

# ISRG JOURNAL OF CLINICAL MEDICINE AND MEDICAL RESEARCH [ISRGJCMR]



OPEN ACCESS



**ISRG PUBLISHERS**

Abbreviated Key Title: ISRG J Clinic.Medici.Medica.Res.

ISSN: 3048-8850 (Online)

Journal homepage: <https://isrgpublishers.com/cmmr/>

Volume – II, Issue -I (January- February) 2025

Frequency: Bimonthly



## Examination of intrauterine infections and maternal traits during delivery by Dr. H. Abdul Moeloek Provincial General Hospital in Lampung for 2024

Prambudi Rukmono<sup>1\*</sup>, Hotmen Sijabat<sup>2</sup>

<sup>1,2</sup> Doctor Profession Study Program, Faculty of Medicine, University Lampung

| **Received:** 03.01.2025 | **Accepted:** 07.01.2025 | **Published:** 12.01.2025

\*Corresponding author: Prambudi Rukmono

Doctor Profession Study Program, Faculty of Medicine, University Lampung

### Abstract

*Intrauterine infection is a grave health concern that can adversely affect pregnancy outcomes, including foetal growth, preterm birth, and the risk of severe neonatal infection. This study was conducted by Dr. H. Abdul Moeloek Regional General Hospital in Lampung Province examined the prevalence of intrauterine infections and maternal characteristics in 2024. An observational analytical method with a cross-sectional approach was employed, involving 76 respondents who met the inclusion criteria from medical records. The findings revealed that the majority of the mothers were housewives with low educational attainment, potentially contributing to a lack of reproductive health knowledge. The average maternal age was 30.6 years, with an average of 2.3 children and a mean birth weight of 2455 g. Approximately 50% of respondents experienced intrauterine infection, with the proportion of caesarean deliveries reaching 60.5%. Pathogen transmission mechanisms, including the transplacental and genital routes, were identified as the primary contributors to infection risk. This study highlights the importance of targeted health education interventions to enhance public understanding of intrauterine infections and their impact on maternal and infant health. Collaborative efforts between healthcare professionals and the community should be strengthened to reduce the incidence of intrauterine infections, improve pregnancy outcomes, and decrease neonatal mortality rates in the region. This study is expected to contribute significantly to clinical practices and health policies in Indonesia.*

**Keywords:** Infection, Intrauterine, Pregnancy, Neonates, Education.

## Introduction

Pregnancy is a vital stage in a woman's life and is characterised by substantial physiological changes in the body. This process involves crucial adaptations of various organ systems in the female body to support foetal development. However, alongside these adaptations, there is also an increase in physical vulnerability that may lead to diverse health risks for both the mother and the foetus. (Aprilia, 2020) Intrauterine infection, an acute condition affecting the uterus, placenta, fetal membranes, and umbilical cord, is considered one of the risk factors (Chen & Gur, 2019). Pregnant women experiencing this infection often exhibit common symptoms, such as prolonged fever, abdominal pain, bleeding, fluid discharge, and preterm labour (Abdullah & Duhita, 2023). Furthermore, intrauterine infection can lead to various serious foetal conditions, including premature birth, low birth weight, developmental abnormalities, congenital diseases, and persistent neonatal infections (Dadwal & Bhatt, 2020).

Intrauterine infection is a global concern, accounting for 45% of neonatal deaths (Tursunbayevna, 2022). Indonesia's neonatal mortality rate is 13 per 1,000 live births, the highest in ASEAN countries after Myanmar and Laos (UNICEF, 2024). The primary causes of neonatal mortality in Indonesia include intrapartum complications (28.3%), respiratory and cardiovascular disorders (21.3%), low birth weight and prematurity (19%), congenital abnormalities (14.8%), neonatal tetanus (1.2%), infections (7.3%), and others (8.2%) (Kementrian Kesehatan Indonesia, 2019). The Lampung Provincial Health Office reported 471 neonatal deaths in 2021, showing fluctuations over the past three years. In 2018, there were 434 cases, which decreased to 404 in 2019, before rising again to 471 in 2020 (Dinas Kesehatan Provinsi Lampung, 2021). Asphyxia is the second leading cause of neonatal death in Bandar Lampung (Dinas Kesehatan Bandar Lampung 2021). Dr. H. Abdul Moeloek Regional General Hospital serves as the main referral hospital in Lampung Province, handling severe and complex medical cases (Dinas Kesehatan Provinsi Lampung, 2022). Preliminary survey by Dr. H. Abdul Moeloek Regional General Hospital recorded 62 cases of intrauterine infections among 651 deliveries.

