EPIDEMIOLOGICAL ANALYSIS OF MATERNAL FEVER DURING PREGNANCY IN INDIA: PATTERNS AND IMPLICATIONS

Payal Gupta[1], Sudeepti Kulshrestha[2], Manya Rawat[3], Priyanka Narad[4], Abhishek Sengupta[5*]

[1,2,3,5]Systems Biology and Data Analytics Research Lab, Amity Institute of Biotechnology, Amity University, Uttar Pradesh, Noida- 201313, India
[4]Division of Biomedical Informatics (BMI), Indian Council of Medical Research, Ansari Nagar, New Delhi, India
vishalgupta2490@gmail.com, ka789@snu.edu.in, ahaanam.1601@gmail.com, asengupta@amity.edu

Abstract

A fever is a brief increase in body temperature, typically brought on by a disease. A person's normal temperature is around 37°C, or 98.6°F. A body temperature exceeding 101°F (38.3°C) during pregnancy might be concerning, particularly if it persists for a considerable amount of time in the very early stages of pregnancy. An increased body temperature in a pregnant woman is referred to as maternal fever. Numerous conditions, including infections like respiratory, urinary tract, influenza, and other bacterial or viral diseases, can result in maternal fever. There are non-infectious causes of fever as well, such dehydration. A mother's temperature of more than 38.0 °C during the active period of labour and delivery is known as intrapartum fever, and it can have several causes, including both infectious and non-infectious disorders. This study introduces an integrated analysis pipeline tailored to elucidate the prevalence of maternal fever and its effect on maternal and fetal morbidity in India. Leveraging PubMed data using keywords like maternal fever, maternal hyperthermia, fetal mortality, neonatal sepsis, and preterm birth, we assembled a comprehensive dataset containing PubMed IDs, author information, titles, years, journal details, countries, abstracts, and publication types. Employing natural language processing (NLP), we identified factors linked to maternal fever and its adverse effects on both mother and child. The analysis utilized Python programming with bio python and scikit-learn packages, and visualization methods such as bar charts, pie charts, and word clouds were employed to depict the trends and geographical distribution of maternal fever cases over time. Despite India's economic growth and increased public health investment in nutritional support, the burden of fever among pregnant women even increasing mortality rate has remained steady in recent years. There is a crucial need to prioritize the quality of antenatal care services for pregnant women, focusing on raising awareness and sensitization to improve maternal nutrition.

INTRODUCTION

Maternal fever refers to elevated body temperature during pregnancy, typically above 100.4°F (38°C). It can result from various causes, including infections like flu or urinary tract infections. Maternal fever poses risks to both the mother and the developing fetus. It may increase the likelihood of preterm labor, birth defects, and complications during delivery. Timely medical evaluation and treatment are crucial to manage maternal fever, as it can indicate underlying health issues that require attention to safeguard the well-being of both the mother and the baby.

Since the mother's temperature rises little during a typical labor, any considerable temperature increases are the result of a pathologic condition, infectious or not. However, dependent whether one of the following goals is the final aim, the term intrapartum fever might change for clinical and scientific purposes: (1) determining elevated risks for unfavourable outcomes for mothers; (2) determining elevated risks for unfavourable outcomes for newborns; or (3) establishing a cutoff point for therapeutic intervention. Because a fever during pregnancy may affect the growing fetus as well as the mother, it might be worrying. Maternal fever has been linked in many studies to newborn sepsis and chorioamnionitis. Not all possible birth outcomes after exposure to such substances during pregnancy have been sufficiently studied in prospective research. This study can help us figure out, to investigate the possibility of a relationship between maternal fever and a higher risk of birth defects, preterm, growth retardation, or miscarriage. Numerous studies have examined the differences in outcomes for mothers and newborns within three temperature ranges: mild fever (100.4–101°F), severe fever (>101°F), and afebrile (<100.4°F). During labor, the mean axillary temperature among women rose up to 100.4°F.

REVIEW OF LITERATURE

Maternal Fever and temperature regulation

Adults often have a core body temperature of 36.5–37.5ºC, or 97.7–99.5ºF (also known as normal temperatures or afebrile(normothermia). Most of the time, a fever will not harm unborn child's development or pregnancy. Over-the-counter drugs can be used to treat low grade fevers, which are less than 100.4 degrees Fahrenheit and should not cause too much discomfort. Women can also experience mild fevers within 101 degrees Fahrenheit. Although low grade fevers should not cause too much concern, be on the lookout for any further symptoms as they appear. Pregnant women should consult doctor right away if temperature rises to 101 degrees Fahrenheit and beyond. A pregnant woman is having a severe fever when the body temperature exceeds 101 degrees Fahrenheit. An expecting

mother is battling an illness if her body temperature rises from 98.6 degrees fa Fahrenheit to a fever. That is why it is critical to get therapy as soon as possible(Equils et al., 2020; Li et al., 2023).

The prevalent condition known as intrapartum fever poses challenges for clinicians in terms of diagnosis and therapy. The evaluation of the mother's temperature, typical labour temperature curves, and the identification of intrapartum fever are all covered in this study. It includes the assessment and treatment of intrapartum fever cases, along with the related morbidities in mothers and newborns. Maternal intrapartum fever has several etiologies, both infectious and non-infectious processes, and can result in a range of problems for both the mother and the newborn. Even a little fever should be thoroughly watched throughout pregnancy. Any fever, no matter how little, should be closely monitored throughout pregnancy. Elevations of 38.5°C or above, or even mild fevers lasting more than twenty-four hours, may pose a risk to the fetus as they might indicate an infection (Kinishi et al., 2024; Segal, 2010).

"The chance of threat, damage, illness or other adverse consequence" is the definition of risk. Risk is commonly understood to be the possibility or likelihood of harm occurring. Therefore, when medical professionals refer to a pregnancy as being "highrisk," they usually mean that there is a greater chance than not that a pregnancy complication, unfavourable event, or poor outcomes will occur either during or following the pregnancy or delivery, as opposed to a straightforward or "low risk" pregnancy.

It is also important to remember that danger in pregnancy and risks in childbirth are two different things. Obesity and hypertension are examples of risk factors for pregnancy, although a person might have these conditions and yet have a simple labour and delivery. Not every risk factor has the same importance(Burgess et al., 2017).

Mechanism of Fever in Pregnant women

One of two processes accounts for most cases of intrapartum fever: either an infectious process or an epidural one. Rare causes include exposure to prostaglandin E2 or other drugs, dehydration, hyperthyroidism, or excessive heat from the environment. Primary inflammation is the underlying mechanism for both infections and epidural-associated fevers(Bos et al., 2017; Goetzl, 2012).

Fever brought on by the administration of certain medications and non-obstetric infectious processes, such as urinary tract infections, are two other less frequent reasons of temperature increase.

One of the most common causes of emergency consultations during pregnancy is fever, which can have serious negative effects on the fetus (malformations, fetal demise), obstetrics (miscarriage, preterm delivery, chorioamnionitis), or put the mother at various risks like sepsis or even organ damage(*Epidural Analgesia and Maternal Fever: A Clinical and Resear... : Current Opinion in Anesthesiology*, n.d.; *Epidural Labor Analgesia and Maternal Fever : Clinical Obstetrics and Gynecology*, n.d.).

Epidemiology refers to the study that is used to examine the causes of illnesses and to characterize how they affect the general population. Determining the risk variables and their relative importance is a key goal. A risk factor may have an impact on the likelihood that a certain disease will manifest. Usually in epidemiological studies a certain geographical area, specific population is studied to determine the factors affecting a specific condition.

Determining illness risk factors is one of epidemiology research's main goals. Cohort studies, case-control research, or cross-sectional research is carried out based on the questions being asked to interpret different frequency of measures risks associated to it(Chan et al., 2018).

INFECTIOUS ORIGIN

Intraamniotic infection (IAI) is a significant cause of intrapartum fever and should be treated with wide-spectrum antibiotics even if the patient does not satisfy all diagnostic criteria (such as fetal tachycardia, maternal leucocytosis, and purulentlooking amniotic fluid). It is recommended to administer prompt antibiotic therapy, particularly when there are other risk factors present, such as premature labor or extended membrane rupture(Thorburn et al., 2021).

