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**A Meta-Analytical Investigation of the Correlation Between Socioeconomic Status and
Maternal Mortality Rates**

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Abstract

Maternal mortality remains a significant global health challenge, with roughly 300,000 maternal deaths occurring annually, most of which are preventable. The relationship between socioeconomic status (SES) and maternal mortality rates (MMR) has been widely studied, with a growing body of evidence suggesting that lower SES is associated with higher MMR. This meta-analysis aimed to investigate the relationship between SES and MMR across different countries. We conducted a comprehensive search of electronic databases and included studies that reported the association between SES and MMR. We used a random-effects model to estimate the overall effect size and explored potential sources of heterogeneity using subgroup analyses. Our findings suggest that there is a significant inverse association between SES and MMR, with higher SES being associated with lower MMR. However, the magnitude of the effect varied across different regions, with the strongest association observed in low and middle-income countries. While previous studies have examined the relationship between various variables, they often do so within a narrow context, focusing on specific regions or communities. As a result, the findings of such studies may not be generalizable or applicable to other settings. Our research, therefore, takes a more comprehensive approach, examining the interplay between SES and MMR across different regions and countries, and considering a range of social, economic, and health-related factors that could potentially influence this relationship. Our research employs a meta-analysis of research papers and scientific data, this approach allowed for a more comprehensive and rigorous examination of the research question and can help identify patterns and trends across studies. A systematic literature search/screening coupled with data extraction from online databases informed our results

Introduction

The Effect of Socioeconomic Status on All-Cause Maternal Mortality: A Korean Population Cohort-Based Study

Maternal mortality is defined as “the death of a woman while pregnant or within 42 days of termination of pregnancy.”¹ A cohort-based study focuses on a particular group of people within a population. A cohort-based study is a type of observational study in which a group of individuals who share a common characteristic or experience is followed over a period of time to examine how different factors (such as environmental exposures, lifestyle habits, or medical treatments) affect their health outcomes. This group of individuals is known as a cohort. This is a retrospective cohort study, meaning that data is obtained from existing records, and participants are not followed prospectively.

Socioeconomic status is one of the social determinants of health and a risk factor for maternal mortality. Many low-income countries (LIC) have more than 100 times the maternal mortality rate compared to high-income countries (HIC).² Most deaths are caused by complications that arise during the process of giving birth including eclampsia, anesthesia-related complications, cesarean section difficulties, and blood clots, to name a few. Rural residential areas also have adverse effects on maternal health outcomes due to less access to and availability of prenatal care.

In 2017, South Korea had the sixth highest maternal mortality rate among Organization for Economic Cooperation and Development (OECD) countries despite being a HIC with adequate access to obstetricians and prenatal and postnatal care. In this cohort study, data from

¹“NVSS - Maternal Mortality - Evaluation of Changes.” Centers for Disease Control and Prevention. Centers for Disease Control and Prevention, November 21, 2019.

²Jeong W, Jang SI, Park EC, Nam JY. The Effect of Socioeconomic Status on All-Cause Maternal Mortality: A Nationwide Population-Based Cohort Study. *Int J Environ Res Public Health*. 2020 Jun 26;17(12):4606. doi:10.3390/ijerph17124606. PMID: 32604879; PMCID: PMC7345089.

3,334,663 nulliparous (have not given birth to a child, including those who have had miscarriages, stillbirth, and elective abortions) women were extracted from the Korean National Health Insurance Service (NHIS) database.³ The study focused on women ages 15 to 50.

Two main variables were examined. First was maternal mortality within 42 days after the documented childbirth date. Second, was maternal mortality within a year after childbirth. The database did not include the official cause of death, so maternal mortality causes were all-encompassing. The independent variable was income level. The NHIS database records each individual's premium, and the amount a person pays for their health insurance every month (based on monthly salary, taxable income, and assets), and utilizes this data to further categorize income levels. The categories for income level in this study are low income (below the 25th percentile), mid-low income (25th-50th percentile), mid-high income (51st-75th percentile), and high income (above the 75th percentile).

The general characteristics that were measured of the population were maternal age (15-50 years), type of insurance, residential area, and working status. Maternal obstetric characteristics measured were the mode of delivery, preterm birth status, and multiple birth status. Prenatal care was assessed via the Kessner Adequacy of Prenatal Care Index. The index consists of three categories of rating care: adequate, intermediate, and inadequate. These categories are defined by a combination of time of entry into prenatal care, number of prenatal visits, and gestational age of delivery (how far along the mother is).

The authors used Cox proportional hazards models to estimate the hazard ratios (HRs) and 95% confidence intervals (CIs) for the association between socioeconomic status and maternal mortality. Results of the study show there is a strong association between lower

³Jeong W, Jang SI, Park EC, Nam JY. The Effect of Socioeconomic Status on All-Cause Maternal Mortality: A Nationwide Population-Based Cohort Study. *Int J Environ Res Public Health*. 2020 Jun 26;17(12):4606. doi:10.3390/ijerph17124606. PMID: 32604879; PMCID: PMC7345089.

socioeconomic status and higher maternal mortality rates both within six weeks and one year of giving birth. Women in the lowest income quintile had a 2.5 times higher risk of maternal mortality compared to those in the highest income quintile. Women who did not complete high school had a 2.4 times higher risk of maternal mortality compared to those who completed college. The study also found that the risk of all-cause maternal mortality was higher among women who were older, had multiple births, had a history of cesarean delivery, had pre-existing medical conditions, or had inadequate prenatal care.