Research conducted by Nur et al. (2019) at RSUP Dr. Hasan Sadikin Bandung revealed a significant correlation between intrauterine infections, such as premature rupture of membranes (PROM), and neonatal outcomes, including Low Birth Weight (LBW) and APGAR scores (Appearance, Pulse, Grimace, Activity, and Respiration). The study found that 66.67% of mothers with PROM gave birth to low birth weight infants and 56.67% had babies with low APGAR scores (Nur et al., 2019). Additional research indicates that intrauterine infections can be caused by TORCH (Toxoplasma, Other, Rubella, Cytomegalovirus, Herpes simplex). In the United States, TORCH infections in neonates frequently result in low birth weight, premature birth, stillbirth, and developmental disorders, which may have long-term effects on infant life (Lynn et al., 2023). In line with these findings, Guo et al. (2023) demonstrated that intrauterine infections significantly affect the incidence of LBW and prematurity in neonates (Guo et al., 2023). A study at the Cipto Mangunkusumo Hospital by Indarti et al. (2022) emphasised the importance of birth weight, APGAR scores, and neonatal complications as key indicators in assessing neonatal outcomes. These indicators reflect the impact of infections and maternal health during pregnancy on newborn health and are crucial for managing the risk of neonatal mortality (Indarti et al., 2022).

The World Health Organization (WHO) reports that, over the past decade, the survival rate of low-birth-weight infants has remained a significant concern. Neonates with low birth weight face a mortality risk 2-10 times higher than that of full-term babies (World Health Organization, 2024). Previous research has indicated that intrauterine infections substantially affect low birth weight and neonatal prematurity (Guo et al., 2023). Preterm infants born with intrauterine infections often exhibit inadequate protective responses, potentially leading to hypoxic-ischaemic damage and intrauterine growth restriction (IUGR). These conditions directly and negatively affect infant birth weight and overall health (Bulat et al., 2019) (Guo et al., 2023).

While numerous studies have investigated the impact of maternal infections on the health of mothers and infants, there is a lack of research examining the relationship between intrauterine infections in pregnant women and birth outcomes in Lampung Province. Most previous studies have concentrated on specific infections without providing a comprehensive overview of the overall effects of intrauterine infections, given the high incidence of infections in Lampung Province and the significant number of serious intrauterine infections in the Dr. H. Abdul Moeloek Regional General Hospital; a thorough investigation at this hospital is necessary. This study is expected to contribute to clinical practice and support efforts to enhance the prevention and management of intrauterine infections in Indonesia.

The research question derived from the aforementioned background is as follows: What is the portrayal of Intrauterine Infection and the characteristics of women in labour at Dr. H. Abdul Moeloek Regional General Hospital in Lampung Province in 2024? The general objective is to ascertain the depiction of Intrauterine Infection and the attributes of women giving birth at the Dr. H. Abdul Moeloek Regional General Hospital in Lampung Province in 2024.

## Methodology

This study employed an analytical observational method using a cross-sectional approach. Cross-sectional research is an observational study in which data are collected simultaneously or at a single point in time. (Herdiani, 2021) The study used secondary data from the medical records of intrauterine infections in pregnant women and their delivery outcomes at the Regional General Hospital. Dr. H. Abdul Moeloek, Lampung Province.

