be the third main reason for transfer to intensive care unit and accounted for 15% of cases .This was also observed in Brazil where sepsis was among the leading causes of transfer to intensive care unit (Singh et al., 2011).

India, a study showed that 50% of maternal deaths due to sepsis were related to unsafe induced abortion. Sepsis has been shown to have a very high case fatality rate (Iftakhar et al., 2009). Another study done in India also showed that Puerperal sepsis was 1.7% of all obstetrical admissions and 34.4% of postnatal complications. It was seen common among young patients of 15–25 years age, 66.3%, of lower parity, 63.0%, low socioeconomic status, 65.20, uneducated patients, 78.2%, home deliveries, 73.9%, prolong labour, 58.6, prolong rupture of membranes from 48–72 hours, 73.8% and deliveries conducted by untrained birth attendants, 60.5%. Puerperal sepsis morbidity characterized by; foul smelling discharge was 25%, retained product of conception, 44.5%, peritonitis, 88.60%, septicaemia, 44.3%, pelvic abscess, 10.8%, endotoxic shock, 4.3%, disseminated intravascular coagulation, 2.1%. Sepsis related mortality was 4.2% (Sham Shad et al., 2010).

The number of cases of puerperal sepsis per year shows wide variations among published literature this may be related to different definitions, recordings etc. Globally, bacterial infections are the cause of 10% of maternal deaths this is more common in low income countries but is also a direct cause of maternal deaths in high-income countries.

In the United States, puerperal infections are believed to occur in between 1% and 8% of all births. About three die from puerperal sepsis for every 100,000 births. The single most important risk factor is Caesarean section. The number of maternal deaths in the United States is about 13 in 100,000. They make up about 11% of pregnancy-related deaths in the United States.

In the United Kingdom from 1985–2005, the number of *direct* deaths associated with genital tract sepsis per 100,000 pregnancies was 0.40–0.85. In 2003–2005, genital tract sepsis accounted for 14% of direct causes of maternal death.

Puerperal infections in the 18th and 19th centuries affected, on average, 6 to 9 women in every 1,000 births, killing two to three of them with peritonitis or sepsis. It was the single most common cause of maternal mortality, accounting for about half of all deaths related to childbirth, and was second only to tuberculosis in killing women of childbearing age. A rough estimate is that about 250,000–500,000 died from puerperal fever in the 18th and 19th centuries in England and Wales alone.

WHO (2014) estimated that globally 5,29,000 maternal death occurs each year due to puerperal sepsis. Annual maternal mortality rates in the developed countries such as the United Kingdom and United State of America are estimated at 8 per 10000,000 live births respectively. (Millennium Development Report-2014).

A study done In Mexico showed that 84% of deliveries occur in health facilities and rising Caesarean section rates were over 27% in the public sector and 70% in the private sector in 2005. Therefore septic shock has been documented to account for as much as 5 to 10% of mortality. Study in U.S.A reported that about 3 women die from puerperal sepsis for every 100, 000 deliveries and that, the single most important risk factor being caesarean section not aseptic conditions (Tuladhar et al., 2009).

A review covering a period of 20 years in Norway, postpartum sepsis accounted for 4 of the 47 deaths and was the third leading cause of death. A research report presented in Pakistan indicated that out of 20 deaths due to sepsis, 60% were due to induced abortion, most of them were first trimester abortion due to unplanned pregnancy, about 20% were due to prolonged labour, repeated vaginal examination in septic condition. 10% of the cases came in septicemia in gasping condition. Another two cases were brought dead in emergency on 14th day of delivery with history of high grade fever; unhealed, unstitched episiotomy.

A study in New Zealand reported rate of 10.9% but this could be attributed to the relatively fewer numbers of study subjects as was the case with the study in Sierra Leone. Interestingly, a higher incidence rate is reported in one study in the United States where the study population may be considered to be of a similar background to those in developing countries (Hussein et al., 2011). This study looked at women from low socioeconomic backgrounds and reported an incidence rate of 6.18%.

I) Management of Puerperal sepsis

Behavioral theories from models developed in psychology have been used to examine infection control practices such as hand washing in health care providers, concluding that it is the interdependence of various factors including environment, organization and structure that matters, rather than individual behavior (Hussein et al., 2011). Viable strategies are those that make changes which affect interactions between individuals, and how they function within their environment and their institutions (Savita et al., 2009).