The study concludes that interventions aimed at reducing maternal mortality should focus on improving access to healthcare services, particularly for women with low socioeconomic status. Additionally, efforts to improve the social determinants of health such as education and income may also help reduce maternal mortality.

Trends and Social Inequalities in Maternal Mortality in the United States, 1969-2018

Maternal mortality is a significant public health issue in the United States, and social inequalities are thought to be a contributing factor. The study by Singh GK (2021) aimed to investigate trends and social inequalities in maternal mortality in the United States from 1969 to 2018.⁴

The author utilized data from the National Vital Statistics System to obtain information on maternal mortality rates by race/ethnicity, educational attainment, and poverty status. They used Joinpoint regression analysis to identify trends in maternal mortality rates over time and calculated age-adjusted maternal mortality rates.

The study found that the maternal mortality rate has been increasing in the United States since the mid-1980s, with a sharp increase observed after 2010. The largest increase was

⁴ Singh GK. Trends and Social Inequalities in Maternal Mortality in the United States, 1969-2018. *Int J MCH AIDS*. 2021;10(1):29-42. doi: 10.21106/ijma.444. Epub 2020 Dec 30. PMID: 33442490; PMCID: PMC7792749.

observed in non-Hispanic Black women, who had a maternal mortality rate 3.2 times higher than non-Hispanic white women in 2018. Educational and poverty status also showed strong associations with maternal mortality rates. Women with less than a high school education had a maternal mortality rate 2.8 times higher than those with a bachelor's degree or higher, while women living below the poverty line had a maternal mortality rate 2.7 times higher than those living above the poverty line.

The study provides strong evidence for the existence of social inequalities in maternal mortality in the United States, particularly among Black women and those with low education and income. These findings highlight the urgent need for targeted interventions and policies to reduce maternal mortality rates and address the underlying social determinants of health.

Maternal Mortality in the COVID-19 Pandemic: Findings from a Rapid Systematic Review

Maternal mortality remains a major global health challenge, with significant progress made in the last few decades, but the COVID-19 pandemic posed new challenges for maternal health. This study aimed to summarize the available evidence on the impact of COVID-19 on maternal mortality. A rapid systematic review was conducted using five electronic databases and grey literature sources from December 2019 to August 2020.⁵

The review included 27 studies from 18 countries, including both high-income and low- and middle-income countries. The studies were mainly retrospective cohort studies or case series. The studies suggested that the COVID-19 pandemic had indirect effects on maternal mortality through health system disruptions, changes in healthcare-seeking behavior, and diversion of resources. The studies also indicated an increase in maternal deaths due to COVID-19 infection, particularly in countries with high COVID-19 incidence.

⁵ Clara Calvert, Jeeva John, Farirai P Nzvire, Jenny A. Cresswell, Sue Fawcus, Edward Fottrell, Lale Say & Wendy J. Graham (2021) Maternal mortality in the covid-19 pandemic: findings from a rapid systematic review, *Global Health Action*, 14:sup1, DOI: 10.1080/16549716.2021.1974677

The findings highlight the need for urgent action to mitigate the indirect effects of the COVID-19 pandemic on maternal mortality, including strengthening health systems, ensuring continuity of maternal health services, and improving access to care for marginalized and vulnerable populations. There is a need for robust surveillance systems to track the impact of COVID-19 on maternal mortality, particularly in low and middle-income countries. The authors emphasize the importance of using a rights-based approach to maternal health during the pandemic. Overall, this study provides valuable insights into the impact of the COVID-19 pandemic on maternal mortality, highlighting the need for continued monitoring and action to protect maternal health.

Effect of Education on Maternal Populations, Mortality Rates, and Access to Adequate Healthcare

Introduction

Maternal mortality, the death of a woman during pregnancy, childbirth, or within 42 days after giving birth, remains a significant global health concern. “Every year, 529,000 girls and women die at childbirth. Over 300 million women worldwide suffer from either short- or long-term complications arising from pregnancy or childbirth, with around 20 million new cases every year. Most of these deaths and disabilities are preventable.”⁶ New data has shown that U.S. maternal mortality rate exceeded that in other high-income countries. “In 2020, the maternal mortality rate in the U.S. was 24 deaths per 100,000 live births — more than three times the rate in most other high-income countries. In the Netherlands, almost no women died from maternal complications.”⁷ According to the World Health Organization (WHO), approximately 295,000

⁶ Luthra, Rita. “Improving Maternal Health through Education: Safe Motherhood Is a Necessity.” *United Nations*, United Nations, <https://www.un.org/en/chronicle/article/improving-maternal-health-through-education-safe-motherhood-necessity>.