The research data and sample comprised 651 pregnant women with intrauterine infection status recorded in medical records from January 2023 to December 2023, meeting the inclusion and exclusion criteria. The sample size was determined using the unpaired categorical analytic sample size formula, resulting in 34 case samples. An additional 10% was added to account for potential dropouts, yielding 38 case samples and 38 controls for a total of 76 samples. The Inclusion criteria encompassed all pregnant patients admitted and delivered during the study period, Dr. H. Abdul Moeloek Regional General Hospital, with known intrauterine infection status, and live-born infants with recorded birth weights. Exclusion criteria involved patients with unclear or incomplete medical records. The independent variable was intrauterine infection in pregnant women, while the dependent variable was the outcome of newborn birth weight at Dr. H. Abdul Moeloek Regional General Hospital. Analysis and processing were performed using the chi-squared test with  $\alpha=0.05$ .

## Results and Discussion

Intrauterine infection is a pathological condition characterised by the entry of infectious agents into the intrauterine space during pregnancy, affecting the uterus, placenta, foetal membranes, and umbilical cord. The intrauterine environment serves as a complex ecosystem that provides physiological necessities such as nutrients, oxygen, and hormones for foetal development, and plays a crucial role as an early immune defense mediator. These structures form a biological barrier that shields the foetus from infection while enabling the transfer of essential substances from the mother to the foetus through various mechanisms, including transplacental exchange (Chen & Gur, 2019).

Intrauterine infections often occur due to the migration of pathogens from the maternal body to the intrauterine compartment via transplacental routes, ascending from the genital tract, or exposure during labour and the early neonatal period. Pathogens, such as bacteria, viruses, or parasites, can trigger immune and inflammatory responses in both the mother and foetus. This inflammatory response can cause tissue damage, impair placental function, and hinder foetal growth and development. The clinical consequences of intrauterine infection can vary, ranging from impaired foetal growth and premature birth to severe neonatal complications such as sepsis or asphyxia (Chen & Gur, 2019).

Table 1 Sample Characteristic Statistics

Description	Minimum	Maximum	Mean
Mother's age at birth	16 years	45 years	30,6 years
Number of children	1 child	6 children	2,3 children
Gestational age	23 months	42 months	35 months
Baby weight at birth	1.500gr	4000gr	2455gr

Table 1 presents the statistical data on the demographic characteristics of the mothers and their newborns. The maternal age ranged from 16 to 45 years, averaging 30.6 years. The mean number of children per mother was 2.3, ranging from one to six offspring. The average gestational age was 35 months, while birth weight fluctuated between 1,500 and 4,000 g, with a mean of 2,455 g.

Tabel 2 Statistik Deskriptif Sampel

Description	n	Percent
<b>Mother's Occupation</b>		
Working	8	10.5
Housewife	68	89.5
<b>Mother's Education</b>		
Less than 9 years	40	52.6
Mandatory 9 years	36	47.4
<b>Risk Age</b>		
High Risk	22	28.9
Low Risk	54	71.1

Description	n	Percent
<b>Status of Intrauterine Infection</b>		
Yes	38	50.0
No	38	50.0
<b>Method of Delivery</b>		
Sectio	46	60.5
Spontaneous	30	39.5
<b>Baby's Gender</b>		
Male	46	60.5
Female	30	39.5
<b>Birth Weight</b>		
Low Birth Weight (<2,500g)	36	47.4
Normal Birth Weight (>2,500g)	40	52.6
<b>Number of Children</b>		
1 child	21	27.6
2 children	24	31.6
3 children	18	23.7
4 children	9	11.8
5 children	3	3.9
6 children	1	1.3
<b>Total</b>	<b>76</b>	<b>100.0</b>

Table 2 provides a comprehensive overview of the maternal characteristics and birth conditions of the 76 study participants. The majority (89.5%) were housewives, with only 10.5% employed. Educational attainment was low for 52.6% of mothers with less than 9 years of schooling, suggesting potential challenges in accessing health information. While most mothers (71.1%) belonged to the low-risk age category, 28.9% were considered high-risk, necessitating additional attention. The intrauterine infection status was evenly distributed, affecting 50% of the cases. Caesarean section was the predominant delivery method (60.5%), with male infants constituting the majority (60.5%). Birth weight varied, with 52.6% of the babies weighing over 2,500 g. Regarding parity, 31.6% of respondents had two children, with family sizes ranging from one to six.

