

Natural Sciences

The Effects of Anorexia Nervosa on Pregnancy

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Anorexia nervosa is one of the most prevalent eating disorders, disproportionately affecting more women than men. It is characterized by deliberate self-starvation alongside other extreme measures to maintain an exceedingly low weight. This scientific literature review aims to analyze the effects of anorexia nervosa on pregnancy in both maternal health and perinatal health. This review addresses a gap in the current literature on maternal and perinatal health that compares pregnancies in which the mother faces active anorexia versus past anorexia. The methodology includes a search for peer-reviewed journals on anorexia in relation to pregnancy published recently from 1987 to 2020. Six research studies from the Jean and Alexander Heard Library online database were identified as relevant based on an overview of their titles, abstracts, and content. The results indicate that regarding the pregnant mother's health, anorexia nervosa has detrimental consequences on numerous organ systems. It leads to nutritional deficiency that can result in anemia and antepartum hemorrhage, which can induce shock and death from blood loss. Regarding the fetus' health, anorexia nervosa is positively correlated with fetal mortality. It can also lead to premature births and low gestational weights, which are associated with future cognitive impairments and memory problems. Based on an analysis of the literature, the conclusion formulates a summary of the findings, brief recommendations, and areas for future research. Due to the wide-ranging causes and effects of anorexia, the most effective treatment for pregnant women is a multidisciplinary approach combining psychotherapy, behavioral therapy, weight restoration, and family involvement.

INTRODUCTION

Anorexia nervosa (anorexia) is one of the most prevalent and frequently studied eating disorders. Individuals with anorexia often base their self-worth on their weight and have body image distortion. It became increasingly common throughout the 20th century, affecting women and men in a 10:1 ratio (Keel, 2016). Anorexia is characterized by intentional food restriction and a severe fear of gaining weight. According to the fifth edition of the *Diagnostic and Statistical Manual of Mental Disorders* by the American Psychiatric Association (2013), those affected use methods such as starvation and excessive exercise to maintain an extremely low weight. This results in a dangerously low Body Mass Index (BMI) for their cohort.

ANOREXIA IN WOMEN

The nutritional deficiencies associated with anorexia can disrupt the functioning of all body systems, including the endocrine system. This can affect fertility in women and even result in amenorrhea, or the continuous loss of menstruation (Mitchell, 2009). Thus, it is critical to examine the possibly

dire health consequences of anorexia on pregnancy in women. The lifetime prevalence of anorexia in females is about 0.9%, but its lifetime prevalence in pregnant women specifically is unclear due to the difficulty of measuring all pregnant women who have suffered from anorexia at any point in their life (Hudson et al., 2007).

OVERVIEW

This literature review intends to better elucidate the effects of anorexia on pregnancy and discusses the health outcomes of both the pregnant woman and the infant. Consequences of anorexia on the labor and delivery process will also be explored. Additionally, this paper will analyze how anorexia affects perinatal health outcomes in the child, referring to the period immediately before or after birth. Furthermore, the latent effects of past anorexia on pregnancy will be distinguished from the current effects of active anorexia on pregnancy. Lastly, the lingering effects of anorexia in women who have recovered will be compared with those of women who are actively struggling with anorexia during pregnancy.

METHODS

Maternal health was selected as the first important parameter of pregnancy due to its priority throughout pregnancy and labor. The mental and physical health of the mother is critical to the proper development and birth of the child. Eating disorders like anorexia can hinder this process as well as postpartum recovery. Perinatal health of the child was chosen as the second parameter since it may be directly impacted by the health of the mother. Anorexia could have detrimental effects since the fetus depends on the mother's diet for nutrients in the womb. Thus, it is necessary to investigate these factors in order to thoroughly answer the research question.

The six main research studies included in this review were found in the Jean and Alexander Heard Library online database and cover a time period from 1987 to 2020. A search was conducted by reading article titles and abstracts to identify relevant peer-reviewed journals. Mantel et al. (2020)'s article was selected because it uses the largest population to date to investigate the effect of anorexia on maternal health and pregnancy outcomes. It is also the only modern study to differentiate between active versus past anorexia presence. This factor is important to understand whether a previous diagnosis of anorexia has lingering effects on pregnancy despite recovery. Ante et al. (2020)'s article was chosen as a longitudinal study over 27 years based on data from almost all baby deliveries in Québec, Canada. It also confounded for numerous other variables, including substance use and comorbid mental disorders. Eagles et al. (2012) provided an in-depth analysis of antepartum hemorrhage, one of the most common complications in pregnant women with anorexia. The paper by Dörsam et al. (2019) is necessary to understand the effects of dietary and nutritional deficiencies throughout pregnancy in women with anorexia. Bulik et al. (1999)'s article was identified because it has a unique focus on the process of delivery, including complications, cesarean deliveries, and high-risk labors that require medical intervention. Unlike many other studies, Stewart et al. (1987) compared the differences between active anorexia and remission, enabling a

deeper understanding of its long-term effects. The results and further strengths and weaknesses of these studies will be analyzed.