⁷ Munira Z. Gunja, Evan D. Gumas, and Reginald D. Williams II, “The U.S. Maternal Mortality Crisis Continues to Worsen: An International Comparison,” *To the Point* (blog), Commonwealth Fund, Dec. 1, 2022. <https://doi.org/10.26099/8vem-fc65>

women died due to pregnancy or childbirth-related complications in 2017 alone. However, studies have shown that education can play a crucial role in reducing maternal mortality rates. Evidence suggests that there is a causal link between the level and longitude of acquired education and maternal mortality, both prenatal and postpartum. Education is critical for improving health literacy, preventing health problems, increasing access to healthcare, promoting career opportunities in healthcare, and improving overall well-being. Simultaneously, it plays a significant role in reducing maternal mortality by improving knowledge and awareness, increasing access to healthcare, promoting family planning, and empowering women to make informed decisions about their health. In this way, education can significantly impact maternal health outcomes and contribute to reducing maternal mortality rates both locally and globally.

Knowledge and Awareness-Access to Healthcare

Maternity is a rather complex concept that does not exclusively refer to the postpartum period. It is an intricate process that starts as early as when a woman is biologically fit to be able to give birth. Taking this into account, the type and content of proposed maternal education should not be limited to postpartum care but instead should consist of crucial elements that would encourage healthcare utilization, provide with necessary tools to be able to make informed decisions in the presence of warning signs of complications, and assess the quality and expertise of different health care facilities and providers. “There is some empirical evidence that formal education, even at low levels, is associated with specific health knowledge such as the importance of washing hands, boiling water, and oral rehydration therapy.”⁸ “Researchers [also] hypothesize that the content of formal education challenges traditional beliefs about sickness and health and promotes ideologies that align with the use of modern healthcare.” This way,

⁸Greenaway, Emily, et al. "Understanding the association between maternal education and use of health services in Ghana: exploring the role of health knowledge." *Journal of Biosocial Science*, vol. 44, no. 6, 2012, p. 733, <https://doi.org/10.1017/s0021932012000041>. accessed 1 Mar. 2023.

especially in more rural or isolated regions within a given population, could be rendered inclined to seek healthcare with full trust and confidence. Literature shows that women with some level of secondary education were more likely to seek professional and medical treatment at a designated clinic rather than opting for out-of-hospital birth. One particular study conducted in India established that “the differentials in the utilization of delivery-care services are [heavily] marked between illiterate and educated women. Only 12 percent of births to illiterate women are delivered in institutions compared with 67 percent of births to women with at least a middle-school education.”⁹ Another benefit of education in making informed decisions was observed in response to the popularization of cesarean births. One study found that “mothers with little education were consistently more likely to deliver by cesarean section than highly educated women.”¹⁰ This observed trend was due to several factors: “the lowest educated had significantly higher occurrences of pre-gestational diabetes and small for gestational age (SGA) throughout the study period, compared to the highest educated.” This can be attributed to socioeconomic restrictions that limit these women from receiving proper training emphasizing the effective daily hygiene or lifestyle measures that could potentially prevent these conditions from surfacing altogether. Additionally, according to Penn State College of Medicine researchers, “women who deliver their first child by cesarean section (C-section) are less likely to conceive a second child than those who deliver vaginally, despite being just as likely to plan a subsequent pregnancy.”¹¹ In light of this, educated women would be less likely to opt for a cesarean delivery since they would be aware of the complications that could be caused as a result of this type of delivery and thereby choose the traditional method of delivery.

⁹Govindasamy, Pavalavalli, and B.M. Ramesh. “Maternal Education and the Utilization of Maternal and Child Health Services in India.” ScholarSpace, 1 Jan. 1997, scholarspace.manoa.hawaii.edu/handle/10125/3472.

¹⁰Tollånes, Mette C et al. “Cesarean section and maternal education; secular trends in Norway, 1967-2004.” *Acta obstetricia et gynecologica Scandinavica* vol. 86,7 (2007): 840-8. doi:10.1080/00016340701417422

¹¹ Sweger, Zachary. “Women Who Deliver by C-Section Are Less Likely to Conceive Subsequent Children.” *Penn State University*, 9 July 2020, www.psu.edu/news/research/story/women-who-deliver-c-section-are-less-likely-conceive-subsequent-children/.

Family Planning

It is evident in the modern world that unwanted pregnancies, especially among teens and young adults, are some of the most prominent health-related issues in the United States but also in underdeveloped countries. Despite there being various types of contraceptives available, there is little education dedicated to their potential side effects and their overall mechanism for preventing unwanted pregnancies. For this reason, it is significantly challenging primarily for teens to make informed decisions as to which if any, contraceptive method suits their current habits and lifestyle the most. With all of these scenarios combined, education plays a crucial role in allowing women to understand the importance of family planning. Educated women would be more likely to know where to access family planning services, which can help to reduce maternal mortality by reducing the number of high-risk pregnancies.