The intrauterine infection profile of Dr. H. Abdul Moeloek Regional General Hospital in Lampung Province for 2024 revealed crucial demographic and clinical criteria for understanding maternal and infant health conditions. The average maternal age at delivery was 30.6 years, ranging from 16 to 45 years, reflecting age group diversity. This is significant, as advanced maternal age is often linked to an increased risk of pregnancy complications, including intrauterine infections (Khadijah et al., 2021).

The mean number of children was 2.3, indicating that most of the mothers in this study had more than one child. This finding suggests that prior knowledge and experience in pregnancy care may influence infection prevention (Junaidi et al., 2020). Gestational age varied between 23 and 42 months (average, 35 months), indicating extended intervals in pregnancy planning that could affect maternal health status.

An average birth weight of 2455 g, ranging from 1500 to 4000 g, highlights a high risk for low birth weight (LBW) infants. Previous studies have shown that LBW is closely associated with intrauterine infections, potentially increasing neonatal morbidity and mortality (Rahmawati *et al.*, 2023). Considering these factors, it is crucial for healthcare institutions to emphasize educational programs and infection prevention during pregnancy and provide appropriate interventions to enhance maternal and infant health outcomes. (Nelson *et al.*, 2022)

Among the 76 respondents, 89.5% were housewives, which could influence their access to and understanding of reproductive health and infection risks. The high proportion of mothers with less than nine years of education (52.6%) highlights the need to enhance maternal and neonatal health education, potentially contributing to the prevention of intrauterine infections. (Nelson *et al.*, 2022)

Of the mothers, 28.9% were in the high-risk age group and 71.1% were in the low-risk category, indicating that most mothers had safer risk factors. However, intrauterine infection status was evenly distributed, with 50% of patients experiencing infection, suggesting the need for special attention to causative factors. Caesarean section was the predominant delivery method (60.5%), possibly related to medical indications to avoid complications such as infection. (Cummins, 2022)

Regarding birth weight, 47.4% of the infants were classified as having low birth weight, a condition potentially arising from intrauterine infection, emphasising the importance of appropriate monitoring and intervention. Additionally, 52.6% of the babies were born with normal weight (>2,500 g), offering hope for neonatal health outcomes. The number of children per mother showed that 31.6% of the respondents had two children, which could influence their experience and knowledge in maintaining a healthy pregnancy. Given these data, collaborative efforts between health care professionals and the community are necessary to reduce the incidence of intrauterine infections and improve maternal and infant health in the region. (Maru *et al.*, 2018)

The pathogens causing intrauterine infections include over 27 types of bacteria, various viruses, six types of fungi, four types of protozoa, and rickettsia. Among the causative agents of intrauterine infections, TORCH group of pathogens is the most common and significant. TORCH pathogens can be transmitted from mother to foetus through their ability to cross the placental barrier, causing congenital infections in the foetus, potentially leading to serious complications during pregnancy (Mohammed *et al.*, 2023). TORCH is an acronym that includes *Toxoplasma gondii*, Other (such as *Treponema pallidum*, varicella-zoster, and parvovirus B19), Rubella, Cytomegalovirus (CMV), and Herpes Simplex Virus (HSV). These pathogens are microorganisms with teratogenic effects, including parasites, bacteria, and viruses. (Hon *et al.*, 2020)

The protozoan *Toxoplasma gondii* can cause maternal infection, typically by ingesting raw or undercooked meat contaminated with cysts (bradyzoites) or by contact with cat faeces containing oocysts. Upon entering the digestive tract, oocysts or bradyzoites migrate to the lymphatic and blood systems and potentially reach the placenta. *T. gondii* surface adhesion molecules, such as profilin and adhesin, bind to proteoglycans on trophoblastic cell surfaces. Following adhesion, *T. gondii* secretes recombinant proteins that alter the structure and function of trophoblastic cell plasma membranes, facilitating invasion and penetration. After breaching the placental barrier, *T. gondii* can infect various foetal organs, including the central nervous system. (Kannan *et al.*, 2021)