As an infection spreads in the chorion and amnion membrane of your uterus, it results in chorioamnionitis. Potentially hazardous bacteria that are introduced to these membranes, the fluid that surrounds the amniotic sac, and occasionally the placenta during pregnancy can result in intraamniotic infections. Although chorioamnionitis can occur at any stage of pregnancy, most instances are identified and managed following childbirth (Hensel et al., 2022; Morton et al., 2021).

The infiltration of bacteria, such as group B strep and E. coli, results in a bacterial infection and causes chorioamnionitis. The infection may originate within the vagina, anus, or the rectum and spread to the uterus, or it might begin there if the amniotic sac ruptures or rips (sometimes referred to as your water breaking).

Bacteria can enter the uterus externally, for example, by doing too many vaginal examinations after a water break, or even inside, during invasive treatments like amniocentesis. Rarely, intraamniotic infection can also develop during invasive procedures (such as amniocentesis or chorionic villus (CV) sampling) or by a bloodforming pathway that results from a systemic infection in the mother (e.g., Listeria monocytogenes). Nonetheless, the majority of intraamniotic infection cases that obstetricians-gynaecologists or other providers of obstetric care identify, and treat will be associated with term women who are in labor. Some of the common causes for maternal fever were viral gastroenteritis, pyelonephritis chorioamnionitis, influenza, common viral infections, and other bacterial infections(Patel et al., 2023a).

Fever during pregnancy is also commonly caused by dengue, hepatitis E, and urinary tract infections. Most instances were brought on by infections spread by vectors and were water-borne. Historically, the herpes simplex virus (HSV), CMV, and rubella virus were the only viruses that should be taken seriously when pregnant. Parvovirus B 19 (B19V), varicella-zoster virus (VZV), measles virus, enteroviruses, adenovirus, (HIV), West Nile virus and Zika virus are among the other viruses that are currently recognized to cause congenital illnesses(Herbst et al., 1995).

The hepatitis E virus is also significant due to the elevated risk of infection in expectant mothers.

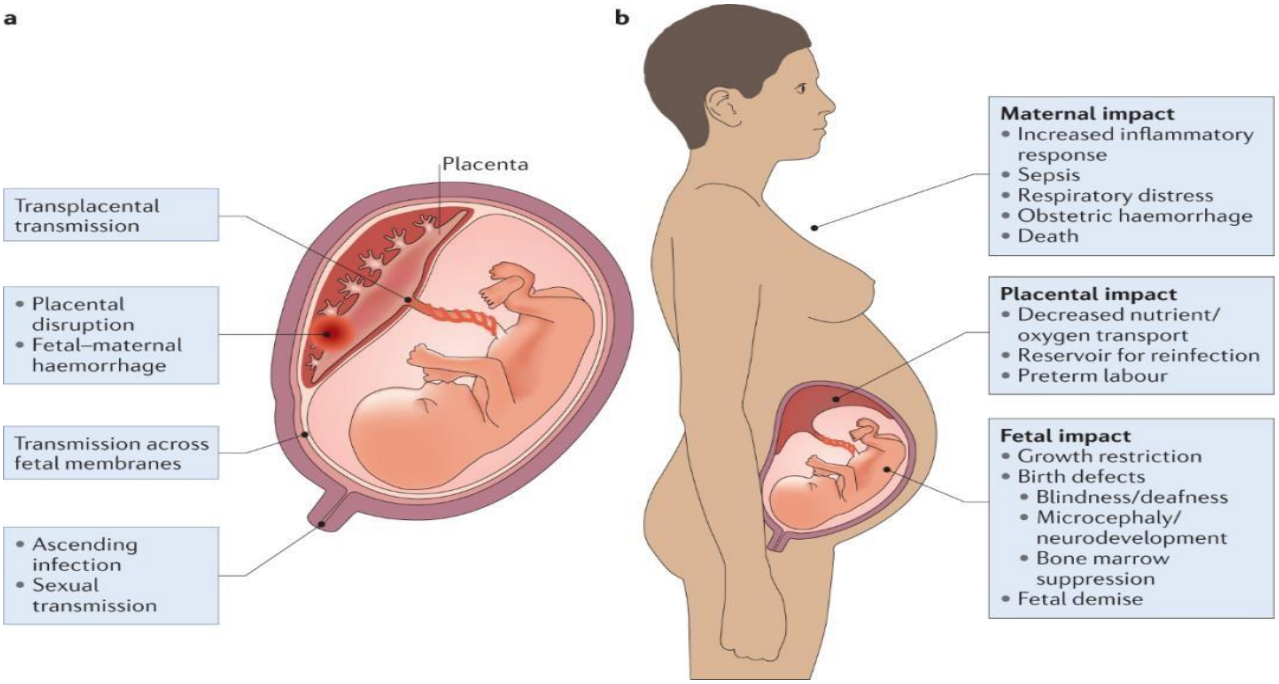

Fig1 - Infections Causing Maternal Fever and its Impact

An infection that causes inflammation in any arrangement of the amniotic fluid, the placenta, the developing baby, fetal membranes, or decidua is known as an intraamniotic infection, also known as chorioamnionitis (Maternal Illness, Including Fever, and Medication Use as Risk Factors for Neural Tube Defects - Shaw - 1998 - Teratology - Wiley Online Library, n.d.). Both long-term newborn difficulties including respiratory dysplasia and cerebral palsy as well as acute neonatal morbidity like neonatal meningitis, pneumonia, sepsis, and mortality have been linked to intraamniotic infection. The tumour necrosis factor (α, β), interleukin-6 (IL) (1α, 1β, 6), and interferons are among the inflammatory cytokines released by the mother immune system in the context of infection. Research and investigations recommend antibiotic treatment for every infant born to mothers who have an intraamniotic infection, whether it is suspected or proven. A frequent disease observed in both term and preterm infants is intraamniotic infection (Coffey & Jessop, 1959; Croen et al., 1991). The effective reduction of morbidity and death in women and babies can be achieved by the timely identification of intrapartum intraamniotic infections and the subsequent application of recommended treatment measures. Appropriate assessment and empirical antibiotic therapy, when necessary, should be facilitated. When an intraamniotic infection is suspected or proven, intrapartum antibiotic administration is advised. In cases of isolated maternal fever, antibiotics must be taken into consideration until another cause other than intraamniotic infection is found and confirmed.

PIDURAL ORIGIN

An epidural contains a mixture of an opioid, usually hydromorphone or fentanyl, plus a local anaesthetic, similar to Novocain.

Usually, the medications are taken at low doses and remain in the spinal area. The mother only absorbs a little quantity into her circulation. As a result, the infant is safe, and the mother will not suffer from the usual opioid side effects, such fatigue, that arise from taking or receiving an opioid intravenously. Approximately 70–75% of women give birth use epidurals, which are the most popular and efficient kind of anaesthesia for reducing pain during labor (Czeizel & Dudás, 1992).

Epidural analgesia is a common method of pain relief during labor and delivery. A local anaesthetic is injected into the skin to numb the area where the epidural needle will be inserted. A needle is inserted between the vertebrae of the lower back into the epidural space, which is just outside the membrane covering the spinal cord and contains nerves. Once the needle is in place, a thin catheter is threaded through the needle into the epidural space. The needle is then removed, leaving the catheter in place. Pain-relieving medications, such as a combination of a local anaesthetic like bupivacaine or ropivacaine and an opioid like fentanyl or sufentanil, are administered through the catheter. The medications block nerve impulses from the lower spinal segments, providing pain relief. In cases of prolonged labor, epidural analgesia can provide long-lasting pain relief, allowing the mother to rest and conserve energy. Epidural analgesia is most used during labor to provide pain relief to the mother while allowing her to remain conscious and actively participate in the birth process (Milunsky et al., 1992).