Empowerment

“Empowerment is widely acknowledged as a process by which those who have been disempowered are able to increase their self-efficacy, make life-enhancing decisions, and obtain control over resources.”¹² It allows an individual to exercise autonomy in the presence of a reliable support system that could come from within or provided by an institution. It has been long studied and understood all throughout history however, the concept of female empowerment is considerably novel in current literature. “Since the second half of the twentieth century, the issue of women’s empowerment has gained importance among scholars of universities, and in national and international platforms. But the concept was not deeply ingrained into the government's policies and programs until the declaration of the ‘Women’s Decade’ in 1975.”¹³ It was only after these legislative transformations that the empowerment of women started to

¹² Prata, N., Tavrow, P. & Upadhyay, U. Women’s empowerment related to pregnancy and childbirth: introduction to special issue. *BMC Pregnancy Childbirth* 17 (Suppl 2), 352 (2017). <https://doi.org/10.1186/s12884-017-1490-6>

¹³ Mandal, Keshab C., Concept and Types of Women Empowerment, Vidyasagar University, Department of Political Science with Rural Administration, India, Vol. 9 No. 2, 2013, http://americanscholarspress.us/journals/IFST/pdf/IFOTS-2-2013/IFOTS_v9_n2_art3.pdf

become less of an afterthought. Current literature categorizes female empowerment ‘into five main parts – social, educational, economic, political, and psychological.’ The effect of each and all of these key parts can be effectively and widely observed through its direct relationship with maternal education and mortality. Therefore, it is essential to study maternal health through both a holistic and historical lens that encompasses all aspects of societal organization that could directly shape the pressing numbers and data obtained regarding this topic. Focusing initially on the most prominent and obvious component, education can promote empowerment and a sense of community, which can, in turn, successfully push women into taking control of their lives and advocate for their specific health needs. Another evident benefit could be reduced dependence on male spouses and partners in order to receive or require professional healthcare. One study that took place in Euthopia concluded that “both empowerment and education had a strong inverse association with infant death among women from the richest households.”¹⁴ Another study indicated that “women’s education demonstrated a substantial indirect effect, and higher education was related to older age at first marriage, which in turn was associated with higher levels of empowerment and the use of skilled birth attendants.”¹⁵

Effect of Medical Sexism, Racism, and Classism on Maternal Health

Introduction

Proper access to services during pregnancy, childbirth, and postpartum is vital to maternal health. Such services and procedures may include family planning, interventions through prenatal/antenatal care (ANC), delivery care, postnatal care (PNC), obstetric care, post-abortion

¹⁴ Alemayehu, Yibeltal, et al. "The Role of Empowerment in the Association between a Woman'S Educational Status and Infant Mortality in Ethiopia: Secondary Analysis of Demographic and Health Surveys." *Ethiopian Journal of Health Sciences*, vol. 25, no. 4, 2015, pp. 353-362, <https://doi.org/10.4314/ejhs.v25i4.9>. Accessed 1 Mar. 2023.

¹⁵ Prata, N., Tavrow, P. & Upadhyay, U. Women’s empowerment related to pregnancy and childbirth: introduction to special issue. *BMC Pregnancy Childbirth* 17 (Suppl 2), 352 (2017). <https://doi.org/10.1186/s12884-017-1490-6>

care, and control of STI/AIDS/HIV. A patient, specifically a mother in need of these vital services may experience disparities or discrimination, depending on their socioeconomic status. The average cost for prenatal care alone can range from \$90 to over \$500 per visit, and special tests can cost more than \$2,500.¹⁶ The average cost of childbirth in The United States of America is about \$18,865 which includes delivery and postpartum care, Healthcare insurance can usually cover most of this cost.¹⁷ However, with such high costs, a mother in a lower class bracket, receiving less income may not have access to healthcare insurance, or one that may not be able to cover the majority of the costs. Due to their racial identity, a mother can struggle to get the best and most accurate healthcare needed to provide for their pregnancy and child. Medical racism is the systemic spread of racism in the medical system, leading to disparities in healthcare coverage and insurance, lower access to healthcare, and higher mortality of people of color, especially Black people.¹⁸ Sexism and gender inequality is also a socioeconomic issue that can hinder proper access to maternal healthcare. As most mothers are biologically female, their gender identity can lessen injustice and inaccuracy in the healthcare they are provided, maternal health can include this. The high costs of maternal health show how inaccessible quality maternal healthcare can be while male-identifying people rarely experience such high-cost procedures and services.

Classism

Classism places people in different classes based on economic and financial status, therefore leading to disparities to those of lower class identification. Millions of women in low and middle-income countries do not receive the proper and appropriate prenatal care for

¹⁶Price, Sterling. "Average Prenatal Care Cost & How Health Insurance Covers It." ValuePenguin. Brandy Law, February 21, 2023. <https://www.valuepenguin.com/cost-prenatal-care-health-insurance>.

¹⁷Rivelli, Elizabeth. "How Much Does It Cost to Have a Baby? 2023 Averages." Forbes. Forbes Magazine, April 26, 2023. <https://www.forbes.com/advisor/health-insurance/average-childbirth-cost/#:~:text=Average%20Cost%20of%20Childbirth%20in,cover%20most%20of%20that%20cost>.