Rubella, caused by the Rubella RNA virus, is transmitted via respiratory droplets from infected individuals. After the initial infection, the virus spreads through the bloodstream throughout the body, including the placenta. Rubella virus can compromise placental barrier integrity through inflammation-mediated damage to the syncytiotrophoblast layer, a protective barrier between the maternal and foetal blood. This damage may allow pathogens to enter foetal circulation. Congenital infection by this virus can result in congenital Rubella syndrome, with effects such as heart defects, hearing impairment, and retinopathy. (Ray, 2021)

CMV, a member of the Herpesviridae family, is a DNA virus that can be transmitted through various bodily fluids including saliva, urine, and blood. Maternal infection can occur through contact with infected bodily fluids or sexual intercourse. CMV can penetrate the placental barrier by targeting trophoblastic cells, particularly cytotrophoblasts. Although antibodies against CMV may be present, they do not always prevent its transmission. CMV causes foetal infections with potential impacts, including hearing disorders, brain damage, and vision problems. (Waters *et al.*, 2019)

HSV, including HSV-1 and HSV-2, can cause genital infections through sexual contact or the reactivation of latent infections. These viruses can enter the maternal body through genital tract lesions and spread through the blood circulation. Infection can be transmitted to the foetus transplacentally, although this is less common than perinatal infection. During childbirth, infants may be exposed to the virus through direct contact with active genital lesions on the mother, potentially leading to infections of the skin, eyes, and the central nervous system. Herpes Simplex Virus (HSV) can infect immune cells in the decidua, the modified endometrial layer during pregnancy, and disrupt placental barrier function. (Scott *et al.*, 2018; Mate *et al.*, 2021)

*Treponema pallidum* is a spiral bacterium that causes syphilis, a sexually transmitted infection that can pass from mother to baby. Infection of the mother generally occurs through sexual contact with an infected individual, where these bacteria enter the body through lesions or sores in the genital tract. After initial infection, *Treponema pallidum* spreads through the lymphatic system and bloodstream, reaching the placenta. The mechanism of spread to the fetus involves transplacental, where these bacteria penetrate the placental barrier and infect the fetus through the mother's blood circulation. This infection can lead to congenital syphilis, which includes serious complications such as organ damage, developmental disorders, and a high risk of fetal death. (Gilroy and Salazar, 2017)

Varicella-zoster virus (VZV) causes chickenpox (varicella) and shingles. This virus can be transmitted to the foetus during pregnancy, particularly if the mother experiences a primary infection in the early trimester. VZV spreads through respiratory droplets or through direct contact with skin lesions. Following maternal infection, the virus circulates in the bloodstream and breaches the placental barrier. Foetal infection may result in congenital varicella syndrome, characterised by birth defects such as limb abnormalities, skin defects, and ocular disorders. Perinatal infection can occur if the mother has an active infection during delivery, risking chickenpox in newborns and serious complications such as pneumonia. ( *et al.*, 2023)

Parvovirus B19, which causes the fifth disease in children, is a DNA virus capable of causing congenital infection when mothers are infected during pregnancy. Maternal infection typically occurs through contact with infected bodily fluids such as saliva or blood,

especially in individuals with active infections. Postinfection, parvovirus B19 circulates in the bloodstream and infects and damages erythrocyte precursor cells in the bone marrow. The virus can cross the placenta and infect the foetus, leading to foetal anaemia, hydrops fetalis, and miscarriage. In severe cases, foetal infections can result in foetal death and other serious complications in newborns (Megli & Coyne, 2022).