In sub-Saharan Africa research has generally focused on either child or maternal health, and there are likely to be opportunities for simple preventive measures affecting both (Simon et al., 2007). According to Miller (2012), there are significant gaps in knowledge of the infective organisms that cause puerperal sepsis in resource-poor settings and the antibiotic management needed to treat it. It‘s been shown that some developing countries have recently experienced increased use of health facilities for labour and delivery care and there is a possibility that this trend could lead to rising rates of puerperal sepsis (Mavalankar et al., 2011). Findings by Khaskheli and colleaques (2013), shows that some countries now have high number of utilization of health facilities but cases of postpartum infections are still being recorded. A health systems approach is necessary to reduce maternal mortality and the occurrence of infections resulting from childbirth. Organizational and behavioral change underpins the success of infection control interventions (Mavalankar et al., 2011).

Antibiotics have been used to prevent and treat these infections however, the misuse of antibiotics is a serious problem for global health. It is recommended that guidelines be followed that outline when it is appropriate to give antibiotics and which antibiotics are most effective.

Atelectasis: mild to moderate fever, no changes or mild rales on chest auscultation.

Management: pulmonary exercises, ambulation (deep breathing and walking).

Urinary tract infection: high fever, malaise, costovertebral tenderness, positive urine culture.

Management: antibiotics as per culture sensitivity (cephalosporine).

Endometritis: moderate fever, exquisite uterine tenderness, minimal abdominal findings.

Management: multiple agent IV antibiotics to cover polymicrobial organisms: clindamycin, gentamicin, addition of ampicillin if no response, no cultures are necessary.

Wound infection: persistent spiking fever despite antibiotics, wound erythema or fluctuance, wound drainage.

Management: antibiotics for cellulitis, open and drain wound, saline-soaked packing twice a day, secondary closure.

Septic pelvic thrombophlebitis: persistent wide fever swings despite antibiotics, usually normal abdominal or pelvic exams.

Management: IV heparin for 7–10 days at rates sufficient to prolong the PTT to double the baseline values.

Mastitis: unilateral, localized erythema, edema, tenderness.
Management: antibiotics for cellulitis, open and drain abscess if present.

J) Hygienic measures

In 1843, Oliver Wendell Holmes Sr. published *The Contagiousness of Puerperal Fever* and controversially concluded that puerperal fever was frequently carried from patient to patient by physicians and nurses; he suggested that clean clothing and avoidance of autopsies by those aiding birth would prevent the spread of puerperal fever. Holmes quoted Dr. James Blundell as stating, "... in my own family, I had rather that those I esteemed the most should be delivered unaided, in a stable, by the manger side, than that they should receive the best help, in the fairest apartment, but exposed to the vapors of this pitiless disease."

Holmes' conclusions were ridiculed by many contemporaries, including Charles Delucena Meigs, a well-known obstetrician, who stated, "Doctors are gentlemen, and gentlemen's hands are clean."[39] Richard Gordon states that Holmes' exhortations "outraged obstetricians, particularly in Philadelphia". In those days, "surgeons operated in blood-stiffened frock coats the stiffer the coat, the prouder the busy surgeon", "pus was as inseparable from surgery as blood", and "Cleanliness was next to prudishness". He quotes Sir Frederick Treves on that era: "There was no object in being clean. Indeed, cleanliness was out of place. It was considered to be finicking and affected. An executioner might as well manicure his nails before chopping off a head".

In 1844, Ignaz Semmelweis was appointed assistant lecturer in the First Obstetric Division of the Vienna General Hospital (Allgemeines Krankenhaus), where medical students received their training. Working without knowledge of Holmes' essay, Semmelweis noticed his ward's 16% mortality rate from fever was substantially higher than the 2% mortality rate in the Second Division, where midwifery students were trained. Semmelweis also noticed that puerperal fever was rare in women who gave birth before arriving at the hospital. Semmelweis noted that doctors in First Division performed autopsies each morning on women who had died the previous day, but the midwives were not required or allowed to perform such autopsies. He made the connection between autopsies and puerperal fever after a colleague, Jakob Kolletschka, died of sepsis after accidentally cutting his hand while performing an autopsy.

Semmelweis began experimenting with various cleansing agents and, from May 1847, ordered all doctors and students working in the First Division wash their hands in chlorinated lime solution before starting ward work, and later before each vaginal examination. The mortality rate from puerperal fever in the division fell from 18% in May 1847 to less than 3% in June–November of the same year. While his results were extraordinary, he was treated with skepticism and ridicule (see Response to Semmelweis). He did the same work in St. Rochus hospital in Pest, Hungary, and published his findings in 1860, but his discovery was again ignored. In 1935, Leonard Colebrook showed Prontosil was effective against haemolytic streptococcus and hence a cure for puerperal fever.