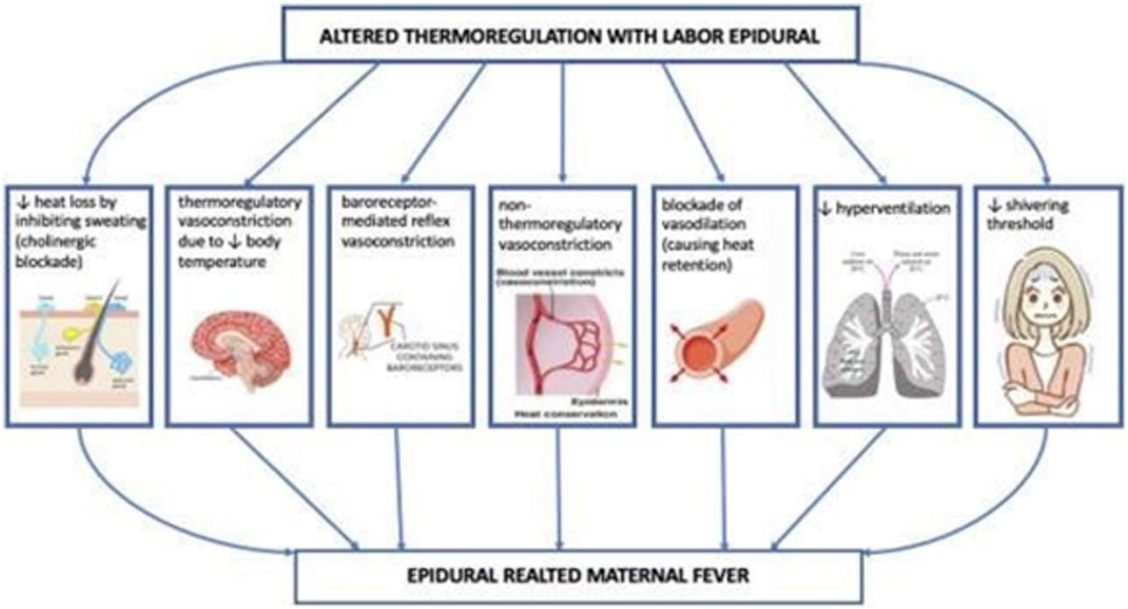

Fig 2- Epidural related Maternal Fever

It is usually utilized during giving birth. The safest and most efficient way to relieve intrapartum pain is with epidural analgesia (EPA). It has been utilized in as many as 34 percent of pregnant women with EPA recently, and it is also linked to higher labor temperatures for mothers. This epidural-associated fever's underlying cause is yet unclear. The most probable cause appears to be irritation brought on by a spinal catheter but not contagious in nature (Edwards et al., 1995).

Particularly in developed countries, epidural analgesia is a commonly utilized method of labor analgesia. It can be prolonged to give anaesthesia for an intrapartum Caesarean birth, negating the requirement for general anaesthesia. It is the most effective kind of labor analgesia. Additionally, it could enhance the outcomes for mothers and newborns in high-risk pregnancies, such as those with pre-eclampsia or cardiac conditions. A parturient who has an epidural for labor analgesia and experiences an elevation in body temperature is said to be experiencing epidural hyperthermia, often referred to as epidural-related fever. The better phrase is hyperthermia since fever suggests an inflammatory process, which here is not demonstrated.

The use of analgesia (epidural analgesia) has complications while treating labor pain because labor is a complicated process. During labor, epidural analgesia (EA) is frequently employed because of its well-known analgesic properties.

Between and 25 percent of patients who have a labor epidural also experience maternal fever associated to the epidural. It was shown by two meta-analyses that maternal fever associated with epidural pain is a clinical fact. Epidural-related maternal fever is linked to all widely used neuraxial procedures, local anaesthetics along with or without opioids, and ongoing treatment regimens; however, the exact role played by each of these factors is uncertain. Firstly, a sterile (non-infectious) inflammatory process may result in the development of hyperthermia because of labor epidural analgesia (Myrianthopoulos & Melnick, 1987). This mechanism may also be due to bupivacaine's inhibition of caspase-1 activation, a protease implicated in cell death and proinflammatory pathway activation. Interleukin-1-receptor antagonist, an anti pyrogenic cytokine, is not released from circulating leucocytes because of this inhibition. Maternal temperature rises steadily following epidural, indicating that epidural fever or hyperthermia is a time-dependent syndrome. Longer labor result in longer epidural analgesia durations, which puts them at higher risk of experiencing elevated body temperature. There may be a higher chance of surgical delivery because, by definition, surgical delivery for arrest of labor also happens after prolonged labor. Neonatal brain damage is linked to chorioamnionitis, while intrapartum fever is linked to epidural analgesia (Patel et al., 2023b). Nevertheless, whether epidural hyperthermia and infant brain damage are related remains unknown. About 21 percent of cases of an intrapartum epidural analgesia, hyperthermia complicates the treatment; the underlying cause is unknown. One theory is that active dilatation and sweating are inhibited by blocking cholinergic sympathetic neurons, which reduces heat loss (Sappenfield et al., 2013). Labor raises the generation of heat, which may lead to a scenario where heat production surpasses heat loss, and the body temperature rises. According to laboratory data, intrapartum inflammation and epidural-related maternal fever are linked to low levels of an anti-inflammatory cytokine called interleukin-1 receptor antagonist (IL-1ra), which in turn raises the frequency of obstetric interventions and the use of antibiotics during labor(Brar et al., 2022). Studies have shown that epidural analgesia can lead to an increase in IL-6 levels in pregnant women. This increase in IL-6 levels is believed to be a result of the body's response to the insertion of the epidural catheter and the administration of local anaesthetics or opioids into the epidural space. However, it is important to note that the clinical significance of this increase in IL-6 levels is not fully understood.

Regarding adverse effects, epidural analgesia is generally considered safe for both the mother and the baby when administered by trained healthcare professionals. However, like any medical intervention, it carries potential risks and side

effects. Adverse effects associated with epidural analgesia in pregnant women may include Maternal Hypotension, prolonged labour etc(Menon et al., n.d.). Epidural analgesia can cause a drop in blood pressure, leading maternal hypotension. This can result in dizziness, nausea, and reduced blood flow to the uterus, potentially affecting fetal oxygenation. Some studies suggest that epidural analgesia may be associated with longer labor durations and an increased likelihood of instrumental delivery (e.g., forceps or vacuum extraction). However, this association is not consistently observed across all studies. As mentioned earlier, epidural analgesia can sometimes lead to maternal fever, possibly due to the body's immune response to the epidural catheter or medications. Itching is also a common side effect of opioids administered via epidural analgesia. Epidural analgesia can interfere with normal bladder function, leading to urinary retention (Cappelletti et al., n.d.).

It is important for pregnant women considering epidural analgesia to discuss the potential risks and benefits with their healthcare providers and to make informed decisions based on their individual circumstances. Additionally, healthcare providers should carefully monitor women receiving epidural analgesia for any adverse effects and intervene promptly if necessary.

MATERNAL FEVER AND NEONATAL SEPSIS: CORRELATION

Neonatal sepsis refers to a systemic infection occurring in the first 28 days of life in a newborn. Maternal fever during labor can be a concerning sign for neonatal sepsis, especially if it occurs during the intrapartum period (during labor and delivery). Maternal fever during labor can be indicative of an intra-amniotic infection, commonly known as chorioamnionitis. This infection can lead to the release of inflammatory mediators and bacteria into the amniotic fluid, which can then directly or indirectly affect the newborn, potentially leading to neonatal sepsis (Tita et al., n.d.).

It can be categorized into early-onset sepsis (EOS) and late-onset sepsis (LOS) based on the timing of onset. EOS typically occurs within the first 72 hours (3 days) after birth, with most cases presenting within the first 24 hours. It is often associated with vertical transmission of bacteria from the mother to the newborn during labor and delivery. Common causative organisms for EOS include Group B Streptococcus (GBS), Escherichia coli (E. coli), and other bacteria present in the maternal genital tract. LOS occurs after 72 hours (3 days) of life up to 28 days of life. It is often associated with nosocomial (hospital-acquired) infections, including colonization from healthcare workers, invasive procedures, or exposure to contaminated equipment. The causative organisms for LOS can vary but often include a broader range of bacteria, including coagulase-negative staphylococci, Staphylococcus aureus, Klebsiella species, and other gram-negative bacteria (Czikk et al., n.d.).

Risk factors for newborn sepsis may vary depending on when the mother's fever first appears, including during childbirth and postpartum periods. Therefore, it can be necessary to assess newborn sepsis in situations when the mother has postpartum fever. Risk factors for neonatal sepsis may vary depending on when the mother's fever first appears, including during childbirth and postpartum periods. According to the numerous studies, babies whose mothers had postpartum fever had a far reduced chance of developing neonatal sepsis than babies whose mothers experienced intrapartum fever. A newborn may get an illness from their mother even before the fever appears. Consequently, the infant could possibly have been susceptible to the illness even after the mother developed a fever during labor(Gantert et al., 2010).