Intrauterine infections can occur through various mechanisms involving pathogen transmission from mother to foetus. In transplacental transmission, pathogens such as *Toxoplasma gondii* and cytomegalovirus (CMV) can penetrate the placental barrier by traversing the placental endothelium or trophoblastic tissue, specifically the syncytiotrophoblast (STB). The STB covers the entire surface of chorionic villi and has a fused nature, providing a strong barrier against microbial transmission. However, in cases of infection, the pathogens can breach this barrier. Upon entering the placenta, pathogens can replicate in trophoblast cells, spread to the placental tissue, and directly infect the foetus. This pathogen replication can cause cellular damage, disrupt placental function, and potentially lead to foetal developmental disorders or premature birth. (Mate *et al.*, 2021)

Placental disruption during intrauterine infections can cause inflammation and damage placental tissue, resulting in structural and functional disruption. Syncytiotrophoblast (STB), which lines the chorionic villi and serves as the primary barrier, may be damaged by infection or inflammation, interfering with nutrient and oxygen exchange between the mother and the foetus. Damage to the cytotrophoblast, the trophoblast layer beneath the STB, can affect the formation and development of chorionic villi, thereby reducing blood flow efficiency and nutrient delivery. Disruption of these tissues allows *Toxoplasma gondii* to infiltrate the foetus. Disruption of the extra-villous trophoblast (EVT) can lead to the entry of cytomegalovirus pathogens. (Bourli *et al.*, 2023)

Maternal-foetal haemorrhage, also known as foetal-maternal bleeding or the mixing of maternal and foetal blood, can contribute to intrauterine infections. This may result from placental trauma or compromised integrity, leading to intermingling of foetal and maternal blood. If the mother's blood is infected, pathogens can be transferred to the foetus, causing infection. For instance, maternal Parvovirus B19 infection might impact foetal red blood cell production and disrupt foetal circulation in cases of maternal-foetal bleeding. (Eric and Weinstein, 1998)

Intrauterine infections can also arise through pathogen transmission across foetal membranes such as the amnion and chorion. Certain bacteria or parasites may reach the amniotic space and affect the foetus through direct contact or via the amnion. Such infections can lead to amnionitis and inflammation of the membranes enveloping the foetus, which may influence foetal development and elevate the risk of complications, such as premature birth and systemic infections. (Duminica-Turcu *et al.*, 2021)

Another mechanism affecting the foetus involves the genital tract, which plays a role in transmitting pathogens, such as Herpes Simplex Virus (HSV), during childbirth. This infection occurs when the infant passes through an infected maternal birth canal, directly exposing the newborn to pathogens and potential systemic or localised infections. Sexual transmission can also serve as a mechanism for intrauterine infection, although it is less common than other routes. Pathogens such as *Treponema pallidum*, the causative agent of syphilis, can be transmitted from the mother to

the foetus via the bloodstream, often during primary or secondary maternal infections. Congenital syphilis can lead to various foetal complications, including birth defects, organ damage, and foetal death. (Gilroy and Salazar, 2017)

## Conclusion

This study was conducted on intrauterine infections by Dr. H. Abdul Moeloek Regional General Hospital in Lampung Province highlights the significance of understanding risk factors and causative pathogens during pregnancy. Intrauterine infections are grave conditions that may lead to complications in both the mother and foetus, including growth restriction, preterm birth, and severe neonatal infections. The findings revealed that most respondents were housewives with limited education, potentially impacting maternal health knowledge. Average maternal age, number of children, and birth weight are crucial indicators of reproductive health in this region. Infection transmission mechanisms, whether transplacental or via the genital tract, require careful consideration to minimise the risks. Collaborative efforts between health care professionals and the community are essential to educate and prevent intrauterine infections, enhance maternal and infant health, and reduce the incidence of potential complications.