K) Notable cases

Elite status was no protection against postpartum infections, as the deaths of several English queens attest. Elizabeth of York, queen consort of Henry VII, died of puerperal fever one week after giving birth to a daughter, who also died. Her son Henry VIII had two wives who died this way, Jane Seymour and Catherine Parr.

Suzanne Barnard, mother of philosopher Jean-Jacques Rousseau, contracted childbed fever after giving birth to him and died nine days later. Her infant son was also in perilous health following the birth; the adult Rousseau later wrote that "I came into the world with so few signs of life that little hope was entertained of preserving me". He was nursed back to health by an aunt. French natural philosopher Émilie du Châtelet died in 1749. Mary Wollstonecraft, author of *Vindication of the Rights of Woman*, died ten days after giving birth to her second daughter, who grew up to write *Frankenstein*. Other notable victims include African-American poet Phillis Wheatley (1784), British housekeeping authority Isabella Beeton, and American author Jean Webster in 1916 died of puerperal fever.

In Charles Dickens' novel *A Christmas Carol*, it is implied that both Scrooge's mother and younger sister perished from this condition, explaining the character's animosity towards his nephew Fred and also his poor relationship with his own father.

CONCLUSION AND RECOMMENDATION

From the study it was found that the prevalence of puerperal sepsis varies from place to place, region to region, country to country and continent to continent. The study revealed that the risks factors of puerperal sepsis are general anesthesia, obstructive lung disease multiple catheterization during labor, multiple vaginal examinations during labor, and untreated bacteriuria, emergency cesarean section, prolonged membrane rupture, prolonged labor, and multiple vaginal examinations during labor, diffuse difficult vaginal childbirth and nipple trauma from breastfeeding etc. The management of puerperal sepsis varies from country to country. In developed country the puerperal sepsis is managed properly, effectively and efficiently. But in least developed country, developing country puerperal sepsis is managed less effectively and efficiently than developed country. Print and electronic media can play a very significant role in creating awareness among people specially pregnant women about puerperal sepsis and about techniques and methods to prevent puerperal sepsis.

Puerperal sepsis is not a problem for one country. It is a problem for the whole world. So, it can be controlled or reduced by combine efforts of all the countries of the world.

- Awareness creation on Puerperal Sepsis and Educating the postnatal mothers regarding the prevention of puerperal infections will increase the areas of learning domain to be a healthy mother and helps to give birth to a healthy child. The entire community needs to be trained on hygiene practices and its consequences. Community health workers are the ambassadors of such. Adequate funding of health facilities provision proper transportation means ensures that this objective is achieved. Such programs act as a preventive measure against puerperal sepsis, thus reducing maternal morbidity and mortalities in the area.
- There were a substantial number of unsafe abortions reported in the study. Such cases arose as a result of failure of family planning methods among married women and in fear of stigmatization by the community; they ended up performing unsafe abortions at their homes. Others were done by school going girls who procured abortion to safe themselves from shame and fear of punished by their parents.
- The study found that low involvement of men in reproductive health issues like family planning was another setback in the improvement of maternal health. Women lacked support in decision making on family planning issues, health seeking behavior from their spouses. Men involvement can boost control of maternal morbidities resulting from pregnancy related complications. In case of unwanted pregnancy well informed couples will seek safe abortion services if necessary. Proper decisions on family planning methods will also be made and better health seeking behavior will be practiced.
- Understaffing is another factor that compromises control of infections in the health facilities. Reports from the study showed that there were issues of understaffing in the health facilities. This brings about issues of patient poor attendance. A patient is likely to develop infection as a result of delayed medication, negligence and even experiencing long duration of labour without assistance.
- The study reported that the poor infrastructure in the area and the terrain of the area have made it impossible to access the community for hygiene education and Puerperal Sepsis awareness creation by health care staff. Such initiatives can help reduce cases of infection since the community will be able to adopt good health seeking behavior including ANC attendance and early seeking of treatment in case of diseases. The study

reported that some women tried treatments on their own before going to the hospitals. This eventually puts their lives at risk since the disease would have dominated beyond treatment.

- The study found the hospitals lacked funds to facilitate awareness creation and hygiene education. This has made it impossible to control cases of infection in Bangladesh.
- The study reported that women were being asked to buy gloves to be used during delivery. Use of gloves is one of the methods to reduce infection cases but with the low economic state of some women, control of infection could be weakened perhaps because cases of recycling can occur.

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