Early onset sepsis (EOS)

Early onset sepsis (EOS) in newborns refers to an infection that occurs within the first week of life, typically within the first 72 hours after birth. Maternal fever during labor is one of the risk factors associated with EOS. When a mother has a fever during labor, it can be a sign of an infection such as chorioamnionitis, which is an inflammation of the fetal membranes due to a bacterial infection. Chorioamnionitis can increase the risk of EOS because the bacteria causing the maternal infection can potentially be transmitted to the newborn during delivery (Hagberg et al., n.d.). The most common cause of early-onset sepsis (EOS) is infection transfer from the mother's genitourinary barrier to the fetus or newborn. These bacteria can spread to the amniotic fluid and ascend the uterus, cervix, and vagina. In cases of chorioamnionitis or maternal fever during labor, there is an increased risk of vertical transmission of bacteria from the mother to the newborn during birth. Bacteria such as Group B Streptococcus (GBS) or Escherichia coli (E. coli) can be transmitted to the newborn, leading to early-onset neonatal sepsis (EOS) within the first 72 hours of life. When a newborn is born to a mother with a fever during labor, healthcare providers typically conduct a thorough evaluation of the newborn for signs of sepsis or infection (Chorioamnionitis - Google Scholar, n.d.). This may include monitoring vital signs, conducting laboratory tests such as blood cultures and inflammatory markers, and assessing for clinical signs of sepsis such as poor feeding, lethargy, respiratory distress, or temperature instability. In cases where there is a concern for neonatal sepsis due to maternal fever during labor, healthcare providers may initiate empirical antibiotic therapy for the newborn to cover potential pathogens until further evaluation and test results are available. This early intervention aims to reduce the risk of progression to severe infection and improve outcomes for the newborn (gynecology & 1993, n.d.).

Several studies have demonstrated a correlation between maternal fever during labor and the risk of EOS in newborns. However, it is important to note that not all infants born to mothers with a fever during labor will develop EOS, and not all cases of EOS are preceded by maternal fever. Other risk factors for EOS include premature rupture of membranes, prolonged labor, group B streptococcus colonization, and maternal colonization with other pathogenic bacteria.

To mitigate the risk of EOS in newborns, healthcare providers often monitor maternal vital signs during labor, administer antibiotics to mothers with fever or other risk factors, and closely monitor newborns for signs of infection after birth. The decision to administer antibiotics to the newborn may depend on several factors such as the presence of risk factors, maternal clinical (Gibbs et al., n.d.)

Late-Onset Sepsis

When a baby is born, interaction with healthcare personnel or other caregivers might s pread infections from the surrounding environment, which can lead to late-onset sepsis (LOS).

A latestage vertically transmitted infection may also contribute to a portion of LOS. Infants who undergo invasive operations that cause disruption to the mucosa, such as intravascular catheter placement, are more susceptible to developing Later onset sepsis.

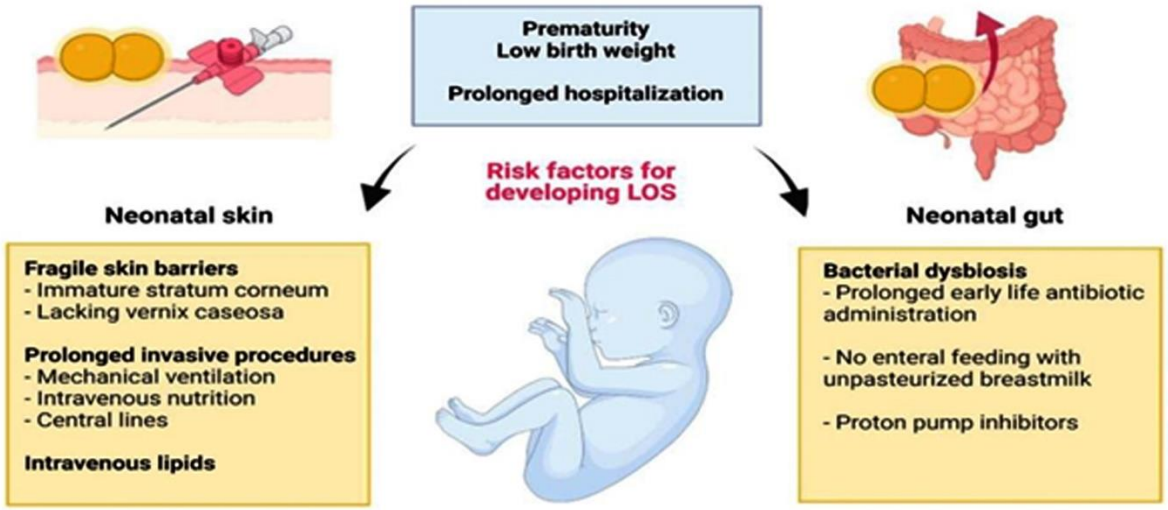

Fig 3 Risk factors for developing Late-onset Sepsis

Late-onset sepsis (LOS) in newborns refers to an infection that occurs after the first week of life, typically between 7 and 90 days after birth. The correlation between LOS and maternal fever is not as direct or well-established as it is for early-onset sepsis (EOS). LOS is more commonly associated with factors such as prolonged hospitalization, invasive procedures, and exposure to healthcare-associated pathogens. Maternal fever during labor is not typically considered a direct risk factor for LOS in newborns. However, maternal fever during labor may indicate an intrauterine infection or chorioamnionitis, which could potentially lead to neonatal sepsis. While the risk of EOS is higher in infants born to mothers with fever during labor, the risk of LOS is generally influenced by other factors such as exposure to hospital environments, invasive procedures (such as intubation or catheterization), and the presence of underlying medical conditions in the infant (America & 2005, n.d.).

It is important to note that LOS in newborns is often caused by different pathogens compared to EOS. In many cases, LOS is caused by healthcare-associated pathogens such as coagulase-negative staphylococci, Staphylococcus aureus, and gram-negative bacilli, which may be acquired in the hospital environment. To prevent LOS, healthcare providers focus on infection control practices in neonatal intensive care units (NICUs), including hand hygiene, proper catheter care, and judicious use of antibiotics. Additionally, monitoring newborns for signs and symptoms of infection, especially in those with risk factors such as prematurity or prolonged hospitalization, is essential for early detection and treatment of LOS (Kim et al., n.d.).

Pathophysiology of sepsis – Neonatal Sepsis

Understanding these pathophysiological causes of sepsis in newborns is crucial for early recognition, diagnosis, and appropriate management to improve outcomes and reduce morbidity and mortality associated with neonatal sepsis. Patho physiologically, the primary cause of the higher risk of sepsis in newborns is their undeveloped immune system Preterm infants have a higher risk of sepsis due to several factors related to their immature immune system, physiological vulnerabilities, and increased exposure to healthcare interventions (Cappelletti et al., 2020). Neonates cannot have a full inflammatory response from polymorphonuclear neutrophils, macrophages, or T lymphocytes because too immature immune functions. Immunoglobulins, particularly IgG antibodies, are transferred from the mother to the fetus during the third trimester of pregnancy. Preterm infants, especially those born very prematurely, have reduced exposure to maternal antibodies in utero, leading to lower levels of protective antibodies at birth. This reduces their ability to mount an effective immune response to infections, increasing their susceptibility to sepsis. The skin serves as a physical barrier against pathogens. However, the skin of preterm infants is thinner, less developed, and more permeable than that of full-term infants (Yancey et al., n.d.).

Preterm infants are at increased risk of respiratory distress syndrome due to surfactant deficiency, immature lung development, and difficulty transitioning to extrauterine life. Respiratory distress syndrome can necessitate invasive respiratory support such as mechanical ventilation or continuous positive airway pressure (CPAP), which increases the risk of ventilator-associated pneumonia and subsequent sepsis. Preterm infants are at increased risk of respiratory distress syndrome due to surfactant deficiency, immature lung development, and difficulty transitioning to extrauterine life. Respiratory distress syndrome can necessitate invasive respiratory support such as mechanical ventilation or continuous positive airway pressure (CPAP), which increases the risk of ventilator-associated pneumonia and subsequent sepsis. Given these vulnerabilities, preterm infants require vigilant monitoring for signs of sepsis, prompt diagnosis, and appropriate antimicrobial therapy when necessary to reduce the morbidity and mortality associated with neonatal sepsis in this vulnerable population (Ershad et al., n.d.). Babies suffering from bacteraemia may not exhibit any symptoms and appear normal on physical examination. Therefore, laboratory testing is crucial to the diagnosing process. In the event that a catheter is in situ, samples should also be taken

there. Urine cultures should be taken into consideration while evaluating LOS, however they are often not advised for evaluating EOS. Any newborn with a positive blood culture or a clinical presentation suggesting involvement of the central nervous system should have a lumbar puncture with cerebrospinal fluid (CSF) testing and culture analysed (K. Simonsen et al., n.d.). To ensure the CSF is sterile, a second lumbar puncture must be performed within forty-eight hours of starting treatment. Polymerase chain reaction (PCR) technology is now being researched as a diagnostic tool to detect sepsis and the causal organism more quickly.