## REFERENCES

1. Abdullah, V.I. and Duhita, F. (2023) 'Edukasi Dan Deteksi Dini Infeksi Saluran Kemih Pada Ibu Hamil', *JMM (Jurnal Masyarakat Mandiri)*, 7(3), p. 2653. Available at: <https://doi.org/10.31764/jmm.v7i3.14949>.
2. Aprilia, W. (2020) 'Perkembangan pada masa pranatal dan kelahiran', *Yaa Bunayya : Jurnal Pendidikan Anak Usia Dini*, 4(1), pp. 40–55.
3. Bourli, P. *et al.* (2023) 'Waterborne transmission of protozoan parasites: A review of worldwide outbreaks - an update 2017-2022', *Journal of Water and Health*, 21(10). Available at: <https://doi.org/10.2166/wh.2023.094>.
4. Bulat, L.M. *et al.* (2019) 'Some age-related features of intrauterine infection in premature infants', *Reports of Vinnytsia National Medical University*, 23(4), pp. 638–644. Available at: [https://doi.org/10.31393/reports-vnmedical-2019-23\(4\)-14](https://doi.org/10.31393/reports-vnmedical-2019-23(4)-14).
5. Chen, HJ, & Gur, T. (2019) 'Version of Record: <https://www.sciencedirect.com/science/article/pii/S0166223619300426>', *Intrauterine microbiota: missing, or the missing link?* [Preprint].
6. Cummins, N.W. (2022) 'Metabolic Complications of Chronic HIV Infection: A Narrative Review', *Pathogens*, 11(2), pp. 4–8. Available at: <https://doi.org/10.3390/pathogens11020197>.
7. Dadwal, V. and Bhatt, R.K. (2020) 'Intrauterine Fetal Infections: Do-Able Approaches', *Journal of Fetal Medicine*, 07(01), pp. 5–8. Available at: <https://doi.org/10.1007/s40556-020-00252-9>.
8. Dinas Kesehatan Provinsi Lampung (2022) 'Profil Kesehatan Kota Bandar Lampung', *Angewandte Chemie International Edition*, 6(11), 951–952., p. 27.
9. Dinkes (2021) 'Profil Kesehatan Kota Bandar Lampung Tahun 2021', *Dinas Kesehatan Pemerintah Kota Bandar Lampung*, p. 182.
10. Duminica-Turcu, A. *et al.* (2021) 'Parvovirus infection and pregnancy', *Romanian Journal of Infectious*