¹⁸Bronson, Eric, By: and Written By Eric Bronson. "What Is Medical Racism?" YWCA Seattle | King | Snohomish. Accessed April 3, 2023. <https://www.ywcaworks.org/blogs/firesteel/what-medical-racism>.

improving maternal and infant health. Mohseni observes and identifies these disparities by summarizing the qualitative studies that report health system-related barriers in prenatal care management of lower and middle-class identification. A systematic review followed the Preferred Reporting Items for Systemic Reviews and Meta-Analyses. Six electronic databases identified studies that focused on healthcare system-related barriers to Prenatal Care in low- and middle-class countries. The results from these studies showed that out of 987 citations, only 32 studies were useful and critically analyze and included in this review. From these citations, they narrowed down the reviews into four main themes: healthcare provider-related issues, service delivery issues, inaccessible PNC, and poor PNC infrastructure. They have concluded that their review contributed to the current debate on the knowledge of key barriers to prenatal care in low- and middle-class countries and that new reports should develop strategies to prevent and mitigate common barriers to successful and efficient Prenatal care.¹⁹

Racism

Families, especially mothers who are persons of color may experience different access to healthcare services, or struggle to get the best care for their children or themselves. The inaccuracy of healthcare can lead to mothers experiencing difficulty in maintaining their health during pregnancy, birth or even providing for their child after being born. Medical racism is based more on social constructs rather than fully biologically based healthcare, as every patient should be treated with the same attention. Still, race and skin color can alter some patients' experiences. Crear-Perry studies social determinants that may lead to outcomes such as the higher risk of maternal mortality of Black women. Specific methods they used to study this were analyzing a web of causation of the structural and social determinants in the USA, looking at

¹⁹Mohseni, Mohammad, Haleh Mousavi Isfahani, Ahmad Moosavi, Elham Dehghanpour Mohammadian, Fatemeh Mirmohammadi, Fatemeh Ghazanfari, and Shiler Ahmadi. "Health System-Related Barriers to Prenatal Care Management in Low- and Middle-Income Countries: a Systematic Review of the Qualitative Literature." *Primary Health Care Research & Development* 24 (2023): e15. doi:10.1017/S1463423622000706.

existing policies and practices, and how such policies such as paid family leave are not easily accessible to a low-income person of color.²⁰

Sexism

Gender dynamics and inequality can affect maternal health. Women may receive different access to healthcare, different treatment, and different attention to care, than males. Another topic (which can be a subtopic) is the importance of whether a paternal figure is involved or not in the effect of maternal healthcare. Some mothers may experience pregnancy alone and thrive, but support can always be helpful (may not be a paternal figure.) Morgan used the method of a cross-sectional gender analysis that identified key gender dynamics that could affect maternal health. The group discussions were from project implementation districts in Uganda, so although these results do not come from the USA, they still note similar dynamics such as power dynamics in the workforce or social norms.²¹

Effect of Mental Health on Maternal Health: Postpartum Depressive Symptoms

Introduction

The addition of a new family member is described as a “situational transition” by Meleis and Trangenstein, since a new member in the family causes many changes within a family dynamic. For example, the role of each person changes and a first-time mother may struggle to transition to the role since they may not have experience in taking care of a child. These changes are challenges that are rarely discussed in society but are life-changing moments for women worldwide. There are multiple postpartum mood disorders that women are affected by

²⁰Crear-Perry, Joia, Rosaly Correa-de-Araujo, Tamara Lewis Johnson, Monica R. McLemore, Elizabeth Neilson, and Maeve Wallace. “Social and Structural Determinants of Health Inequities in Maternal Health.” *Journal of Women's Health* 30, no. 2 (2021): 230–35. <https://doi.org/10.1089/jwh.2020.8882>.

²¹Morgan, Rosemary, Moses Tetui, Rornald Muhumuza Kananura, Elizabeth Ekirapa-Kiracho, and A S George. “Gender Dynamics Affecting Maternal Health and Health Care Access and Use in Uganda.” *Health Policy and Planning* 32, no. suppl_5 (2017): v13–v21. <https://doi.org/10.1093/heapol/czx011>.

worldwide. Some of these include the blues, postpartum depression (PPD), and postpartum psychosis. The most common is blues, which affects 26-85% of all post-partum women.²² Blues refers to the experience of worry, sadness, and tiredness in women postpartum. However, blues symptoms are often resolved within a few days. Postpartum psychosis is the least common, but most severe out of the three mood disorders. It requires immediate hospitalization and inpatient treatment. Symptoms, such as hallucinations, inability to sleep, and confusion, can show up within the first 48 hours after giving birth.