Even in the absence of confirmed test results, empirical therapy with antibiotics should begin right away as infection is clinically suspected. The first selection of antibiotics should generally be based on the antimicrobial resistance characteristics of common bacteria seen in the newborn critical care unit. The most prevalent infections in EOS (E. coli, L. monocytogenes and GBS) are covered by standard treatment regimens which involve intravenous (IV) ampicillin and aminoglycosides. Considering this, medical professionals should make sure that parents are aware of all necessary testing, their significance, and the outcomes. The parents must be informed of any modifications to the treatment plan or antibiotic regimen (Camacho-Gonzalez et al., n.d.).

COMPLICATIONS IN PREGNANCY DUE TO MATERNAL FEVER

Pregnancy-related Maternal fever is a prevalent clinical issue globally. Pregnancy complicated by fever and illness carries a much higher danger to both the mother and the fetus. Since pregnant fever commonly presents with unusual symptoms, obstetricians frequently encounter difficulties in treating it. Normal pregnancy normally results in a decline in maternal immune function, and because many strong antibiotics have the potential to cause teratogenicity, pregnant women should use them with caution.

One of the most common causes of emergency consultations during pregnancy is fever, which can have serious negative effects on the fetus (abnormalities, fetal demise), obstetrics (miscarriage, preterm delivery, chorioamnionitis), or affect the mother (sepsis, organ damage). maternal fever during pregnancy can potentially complicate things. Fever during pregnancy, particularly if it is high or prolonged, can sometimes pose risks to both the mother and the developing baby (Zea-Vera et al., n.d.).

It is essential for pregnant women to seek medical attention if they have a fever, especially if it is accompanied by symptoms such as chills, body aches, or other signs of infection. Prompt treatment can help manage the fever and reduce the risk of complications. During pregnancy, it is important for expectant mothers to monitor their temperature regularly, especially if they suspect they may have a fever. Pregnant women should monitor their temperature as needed, especially if they are feeling unwell or suspect they may have a fever. If there are concerns about fever or infection, temperature can be checked more frequently, such as every 4-6 hours. Temperature measurements can be taken orally, rectally, or using a temporal artery thermometer. Oral temperature is commonly used and is considered accurate if taken correctly (Neonatal Sepsis - Google Scholar, n.d.). It is important to follow the instructions for the thermometer being used to ensure an accurate reading. The normal body temperature for adults, including pregnant women, is typically around 98.6°F (37°C), although there can be slight variations. A fever is generally considered to be a temperature of 100.4°F (38°C) or higher. During pregnancy, it is essential for women to contact their healthcare provider if they have a fever or any concerns about their health. Monitoring temperature regularly can help detect fever early and facilitate timely medical evaluation and treatment if necessary. Adults often have a core body temperature of 36.5–37.5ºC, or 97.7–99.5ºF (also known as normal temperatures or afebrile(normothermia). Most of the time, a fever will not harm unborn child's development or pregnancy. Over-the-counter drugs can be used to treat low grade fevers, which are less than 100.4 degrees Fahrenheit and should not cause too much discomfort.

ETIOLOGY OF FEVER IN PREGNANT WOMEN-

Fever in pregnant women can have various causes, both infectious and non-infectious.

INFECTIOUS

Type of Infection	Cause	Example
Urinary Tract Infections	Bacteria (mainly E. coli)	
Respiratory Infections	Variety of microbes, including bacteria, viruses, and fungi	Influenza (flu), pneumonia
Sexually Transmitted Infections	Bacteria, viruses, and parasites	Bacteria-chlamydia, gonorrhoea, and syphilis Virus-HIV, Zika
Intrauterine Infections	Bacteria from vagina that move up to uterus	Chorioamnionitis

Viral diseases- Dengue, Chikungunya, Hepatitis E, Hepatitis A, Chicken pox, H1N1

Influenza, Acute Hepatitis B Infection

Bacterial diseases- UTI, Tuberculosis, Scrub typhus, Typhoid, Leptospirosis

Others- Malaria, URTI, Gastroenteritis, Pneumonia, Parotitis, Cholecystitischolangitis, Liver abscess (K. A. Simonsen et al., 2014).

CHORIOAMNIONITIS: Chorioamnionitis, also known as intra-amniotic infection, is a condition characterized by inflammation of the fetal membranes (chorion and amnion) and the amniotic fluid. It typically occurs during pregnancy or labor and is commonly associated with ascending bacterial infection from the lower genital tract into the uterus (Ershad et al., 2019). Neonatal sepsis refers to a systemic infection occurring in the first 28 days of life in a newborn. It can be categorized into early-onset sepsis (EOS) and late-onset sepsis (LOS) based on the timing of onset (Philip et al., n.d.).

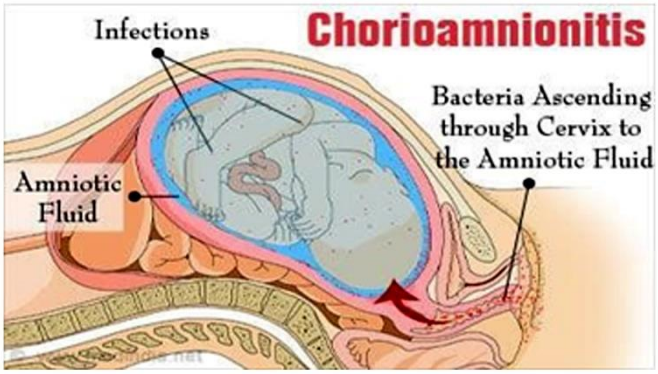

Fig 4 - Chorioamnionitis

Premature rupture of the membranes refers to a condition where a pregnant woman's membranes burst before she enters labor. Premature rupture of membranes also is the term used to describe when water bursts early. Chorioamnionitis often occurs after rupture of membranes (water breaking), as this provides a direct pathway for bacteria to ascend into the uterus and infect the amniotic fluid and fetal membranes. Preterm birth occurs when the membrane breaks earlier than the thirty-seventh week of pregnancy (Odabasi et al., 2020).

NON- INFECTIOUS

CONDITION	EXAMPLE
Inflammatory Conditions: Conditions like autoimmune diseases can cause fever.	Lupus, hyperthyroidism, rheumatoid arthritis
Thromboembolic Events: Thromboembolic events refer to conditions where blood clots (thrombi) form within blood vessels and then dislodge, traveling through the bloodstream until they become lodged in a smaller blood vessel, causing obstruction	Deep Vein Thrombosis (DVT), Pulmonary Embolism (PE), Cerebral Thromboembolism
Medication Reactions: Some medications can cause fevers as a side effect.	Aspirin, nonsteroidal anti-inflammatory agents, and nutritional supplements

PREGNANCY-SPECIFIC

CONDITION	OVERVIEW
Hyperemesis Gravidarum	severe form of nausea and vomiting during pregnancy that can lead to dehydration, weight loss, and electrolyte imbalances.
Gestational Pyelonephritis	A severe form of UTI that involves the kidneys, causing fever and flank pain.

The prominent condition known as maternal fever during any period of the pregnancy poses challenges for clinicians in terms of diagnosis and therapy. Just over one percent of pregnant women with clinical chorioamnionitis at pregnancy go on to develop severe sepsis, indicating the rarity of true maternal sepsis. But inflammation and heat have a negative effect on uterine contractility, which raises the possibility of a caesarean birth and postpartum haemorrhage following childbirth (Vergnano et al., n.d.).

In comparison to the diseases linked to it, it was determined that maternal fever adds to the increased risk and may be a sign of more serious infections, so it acts as a marker or indication for an infection. A multitude of inflammatory mediators are introduced to the fetus because of the mother's pyrexia. It can lead to few challenges or complications like

Birth Defects: High fever during the first trimester (the first 12 weeks) of pregnancy can slightly increase the risk of certain birth defects (Shah et al., 2014).