THE EFFECT OF ANOREXIA NERVOSA ON MATERNAL HEALTH AND PREGNANCY OUTCOMES

Anorexia poses numerous threats to pregnant women. Mantel et al. (2020) aimed to investigate the risk of negative health outcomes in pregnancy for women suffering from eating disorders. They used data on all singleton births, in which only one child is birthed during delivery, from January 1, 2003, to December 31, 2014, in the Swedish Medical Birth Register (MBR). The sample consisted of 7,542 women with eating disorders and 1,225,321 women without eating disorders who were 30.3 years old on average. There were 2,769 females with anorexia who were 29.4 years old on average. The MBR provided information on "demographic data, reproductive history, risk factors, and comorbidities, as well as complications during pregnancy, delivery, and the neonatal period" (Mantel et al., 2020, p. 286). The National Patient Register (NPR), which is linked to the MBR, provided inpatient and outpatient care information used to categorize the study population into "exposed" and "unexposed" women. Exposed women had active eating disorders with an inpatient or outpatient clinic listing within one year before conception or over the course of pregnancy. Unexposed women did not have a diagnosis within one year prior to conception.

Mantel et al. (2020) performed statistical analyses to compare negative pregnancy outcomes between women with and without eating disorders. The authors showed that comorbidities such as anxiety disorder, mood disorder, drug abuse, nicotine addiction, and diabetes were significantly higher in women with anorexia, all of which can impair fetal development. The risk of hyperemesis, or severe nausea and vomiting throughout pregnancy, was more than doubled in anorexic women. This can cause electrolyte imbalance, dehydration, and further weight loss. Women with anorexia were 60% more likely to experience antepartum hemorrhage, which refers to the separation of the placenta from

the uterine wall leading to abnormal bleeding from the genital tract in the third trimester. Moreover, women with active anorexia were twice as likely to have anemia, but women who only previously had anorexia did not experience any increased risk. Preeclampsia, or high blood pressure during pregnancy, was not correlated with any form of eating disorder. Taken in aggregate, the risks were undoubtedly much greater for women with active anorexia than those who had recovered from previous eating disorders.

The results from Mantel et al. (2020) reveal the detrimental effects of anorexia on maternal health during pregnancy. Nutritional deficiency can lead to anemia due to low hemoglobin levels and inadequate oxygen transportation to body tissues. Since women who recovered from anorexia did not have an increased risk of anemia, certain health problems linked to dietary restrictions can be completely ameliorated without long-term effects after returning to an adequate nutritional intake. Placental detachment may be explained by caloric restrictions which induce malnourishment and low weight, leading to insufficient mineral and vitamin levels. Furthermore, malnutrition can impair the coagulation system, which prevents necessary blood clots and can increase blood loss from antepartum hemorrhage. Meanwhile, measures of health like blood pressure were not associated with anorexia.

In order to analyze the value of the results of this study, its strengths and weaknesses must be thoroughly weighed. One strength is that it used the largest population to date to investigate the relationship between eating disorders and pregnancy and neonatal outcomes. Further, it used a national population rather than a retrospective hospital-based cohort that may have been biased. It is the only modern study to distinguish active versus previous eating disorder presence and use a population-based approach, reducing selection bias. However, the results of this study are limited in that it did not assess the validity of the eating disorder diagnoses in the Swedish NPR. The definition of “exposure” created by Mantel et al. (2020) can lead to selection bias towards more severe patients, thus overestimating risk outcomes. Moreover,

since many individuals who meet the diagnostic criteria for eating disorders do not seek clinical treatment, registered patients do not represent the general population. Factors such as baseline BMI and pregnancy weight gain may have mediated the exposure and the outcomes, but researchers did not measure or adjust for these confounding variables (Mantel et al., 2020). The statistical sensitivity analysis they performed was also unable to establish whether these nutritional level measurements acted as mediators (Mantel et al., 2020). Women with current or past anorexia should be categorized as high-risk pregnancies to ensure adequate medical care, although other factors such as early BMI may lead to complications and should also be considered.

OTHER COHORT STUDIES ON MATERNAL ANOREXIA NERVOSA

Other large cohort studies have also investigated anorexia's connections with maternal pregnancy outcomes. Ante et al. (2020) aimed to investigate the association between anorexia nervosa hospitalization before or during pregnancy with increased risk of adverse maternal and neonatal complications. The research design was a retrospective study from 1989 to 2016 on a cohort of 2,134,945 singleton pregnancies in Quebec, Canada. They used corresponding data on all inpatient hospitalizations from Quebec to calculate risk ratios for the health outcomes.