- Diseases*, 24(supp). Available at: <https://doi.org/10.37897/RJID.2021.S.8>.
11. Eric, L. and Weinstein, L. (1998) 'Unexpected Second Trimester Pregnancy Loss Due to Maternal Parvovirus B19 Infection', *Lowden, Eric; Weinstein, Louis*, 53(4), pp. 205–206.
  12. Gilroy, M.N. and Salazar, J.C. (2017) 'Syphilis (*Treponema pallidum*)', *Congenital and Perinatal Infections*. Edited by J.S. Read and M.R. Schleiss. Oxford University Press, p. 0. Available at: <https://doi.org/10.1093/med/9780190604813.003.0021>.
  13. Guo, X., Wang, Y. and Yu, H. (2023) 'Relationship between placental pathology and neonatal outcomes', *Frontiers in Pediatrics*, 11(June), pp. 1–8. Available at: <https://doi.org/10.3389/fped.2023.1201991>.
  14. Herdiani, F.D. (2021) 'Penerapan Oracle Enterprise Architecture Development (OADP) Dalam Perancangan Arsitektur Sistem Informasi Manajemen Aset Properti: Studi Kasus PT. Pos Properti Indonesia', *Jurnal Ilmiah Ilmu Terapan Universitas Jambi*, 5(1), pp. 31–38. Available at: <https://doi.org/10.22437/jiutuj.v5i1.12886>.
  15. Hon, K.L. *et al.* (2020) 'Congenital infections in hong kong: Beyond torch', *Hong Kong Medical Journal*, 26(4), pp. 323–330. Available at: <https://doi.org/10.12809/hkmj208398>.
  16. Indarti, J. *et al.* (2022) 'Maternal and Neonatal Characteristics and its Contact Tracing of Covid-19 in Pregnancy in Cipto Mangunkusumo General Hospital', 10(2).
  17. Kannan, G. *et al.* (2021) 'Acquisition of Host Cytosolic Protein by *Toxoplasma gondii* Bradyzoites', *mSphere*, 6(1). Available at: <https://doi.org/10.1128/msphere.00934-20>.
  18. Kemenkes RI (2019) 'Lakip Kesga 2021'.
  19. Ledingger, D., Nußbaumer-Streit, B. and Gartlehner, G. (2024) *WHO Recommendations for Care of the Preterm or Low-Birth-Weight Infant*, *Gesundheitswesen*. Available at: <https://doi.org/10.1055/a-2251-5686>.
  20. Lynn, M.K. *et al.* (2023) 'TORCH Congenital Syndrome Infections in Central America's Northern Triangle', *Microorganisms*, 11(2), pp. 1–18. Available at: <https://doi.org/10.3390/microorganisms11020257>.
  21. Maru, S. *et al.* (2018) 'An integrated community health worker intervention in rural Nepal: A type 2 hybrid effectiveness-implementation study protocol', *Implementation Science*, 13(1). Available at: <https://doi.org/10.1186/s13012-018-0741-x>.
  22. Mate, A. *et al.* (2021) 'Impact of maternal nutrition in viral infections during pregnancy', *Biochimica et Biophysica Acta - Molecular Basis of Disease*, 1867(11). Available at: <https://doi.org/10.1016/j.bbadis.2021.166231>.
  23. Megli, C.J. and Coyne, C.B. (2022) 'Infections at the maternal–fetal interface: an overview of pathogenesis and defence', *Nature Reviews Microbiology*, 20(2), pp. 67–82. Available at: <https://doi.org/10.1038/s41579-021-00610-y>.
  24. Mohammed, M., Al-Saadi, M.S. and Al-Karawi, A.S. (2023) 'An examination of the seroprevalence of torch infections and their correlation with adverse reproductive outcomes in females exhibiting a bad obstetric history', *Indian Journal of Microbiology Research*, 10(4), pp. 209–215. Available at: <https://doi.org/10.18231/j.ijmr.2023.037>.
  25. Nelson, H.D. *et al.* (2022) 'Associations of Unintended Pregnancy With Maternal and Infant Health Outcomes: A Systematic Review and Meta-analysis', *JAMA*, 328(17), pp. 1714–1729. Available at: <https://doi.org/10.1001/jama.2022.19097>.
  26. Nur, R. *et al.* (2019) 'Hubungan Karakteristik Maternal dan Luaran Neonatus Kasus Ketuban Pecah Dini di RSUP Dr. Hasan Sadikin Bandung: Studi Kasus-Kontrol Maternal Characteristics and Neonatal Outcomes of Premature Rupture of Membranes Cases in a Tertiary Hospital in West Java', *201 Indonesian Journal of Obstetrics & Gynecology Science*, pp. 2615–496.
  27. Ray, S. (2021) 'Congenital rubella syndrome-A meta-analysis', *International Journal of Pediatrics and Neonatology*, 3(1), pp. 22–24.
  28. Scott, K. *et al.* (2018) 'What do we know about community-based health worker programs? A systematic review of existing reviews on community health workers', *Human Resources for Health*. Available at: <https://doi.org/10.1186/s12960-018-0304-x>.
  29. Tursunbayevna, O.N. (2022) 'Results Of Newborn Tests With Intrauterine Infection Ortikboeva Nilufar Tursunbayevna Assistant Of The Department Of № 1 Pediatrics And Neonatology , Samarkand State Medical University , Uzbekistan Sirojiddinova Khiromon Nuriddinovna Assistant Candidate O', pp. 290–294.
  30. United Nations Children's Fund (UNICEF) (2024) *The Demographic and Health Surveys (DHS) Program, ICF, Levels & Trends in Child Mortality*.
  31. Waters, S. *et al.* (2019) 'The detection of CMV in saliva can mark a systemic infection with CMV in renal transplant recipients', *International Journal of Molecular Sciences*, 20(20). Available at: <https://doi.org/10.3390/ijms20205230>.
  32. *et al.* (2023) 'Varicella Zoster Virus (VZV) Infection: A Comprehensive Review of Chickenpox', *International Journal of Medical Science and Clinical Research Studies*, 03(10), pp. 2479–2484. Available at: <https://doi.org/10.47191/ijmscrs/v3-i10-67>.