Premature Birth: Fever during pregnancy, especially if it is accompanied by certain infections, can increase the risk of premature birth.

Neural Tube Defects: There is a slight increased risk of neural tube defects, such as spina bifida, with high fever during early pregnancy.

Miscarriage: In some cases, particularly if the fever is exceedingly high, there may be a risk of miscarriage, especially during the first trimester.

Fetal Distress: High fever can sometimes cause distress to the fetus, affecting its heart rate and overall well-being.

EFFECT OF MATERNAL FEVER ON MATERNAL MORBIDITY

Maternal fever during pregnancy can indeed have implications for maternal health, potentially leading to increased morbidity (illness or disease) for the pregnant woman. The processes that cause intrapartum fever are associated with three main negative effects on mothers firstly infectious origins which may lead to sepsis; overuse of antibiotics due to the challenges in distinguishing between transmissible and noninfectious fever detrimental impacts of inflammation and high temperatures on uterine contractions, which raises the risk of postpartum haemorrhage and caesarean delivery. Fever often leads to increased sweating, which can cause dehydration if fluids are not adequately replaced. Dehydration can exacerbate symptoms and lead to further discomfort for the mother (Banerjee et al., 2004). Maternal fever, particularly if it is prolonged or severe, can increase the risk of complications such as urinary tract infections, kidney infections (pyelonephritis), and respiratory infections, which can lead to additional morbidity. In severe cases, maternal fever can be a sign of a systemic infection, which, if left untreated, can progress to sepsis. Sepsis is a life-threatening condition characterized by the body's extreme response to an infection. can cause significant discomfort, fatigue, and malaise, impacting the pregnant woman's overall well-being and ability to carry out daily activities. Maternal fever may necessitate medical intervention, such as antibiotic treatment or hospitalization, which can disrupt the mother's routine and increase stress levels. Dealing with illness during pregnancy can also lead to emotional distress for the mother, including anxiety about the potential impact on the health of her baby (Sharpe & Arendt, 2017).

where blood clotting factors are consumed rapidly, leading to excessive bleeding. Maternal fever and associated infections can delay the recovery process after childbirth, prolonging the time it takes for the uterus to return to its normal size and tone. This delayed involution of the uterus can increase the risk of postpartum haemorrhage.

maternal fever during pregnancy can potentially influence postpartum haemorrhage (PPH), which is excessive bleeding after childbirth. While fever itself may not directly cause PPH, it can be indicative of underlying conditions or infections that may increase the risk of bleeding complications during and after childbirth. Proper management of infections and timely interventions can help reduce the risk of postpartum haemorrhage and its associated complications. Additionally, women with a history of fever or infection during pregnancy should be closely monitored for signs of bleeding complications in the postpartum period.

METHODOLOGY

NLP Pipelines and searching of keywords

NLP stands for Natural Language Processing. A subclass of artificial intelligence allows robots to understand and interpret language spoken by people. Human languages can be represented by text or audio. NLP pipelines refer to the sequence of steps or processes that are used to analyse and understand natural language text. These pipelines typically involve a series of tasks performed in a specific order to transform raw text data into a structured data format that computers can work with.

In this study we have utilized NLP pipelines to extract data on our topic of research- "Maternal Fever," this has simplified the process of web scraping for us. Instead of wasting hours sorting out papers and data sets we can simply find research done on any topic using simple keyword like "intrapartum fever"," maternal hyperthermia." The outlook of NLP pipelines can vary depending on the specific application and the complexity of the tasks involved. They are often tailored to the requirements of a particular project or problem, with different combinations of tasks and techniques used to achieve desired outcomes. We can find articles using PubMed ids, extract abstracts and even visualize data in form of bar graphs or pie charts using matplotlib and other software all integrated into one pipeline using python code. Employing natural language processing (NLP), we identified factors linked to maternal fever and its adverse effects on both mother and child. The analysis utilized Python programming with bio python and scikit-learn packages, and visualization methods such as bar charts, pie charts, and word clouds were employed to depict the trends and geographical distribution of maternal fever cases over time (Cappelletti et al., n.d.; Menon et al., n.d.).

Text mining and Web Scraping

The practice of installing bots to retrieve data and material from websites is known as web scraping. Web scraping retrieves the underlying HTML code and the data stored in a database, in contrast to screen scraping, which merely replicates the pixels that are displayed on monitor. The complete website content may then be duplicated elsewhere by the scraper. One automatic way to get a lot of data from webpages is called web scraping. The majority of that data is unstructured HTML data that is transformed into structured data in a database or spreadsheet for usage in a variety of applications. Web scraping may be done in a variety of methods to extract data from websites. These include writing your own web scraping programs or using certain APIs or internet services (Tita et al., n.d.).

Using this pipeline we have retrieved data from PubMed on our topic of research. We can retrieve thousands on articles by entering single keywords, store them in excel files to study this data. We can also classify our search by specifying countries, allowing us to understand the progress in various countries and their year or publications.

Data processing and Visualization

Using PubMed's API or web scraping techniques to gather relevant research articles related to maternal fever during pregnancy. PubMed offers a vast repository of biomedical literature and is a valuable resource for collecting scientific articles. We have Cleaned and preprocess the collected text data to remove noise, such as HTML tags, punctuation, and stop words. Tokenize the text into individual words or phrases and perform tasks such as lowercasing and lemmatization to normalize the text. identify relevant information within the text related to maternal fever, such as prevalence, risk factors, complications, management strategies, and outcomes. This step may involve named entity recognition (NER), dependency parsing, and other techniques to extract key entities and relationships from the text. Analysing the semantics of the text to understand the context and meaning of the extracted information, involve sentiment analysis, topic modelling, and other methods to identify patterns and themes within the text. Synthesize the extracted information from multiple research articles to generate insights and conclusions about maternal fever during pregnancy. This involves aggregating and summarizing the findings from different studies, identifying trends and commonalities, and assessing the quality and reliability of the evidence. We have also Represented the synthesized data in a structured format, such as a knowledge graph or database, to facilitate further analysis and visualization. This may involve linking entities and relationships extracted from the text and organizing them into a hierarchical or network structure. By implementing these steps in an NLP pipeline, you can effectively collect and analyse data on maternal fever from PubMed and research articles, enabling researchers and healthcare professionals to gain insights into this important clinical condition during pregnancy.

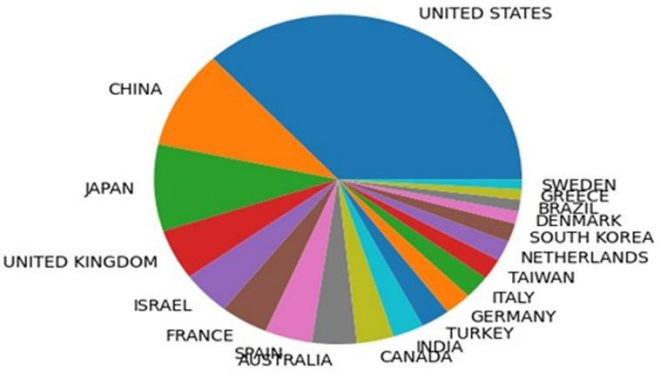

Fig 5 – Pi chart of research done on Maternal Fever (Top 20)

Natural Language Processing (NLP) is very crucial for web scraping, enhancing the extraction and analysis of textual information from web pages. NLP techniques help identify and extract relevant textual content from web pages. This involves parsing HTML or other markup languages to locate text elements such as paragraphs, headings, or lists. NLP methods can be used to clean and preprocess this extracted text, removing noise and irrelevant information. NER is used to identify and classify

named entities within the extracted text, such as people, organizations, locations, dates, or other entities of interest. This can be valuable for extracting structured data from unstructured text, enabling applications like news aggregation, event tracking, or competitive analysis.

Web scraping often involves gathering data from various data sources such as reviews, social or online forums. NLP techniques, particularly sentiment analysis, can be used to analyse the opinions, attitudes, and emotions expressed in these texts. This information can be valuable for understanding customer feedback, market trends, or brand reputation. NLP is used to provide structured and compact form to understand volumes of textual content extracted from web pages. Text summarization techniques help condense lengthy documents or articles into shorter, more digestible summaries, preserving the key information and main points. This can be useful for content aggregation, news curation, or generating previews of web content.