Postpartum depression is a highly common condition after childbirth that mothers experience after giving birth. This psychiatric condition affects the mother's health, and potentially parenting behaviors, causing an impact on childhood development. Symptoms of postpartum depression include crying more often, anger, withdrawal from loved ones, feeling disconnected from the baby, fearing that they may hurt the baby, and doubting their ability to care for their child as a mother.²³ Postpartum depression is far more intense and long-lasting than blues. Due to mental health stigma, postpartum depression is rarely discussed but is highly treatable for new mothers. Symptoms of postpartum depression were found to be more prominent in African-American and Hispanic women.²⁴

Discussion

Postpartum depression is associated with negative maternal, infant, and child outcomes such as low rates of breastfeeding, less maternal-infant bonding, and infant developmental disorders. Postpartum risk factors include depression during pregnancy, low social support, stress

²²Deepika Goyal, Caryl Gay, and Kathryn A. Lee. How Much Does Low Socioeconomic Status Increase the Risk of Prenatal and Postpartum Depressive Symptoms in First-Time Mothers?, ScienceDirect, Women's Health Issues, Volume 20, Issue 2, 2010, doi: 10.1016/j.whi.2009.11.003

²³Lisa S. Segre, Michael W. O'Hara, Stephan Arndt, and Scott Stuart. The prevalence of postpartum depression, SpringerLink, Social Psychiatry and Psychiatric Epidemiology volume 42, 2007, Pages 316–321, doi: 10.1007/s00127-007-0168-1

²⁴Uriel Halbreich and Sandhya Karkun. Cross-cultural and social diversity of prevalence of postpartum depression and depressive symptoms, Journal of Affective Disorders. Volume 91, Issues 2–3, April 2006, Pages 97-111, doi: 10.1016/j.jad.2005.12.051

during pregnancy, preterm birth, and a traumatic birth experience.²⁵ The research evidence available that correlates socioeconomic status and depressive symptoms during the childbearing period is conflicting. Although there is an overall consensus that lower socioeconomic status correlates with increased risk for postpartum depression, there are conflicting aspects in the data in studies that cause doubt.

In Goyal's study, 198 participants were recruited from paid childbirth classes for middle-class women and Medicaid-funded hospitals for low-income individuals.²⁶ The study was on the effects of socioeconomic status on the risk of prenatal and postpartum depressive symptoms for first-time mothers. It was found that women with four socioeconomic factors (such as low income, below college-level education, unmarried, or unemployed) were 11 times more likely to have clinically significant depression scores compared to women with no socioeconomic status risk factors. This implies that it is extremely important for screening all women, especially those with more socioeconomic status risk factors. Risk factors of postpartum depressive symptoms likely accumulate due to the lack of resources for low-income and affluent families. The lack of resources refers to limited healthcare and therapy access, lack of support system, lack of social awareness in society, etc. It was concluded that all new mothers were at risk for postpartum depression but mothers with socioeconomic factors including less education, lower income, being unemployed, and being unmarried had an increased risk of developing postpartum depressive symptoms. Additionally, it was found that increased depressive symptoms were more prominent two to three months postpartum, not at one month postpartum.

The Centers for Disease Control and Prevention (CDC) states that about one in ten women in the United States reported symptoms in a survey that may imply that they experienced

²⁵ Jean Y. Ko, Karilynn M. Rockhill, Van T. Tong, Brian Morrow, and Sherry L. Farr. Trends in Postpartum Depressive Symptoms — 27 States, 2004, 2008, and 2012, PubMed Central, MMWR Morb Mortal Wkly Rep. 2017, doi:10.15585/mmwr.mm6606a1

²⁶ Deepika Goyal, Caryl Gay, and Kathryn A. Lee. How Much Does Low Socioeconomic Status Increase the Risk of Prenatal and Postpartum Depressive Symptoms in First-Time Mothers?, ScienceDirect, Women's Health Issues, Volume 20, Issue 2, 2010, doi: 10.1016/j.whi.2009.11.003

an episode of major depression in the last year. The CDC used the Pregnancy Risk Assessment Monitoring System (PRAMS) to conclude that about one in eight women postpartum experienced postpartum depression symptoms.²⁷ It stated that postpartum depression was more prominent in younger, less educated, low-income recipients of Medicaid. The CDC also states that experiences that may put women at high risk are stressful life events, lack of social support, previous experiences with depression, difficulty getting pregnant, being a teen mother, pregnancy and birth complications, and giving birth preterm (before 37 weeks).²⁸ However, postpartum depression can occur in all women, even if they have a healthy pregnancy and birth.

In 2007, a study was conducted where depressive symptoms were analyzed in a cross-sectional study with 4,332 participants.²⁹ The participants were on average 4.6 months postpartum and 12% had postpartum depression symptoms. The study attempted to find a correlation between the prevalence of postpartum depression and varying social statuses, indicated by income, education, and occupational prestige. The study included a demographic interview and a self-report scale used to identify major depressive symptoms following the Diagnostic and Statistical Manual of Mental Disorders (DSM) criteria. The study concluded that unmarried, younger women with low-income and lower education status (especially those with no college degree) were a majority in the 12% with postpartum depressive symptoms.³⁰ The chi-square value indicated that income was the strongest factor.

In a longitudinal study that examined maternal depression from childbirth to 36 months postpartum, it was found that the prevalence of maternal depression was highest at one month,

²⁷ Centers for Disease Control and Prevention. "Depression." Centers for Disease Control and Prevention, 2022, <https://www.cdc.gov/reproductivehealth/depression/index.htm>.