Web scraping may involve collecting text from web pages in multiple languages. NLP-based translation systems can be used to automatically translate text between different languages, enabling multilingual web scraping applications. This is particularly useful for global businesses, market research, or cross-lingual content analysis. NLP techniques can be used to identify and extract important keywords or phrases from the extracted text. Keyword extraction helps identify the main topics or themes discussed in web content, enabling categorization, tagging, or indexing of scraped data. Topic modelling algorithms can be applied for analysing the underlying themes or topics present in large collections of web documents like the Latent Dirichlet Allocation. This can help uncover hidden patterns, trends, or clusters of related content within scraped data.

By leveraging NLP techniques in web scraping, organizations can extract valuable insights and knowledge from unstructured web data, enabling informed decision making, competitive analysis, and data-driven applications.

Results and Discussion

SCENARIO OF MATERNAL FEVER IN INDIA

Maternal fever, especially during pregnancy, can pose risks to both the mother and the developing fetus. In India, like in many parts of the world, maternal health is a significant concern, and fever during pregnancy is taken seriously due to its potential complications. Fever during pregnancy in India can result from various causes, including infections such as urinary tract infections, respiratory infections, malaria, dengue, and other vector-borne diseases prevalent in different regions. Additionally, non-infectious causes such as heat-related illnesses can also lead to fever.

Pregnancy-related maternal fever while also suffering from malaria increases newborn mortality and poor birth weight. Many pregnant women who reported having a fever were included in the research, and the effect of malaria on pregnancy was evaluated as it is prevalent in India. Various study's findings indicate that second trimester infections are more prevalent due to protozoal infections. It raises the risk of meconium-stained amniotic fluid, intrapartum fetal discomfort, and abortions. In conclusion, feto-maternal morbidity throughout pregnancy is significantly influenced by malaria. Malaria is a mosquito-borne infectious disease caused by parasites of the Plasmodium species. Pregnant women are particularly vulnerable to malaria because pregnancy weakens the immune system, making them more susceptible to infections. Malaria during pregnancy can lead to feto-maternal complications and morbidity. When pregnant women are infected with malaria, she may experience symptoms such as fever, chills, sweats, body aches, fatigue, and sometimes nausea and vomiting. Fever is one of the hallmark symptoms of malaria and is often the first sign of infection. Malaria during pregnancy can have adverse effects on both maternal and fetal health. It can increase the risk of complications such as anaemia, miscarriage, stillbirth, preterm birth, and low birth weight. In areas where malaria is endemic, it is a significant cause of maternal and infant mortality.

DENGUE

The most frequent arboviral illness is dengue fever and is very prevalent among pregnant women in India. The two most frequent neurologic side effects are brain dysfunction and inflammation in the brain. A portion of the neuroaxis may be impacted by thrombocytopenia (low platelet count)-related haemorrhagic consequences. Dengue fever is a mosquito-borne viral illness caused by the dengue virus, which is transmitted primarily by the Aedes mosquito. Dengue fever can affect individuals of all ages, including pregnant women, and can lead to maternal fever. In India, dengue fever is endemic in many parts of the country, particularly during the monsoon season when mosquito populations are high. Pregnant women are susceptible to dengue infection, and the presence of fever during pregnancy can cause complications. Maternal complications of dengue fever can lead to preterm birth, low birth weight, miscarriage, and maternal mortality. Additionally, there is evidence to suggest that dengue infection during pregnancy may increase the risk of vertical transmission of the virus to the fetus, although this risk appears to be low. The management of dengue fever in pregnant women involves supportive care to alleviate symptoms and prevent complications. Pregnant women with dengue fever should receive close medical monitoring, hydration therapy, and symptomatic treatment for fever and pain. In severe cases, hospitalization and intensive care may be necessary. Pregnant women can be more precautious by wearing mosquito repellents, avoiding places with insects and mosquitos, wearing protectional clothing to avoid mosquito bites. Additionally, efforts to control mosquito populations and reduce breeding sites are important for preventing dengue transmission in communities. Overall, dengue fever can cause maternal fever and pose significant risks to pregnant women in India. Early detection, prompt medical care, and preventive measures are essential for managing dengue infection in pregnant women and reducing its impact on maternal and fetal health.

Group B Streptococcus (GBS)

Group B Streptococcus (GBS) is a significant cause of neonatal sepsis worldwide, including in India. GBS is a bacterium commonly found in the gastrointestinal and genital tracts of healthy adults. While GBS colonization is generally harmless in adults, it can be transmitted to newborns during childbirth and cause serious infections. Group B streptococcal disease (GBS) is an invasive illness caused by the Gram-positive bacteria Streptococcus agalactiae. It is a major contributor to prenatal problems and neonatal deaths. In spite of the high rate of preterm deliveries and stillbirths, the burden of GBS in India is unclear.

In India, as in other parts of the world, GBS is recognized as a leading cause of neonatal sepsis, pneumonia, and meningitis. Factors such as inadequate prenatal care, lack of awareness about GBS, limited access to healthcare services, and suboptimal infection control practices in healthcare facilities contribute to the burden of GBSrelated neonatal infections in India.

Preventing GBS transmission from mother to newborn is crucial for reducing the incidence of GBS-related neonatal sepsis. Screening pregnant women for GBS colonization during late pregnancy. Recommended use of intrapartum antibiotic prophylaxis for GBS-positive women during labor to reduce the risk of transmission to the newborn.

Promoting good hygiene practices during childbirth, including handwashing and sterile techniques. Educating healthcare providers and pregnant women about the risks of GBS infection and the importance of screening and prevention measures. Efforts to implement these strategies vary across different regions of India due to differences in healthcare infrastructure, resources, and awareness levels. However, there is growing recognition of the importance of addressing GBS as a cause of neonatal sepsis, and initiatives are being undertaken to improve screening, prevention, and treatment of GBS-related infections in India.

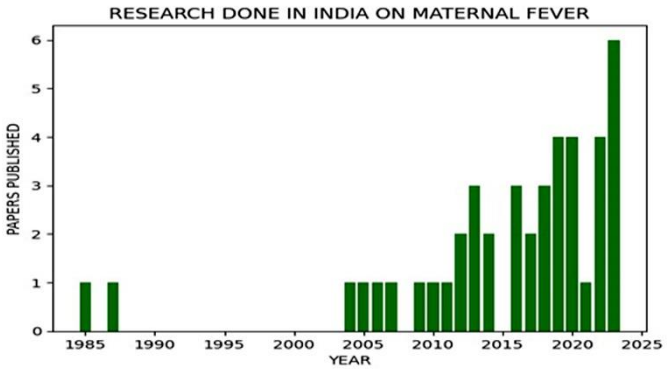

Fig 6 – Research Papers published in India over years on Maternal Fever

Neural tube defects

Neural tube defects (NTDs) are congenital malformations of the brain, spine, or spinal cord that occur during early embryonic development. Maternal fever, especially during the critical period of neural tube formation in the first trimester of pregnancy, has been associated with an increased risk of NTDs.

In India, where maternal health is a significant concern, the prevalence of NTDs can be influenced by several factors, including maternal fever. However, there is not a direct correlation between maternal fever and NTDs prevalence solely attributable to fever. Several factors contribute to the prevalence of NTDs in India like women have Folic Acid Deficiency: Insufficient intake of folic acid, a B vitamin crucial for neural tube development, is. a major risk factor for NTDs. Many women in India have inadequate folic acid intake due to dietary habits or lack of access to prenatal supplements. Many Genetic and Environmental Factors like Genetic predisposition and exposure to environmental factors can also contribute to the risk of NTDs. These factors may interact with maternal fever but are independent variables affecting NTD prevalence.

Access to prenatal care, including folic acid supplementation and prenatal screening, significantly impacts the detection and prevention of NTDs. Inadequate healthcare access can contribute to higher rates of NTDs due to missed opportunities for prevention and management.