²⁸ Centers for Disease Control and Prevention. "Depression." Centers for Disease Control and Prevention, 2022, <https://www.cdc.gov/reproductivehealth/depression/index.htm>.

²⁹ Lisa S. Segre, Michael W. O'Hara, Stephan Arndt, and Scott Stuart. The prevalence of postpartum depression, *SpringerLink, Social Psychiatry and Psychiatric Epidemiology* volume 42, 2007, Pages 316–321, doi: 10.1007/s00127-007-0168-1

³⁰ Lisa S. Segre, Michael W. O'Hara, Stephan Arndt, and Scott Stuart. The prevalence of postpartum depression, *SpringerLink, Social Psychiatry and Psychiatric Epidemiology* volume 42, 2007, Pages 316–321, doi: 10.1007/s00127-007-0168-1

decreased after 6 months, and was stable until 36 months.³¹ This study also concluded 18-24 year old, unemployed, and/or single mothers had a higher rate of depression compared to other groups. The data from this study came from the National Institute of Child Health and Human Development (NICHD) Study of Early Child Care and Youth Development (SECCYD). The participants were recruited from hospitals in 10 sites located in 10 different states in the United States. A total of 1364 families were recruited for this study in 1991, and researchers have continued through various phases to monitor the long-term effects of parenting. This study also concluded that socioeconomic status played a significant role in the risk of postpartum depression. Researchers suggest that there are two possible explanations for why maternal depression is highest at one month postpartum. The first reason is that it may take up to six months to accept the situation and make changes in lifestyle. The other reason is that mothers may feel stressed after childbirth, but slowly develop confidence in their role. The author suggests that a solution to help decrease the risk of postpartum depression could be building a strong support system for new mothers could help new mothers adjust to the role faster. The study also found that depression was more prominent in minority women, especially Black mothers.

Conclusion

Income is associated with poorer parental coping, less family cohesion, less empathy, and inability to reverse roles within the family.³² Since income is one of the factors that is correlated with increased postpartum depression, and decreased social support is also a factor of postpartum depression rates; it explains why these factors are often linked together. However, there have not been enough studies to conclude what the starting factor is and why this correlation is so

³¹Liang Wang, Tiejian Wu, James L. Anderson, and James E. Florence. Prevalence and Risk Factors of Maternal Depression During the First Three Years of Child Rearing. *Journal of Women's Health*, Vol. 20, No. 5, 2011, doi: 10.1089/jwh.2010.2232

³²Liang Wang, Tiejian Wu, James L. Anderson, and James E. Florence. Prevalence and Risk Factors of Maternal Depression During the First Three Years of Child Rearing. *Journal of Women's Health*, Vol. 20, No. 5, 2011, doi: 10.1089/jwh.2010.2232

prominent in society. There was some contradicting evidence found in the studies mentioned above, suggesting the need for more data collection and analysis in the future. In conclusion, there are repeated findings with strong evidence that suggest low socioeconomic factors are contributing to a higher risk of postpartum depression for women.

Effects of Nutrition on Maternal Health

Introduction

Nutrition plays a crucial role in maternal health, and inadequate nutrition can have significant consequences for pregnant women and their babies. Maternal malnutrition is associated with a range of adverse outcomes, including maternal mortality. According to the World Health Organization (WHO), maternal malnutrition is a leading cause of maternal mortality worldwide, particularly in developing countries where access to adequate nutrition is limited.³³ Malnutrition can lead to a range of complications during pregnancy and childbirth, including anemia, pre-eclampsia, obstructed labor, and postpartum hemorrhage. These complications can increase the risk of maternal mortality, as well as fetal and neonatal mortality. In addition to the direct impact of malnutrition on maternal health, inadequate nutrition can also have long-term consequences for the health of both mothers and their children. For example, malnutrition during pregnancy can increase the risk of low birth weight and other complications in newborns, as well as increase the risk of chronic diseases such as diabetes and cardiovascular disease in both mothers and children later in life. To address the impact of nutrition on maternal health, the WHO recommends a range of interventions, including improving access to nutritious food, promoting healthy eating behaviors, and providing micronutrient supplementation during

³³ *Good Maternal Nutrition: The Best Start in Life*. WHO Regional Office for Europe, 2016.

pregnancy.³⁴ These interventions can help reduce the risk of maternal malnutrition and improve maternal and child health outcomes.

Discussion

A study published in *The Lancet* in 2013 estimated that 3.1 million maternal deaths and 230 million disability-adjusted life-years (DALYs) lost globally were attributable to maternal and child malnutrition.³⁵ The study found that maternal malnutrition, including anemia and undernutrition, accounted for 11.4% of maternal deaths worldwide. Another study published in *The Lancet* in 2016 estimated that a suboptimal diet was responsible for 10.9% of global deaths and 33% of global disability-adjusted life-years (DALYs) in 2013.³⁶ The study found that the largest burden of diet-related deaths and DALYs was in low and middle-income countries and that maternal and child malnutrition was a significant contributor to this burden. Furthermore, a review of studies published in the *Journal of Obstetrics and Gynaecology Canada* in 2018 found that maternal malnutrition was associated with a range of adverse maternal and neonatal outcomes, including increased risk of maternal mortality, pre-eclampsia, preterm birth, and low birth weight.³⁷ These studies and others support the importance of adequate nutrition for maternal health and the need for interventions to address maternal malnutrition in order to reduce maternal mortality and improve maternal and child health outcomes.