COVID-19 and trend of vaccination among pregnant women

COVID-19 vaccination among pregnant women in India has been a topic of discussion and evolving policy. Initially, pregnant, and lactating women were not included in India's COVID-19 vaccination drive. The Government of India has authorized COVID-19 vaccination for pregnant women. They are eligible to receive the vaccine after consulting with their healthcare providers and providing informed consent. While pregnant women were not included in the initial clinical trials of COVID-19 vaccines, subsequent real-world data and studies have provided evidence of the safety and efficacy of COVID-19 vaccines in pregnancy. The benefits of vaccination in preventing COVID-19 infection and its complications are generally considered to outweigh the potential risks in pregnant individuals. COVID-19 vaccines authorized the use of vaccines like Covaxin and Covishield for emergency use in India, available for pregnant women. Both vaccines have been used extensively in India's vaccination program for the general population. Pregnant women in India can access COVID-19 vaccination through designated vaccination centres. They may need to provide documentation or a doctor's certificate confirming their pregnancy eligibility for vaccination. Addressing vaccine hesitancy and raising awareness about the importance of COVID-19 vaccination in pregnancy are essential for ensuring high vaccine uptake among pregnant women. Healthcare providers play a crucial role in counselling pregnant individuals about the safety and benefits of vaccination. It is important for pregnant women in India to consult with their healthcare providers to make informed decisions about COVID-19 vaccination based on their individual health status, risk factors, and preferences. Like with any vaccine, side effects are possible after COVID-19 vaccination, including maternal fever. Fever is a common side effect of COVID-19 vaccines, especially after the second dose and among younger individuals. The side effects of COVID-19 vaccination among pregnant women are generally similar to those experienced by the general population. These side effects are usually mild to moderate and resolve on their own within a few days. Many people experience some pain, redness, or swelling at the injection site after receiving a COVID-19 vaccine. This is a common side effect and typically resolves within a day or two. Feeling tired or fatigued is a common side effect reported by some. Headaches are another common side effect of COVID-19 vaccination. In pregnant women, fever after vaccination is generally mild and transient. Vaccine safety in pregnant women is a crucial consideration, especially regarding potential adverse effects such as maternal fever. Vaccination during pregnancy is recommended for certain diseases to protect both the pregnant woman and her baby, but safety concerns are carefully assessed. It is important to note that serious side effects from COVID-19 vaccination are rare. Pregnant women who experience severe or persistent side effects after vaccination should contact their healthcare provider for guidance. Additionally, pregnant women should seek medical attention if they experience any concerning symptoms after vaccination, such as difficulty breathing, swelling of the face or throat, or a severe headache that does not go away.

Overall, the pros of COVID-19 vaccination outweigh its cons in preventing COVID19 infection, including among pregnant

women. Pregnant women should discuss the potential benefits and risks of vaccination with their healthcare provider to make an informed decision based on their individual circumstances.

One of the studies suggested Amnioinfusion which is a medical procedure in which sterile fluid is infused into the amniotic cavity during labor or certain obstetric situations. It is primarily used to alleviate umbilical cord compression during labor or to dilute meconium-stained amniotic fluid. While amnioinfusion is not typically performed specifically to minimize maternal fever, it can indirectly contribute to fever management by addressing certain obstetric complications. Chorioamnionitis is a bacterial infection of the amniotic fluid and membranes, which can lead to maternal fever during labor. Meconium-stained amniotic fluid is associated with an increased risk of chorioamnionitis. Amnioinfusion may be used to dilute meconium-stained amniotic fluid, potentially reducing the risk of infection and subsequent maternal fever. In cases where there is concern for intrauterine infection, such as premature rupture of membranes (PROM) with suspected ascending infection, amnioinfusion may be considered to flush out potentially contaminated amniotic fluid, thereby reducing the risk of maternal fever associated with chorioamnionitis. In situations where umbilical cord compression is causing fetal distress during labor, amnioinfusion can help relieve pressure on the umbilical cord by increasing the volume of amniotic fluid. By improving fetal oxygenation and reducing the risk of fetal compromise, amnioinfusion may indirectly contribute to minimizing maternal fever related to obstetric complications.

Future prospects to improve Maternal care

Pregnancy-related fever is a frequently occurring symptom that can lead to a wide range of issues for both the mother and the fetus and newborn. There should be a focus on raising awareness of the need to prevent the common aetiologies of fever in order to avoid potentially fatal consequences for the fetus. Simple laboratory tests can help in early detection and treatment planning. Thus, enhancing health awareness and education as well as conventional infection control procedures in households, communities, and healthcare settings would be crucial in averting such unfavourable feto-maternal consequences.

Currently there is no therapy for epidural hyperthermia, and it is not easy to separate maternal hyperthermia from intrapartum infection. irrespective of whether the pregnant woman receives epidural analgesia, the therapy of intrapartum fever should be the same due to the potentially catastrophic effects of intrapartum infection for both the mother and the newborn. This covers the use of blood cultures, paracetamol, antibiotics, and supportive care. Furthermore, the newborn has to have cultures of their blood and C-reactive protein tests performed to assess for sepsis, and they should have empirical intravenous antibiotic treatment. Only in cases where there is proof of fetal compromise—such as an abnormal cardiotocogram—is an early birth recommended. Commonly occurring, epidural hyperthermia is becoming more well acknowledged for its detrimental effects, especially on the newborn.

It is impossible to distinguish epidural hyperthermia from other types of intrapartum hyperthermia, and there are currently no reliable therapies. Therefore, treating an epidural hyperthermia is similar to treating an intrapartum infection. To completely understand the effects and process of epidural fever (also maternal fever) and to create preventative and treatment plans, more study is required.

For the early diagnosis of neonatal sepsis, potential predictors such as newborn fever, birth weight, gender, and illness of the fetus, cervicovaginitis, and mother age should be discovered. In the future, prediction modelling approaches may be viewed as a novel method for clinician decision-making towards the diagnosis of the disease, if not as a stand-alone treatment. These approaches were able to identify promising maternal, neonatal, and the laboratory indicators in the swift identification of early and late neonatal sepsis.

In one of the research papers Transcervical amnioinfusion was suggested, the study should be furthermore explored. Transcervical amnioinfusion during labor is a straightforward, secure, and manageable process. It may be safely carried out to lower intrapartum operational intervention and lower fetal and maternal mortality in a setting with inadequate peripartum facilities, particularly in poor nations. Handling maternal fever during pregnancy requires careful evaluation and appropriate management to ensure the health and safety of both the mother and the developing fetus. If a pregnant woman develops a fever, especially if it is accompanied by other symptoms like chills, body aches, or unusual vaginal discharge, she should seek medical evaluation promptly. Engaging communities in health promotion initiatives focused on maternal health and infectious disease prevention can foster a culture of proactive healthcare-seeking behaviour among pregnant women. Community-based programs that provide education, support, and resources can empower women to take proactive steps to safeguard their health and mitigate the risk of maternal fever-related morbidity. Minimizing maternal morbidity due to maternal fever requires a comprehensive approach that encompasses preventive measures, early detection, prompt treatment, and ongoing monitoring.

CONCLUSION

This research can assist us in determining birth outcomes whether there may be a connection between maternal fever and an increased risk of miscarriage, growth retardation, preterm birth, or birth abnormalities. Chorioamnionitis, also known as intra-amniotic infection, Infants born to mothers with chorioamnionitis are at higher risk of neonatal sepsis, as they may be exposed to infected amniotic fluid during birth. In severe cases, chorioamnionitis can lead to maternal sepsis, a life-threatening condition characterized by systemic inflammation and infection.

Ultimately, the management of maternal fever during pregnancy should be tailored to the individual's specific circumstances and the underlying cause of the fever. Close communication with a healthcare provider is key to ensuring appropriate care and monitoring throughout the pregnancy (gynecology & 1993, n.d.). In India, maternal fever management involves a multidisciplinary approach, including obstetricians, infectious disease specialists, and nurses, to ensure optimal care for both the mother and the unborn child. Timely diagnosis, appropriate treatment, and close monitoring are essential to minimize complications and promote maternal and fetal well-being.

Investing in research to develop novel therapies and interventions for maternal feverrelated complications can expand treatment options and improve outcomes for pregnant women. This includes exploring alternative approaches such as

immunomodulatory therapies or targeted antimicrobial agents that are safe and effective during pregnancy Enhancing access to quality prenatal care and educational resources for pregnant women can help identify risk factors for maternal fever early on and provide guidance on preventive measures (Kim et al., n.d.). This includes educating women about the importance of vaccinations, hygiene practices, and seeking medical attention promptly for any symptoms of infection. Continued research and development in diagnostic technologies, such as point-of-care testing for infectious pathogens, can facilitate rapid and accurate diagnosis of the underlying causes of maternal fever. Innovative diagnostic tools can enable healthcare providers to initiate appropriate treatment promptly, thereby reducing maternal morbidity. By addressing these future scope areas and implementing evidence-based strategies, healthcare systems can work towards minimizing maternal morbidity associated with maternal fever, ultimately improving maternal and neonatal outcome (K. Simonsen et al., n.d.)

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