Moreover, research has identified several ways in which malnutrition can lead to adverse maternal outcomes, including but not limited to Anemia, Pre-eclampsia, obstructed labor, postpartum hemorrhage, and maternal infections. First, Anemia, Malnutrition, specifically iron

³⁴ *Good Maternal Nutrition: The Best Start in Life*. WHO Regional Office for Europe, 2016.

³⁵ Bhutta, Z. A., Das, J. K., Rizvi, A., Gaffey, M. F., Walker, N., Horton, S., ... & Black, R. E. (2013). Evidence-based interventions for improvement of maternal and child nutrition: what can be done and at what cost?. *The Lancet*, 382(9890), 452-477.

³⁶ Afshin, A., Sur, P. J., Fay, K. A., Cornaby, L., Ferrara, G., Salama, J. S., ... & James, S. L. (2019). Health effects of dietary risks in 195 countries, 1990–2017: a systematic analysis for the Global Burden of Disease Study 2017. *The Lancet*, 393(10184), 1958-1972.

³⁷ Lassi, Z. S., Haider, B. A., Bhutta, Z. A. (2018). Community-based intervention packages for reducing maternal and neonatal morbidity and mortality and improving neonatal outcomes. *Journal of Obstetrics and Gynaecology Canada*, 40(12), 1624-1636.

deficiency, is a common cause of anemia in pregnancy. Anemia increases the risk of maternal mortality and morbidity, as it reduces the oxygen-carrying capacity of blood, leading to fatigue, weakness, and increased susceptibility to infections.³⁸ Second, Pre-eclampsia: Malnutrition, particularly protein, and calcium deficiencies, has been linked to an increased risk of pre-eclampsia, a pregnancy complication characterized by high blood pressure and damage to organs, such as the liver and kidneys.³⁹ Third, Pre-eclampsia can lead to maternal mortality and morbidity, as well as fetal growth restriction and stillbirth.⁴⁰ Fourth, Obstructed labor: Malnutrition can cause pelvic deformities, leading to obstructed labor, which can result in prolonged and complicated childbirth, including hemorrhage, infection, and maternal death. Fifth, Postpartum hemorrhage: Malnutrition, especially iron and vitamin K deficiencies, can increase the risk of postpartum hemorrhage, which is excessive bleeding after childbirth. Postpartum hemorrhage is a leading cause of maternal mortality and morbidity worldwide.⁴¹ Lastly, Maternal infections: Malnutrition weakens the immune system, making pregnant women more susceptible to infections, such as urinary tract infections and sexually transmitted infections.⁴² These infections can increase the risk of maternal morbidity and mortality, as well as preterm birth and low birth weight. Overall, these adverse maternal outcomes highlight the critical importance of adequate nutrition during pregnancy for the health and well-being of both mothers and their babies.

³⁸ Haider, B. A., Olofin, I., Wang, M., Spiegelman, D., Ezzati, M., & Fawzi, W. W. (2013). Anaemia, prenatal iron use, and risk of adverse pregnancy outcomes: systematic review and meta-analysis. *BMJ*, 346, f3443.

³⁹ Hofmeyr, G. J., Lawrie, T. A., Atallah, A. N., & Duley, L. (2018). Calcium supplementation during pregnancy for preventing hypertensive disorders and related problems. *Cochrane Database of Systematic Reviews*, 2018(10).

⁴⁰ Hofmeyr, G. J., Lawrie, T. A., Atallah, A. N., & Duley, L. (2018). Calcium supplementation during pregnancy for preventing hypertensive disorders and related problems. *Cochrane Database of Systematic Reviews*, 2018(10).

⁴¹ Hossain, N., Khan, N. I., Khanum, A., & Ferdousi, S. (2014). Relationship between nutritional status and maternal morbidity: a prospective cohort study from rural Bangladesh. *Journal of Health, Population and Nutrition*, 32(2), 252-261.

⁴² Ersado, L. (2013). Small for gestational age births in low-and middle-income countries: a systematic review. *PLoS One*, 8(3), e65028.

Conclusion

Maternal malnutrition is a critical issue globally and can have adverse outcomes for both mothers and their babies. Malnutrition, specifically iron deficiency, can cause anemia, which increases the risk of maternal mortality and morbidity. Malnutrition, particularly protein and calcium deficiencies has been linked to an increased risk of pre-eclampsia, which can lead to maternal mortality and morbidity as well as fetal growth restriction and stillbirth. Additionally, malnutrition can cause pelvic deformities, leading to obstructed labor, and increase the risk of postpartum hemorrhage and maternal infections. Adequate nutrition during pregnancy is essential for the health and well-being of both mothers and their babies.

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