They found that 1,910 of these pregnancies were in women affected by anorexia. Similar to Mantel et al. (2020), rates of comorbid mental disorders like anxiety disorder, bipolar disorder, depression, schizophrenia, and substance abuse were significantly higher in women who had been admitted for anorexia. Pregnant women with anorexia were more likely to experience antepartum hemorrhage but did not face an increased risk of preeclampsia, both of which are results consistent with Mantel et al. (2020). Furthermore, the risk was almost doubled for developing cardiovascular disorders, acute liver failure, or renal disorders. Women in the anorexic sample were almost twice as likely to require admission to the intensive care unit.

These results from Ante et al. (2020) show the wide-ranging cognitive, emotional, and physical consequences of anorexia. The dramatically increased risk for physical health conditions suggests a high probability of poor fetal growth, especially when hospitalization for anorexia was closer to pregnancy. Increased risk of heart, liver, and kidney failure was likely related to organ damage from continuous starvation. These findings corroborate those from Mantel et al. (2020), which studied a separate large population in a different country and time frame.

One strength of Ante et al. (2020) is that the researchers used data including 99% of deliveries in Quebec, which is representative of the population. The sample size was very large and extended over a long period of time. Ante et al. (2020) also adjusted for confounding variables in the risk ratios, including “maternal age, parity, comorbid mental disorders, preexisting metabolic disorders, substance use, socioeconomic status, place of residence, and time period at delivery” (p. 676). This indicates that drug or medication abuse did not confound the conclusions. On the other hand, limitations include the fact that substance abuse and comorbid mental disorders are frequently underreported. Researchers also did not have data on BMI, ethnicity, or marital status. They could not measure pregnancy weight change and determine whether low BMI further exacerbated the effects of anorexia. Since researchers used information from a hospital dataset, they did not consider women with self-reported anorexia or anorexia that did not require inpatient hospitalization. Those with less severe anorexia may have been miscategorized, affecting the correlation strengths. Lastly, these results were based on a diverse Canadian province with universal healthcare, which may not be generalizable to other populations.

RISK OF ANTEPARTUM HEMORRHAGE

Antepartum hemorrhage, which is the separation of the placenta from the uterine wall that causes bleeding from the birth canal, is one of the most frequently discussed complications during late pregnancy in women with anorexia. Eagles et al.

(2012) found that its risk increases more than the risk of any other adverse maternal health outcomes with patients who have anorexia. The authors aimed to compare pregnancy outcomes in women with versus without a history of anorexia using multi-level logistic regression, particularly because conflicting findings from existing literature have led healthcare professionals to be overly cautious when giving medical advice. They used data from women with a recorded diagnosis of anorexia who sought psychiatric assistance between 1965 and 2007 in North East Scotland. They studied 230 pregnancies in these women with anorexia compared to 1,144 pregnancies in women without any history of anorexia. Researchers focused on risk ratios of pregnancy outcomes such as antepartum hemorrhage as well as perinatal outcomes, which relate to the time immediately before and after birth.

The results of Eagles et al. (2012) showed that the relative risk of antepartum hemorrhage almost doubled when compared to non-anorexic women. Women with anorexia are more likely to develop bleeding disorders in which blood clots do not form properly. This is due to vitamin K deficiency caused by insufficient dietary fat intake. Antepartum hemorrhage can be life-threatening to both the mother and the fetus. It can cause the mother to go into shock from excessive blood loss and prevent the fetus from receiving oxygen and nutrients (Giordano et al., 2010).

The strengths of Eagles et al. (2012) include the fact that they had comprehensive data on pregnancies from the Aberdeen Maternity and Neonatal Databank (AMND). The extensive information enabled statistical adjustment for confounding variables including maternal BMI, socioeconomic status, and smoking status. This ensured that the complications are not simply due to the low weight of the mother, but rather attributed to anorexia. On the contrary, limitations include the fact that pregnancy weight gain data was not collected despite that women with anorexia often experience greater weight gain, which can reduce poor health outcomes. Researchers also did not have details on the symptoms of anorexia throughout the pregnancies, which prevented correlating

specific outcomes with symptoms. The AMND encompassed a region that faces low geographical mobility, but did not track anorexia patients who moved away from North East Scotland before pregnancy. These women with greater geographical mobility may have different occupations or socioeconomic statuses, which could have affected health outcomes.

SYSTEMATIC REVIEW OF ANOREXIA NERVOSA ON MATERNAL PREGNANCY OUTCOMES

Dörsam et al. (2019) performed a systematic review of thirteen scientific texts to synthesize evidence on nutrition and associated issues in pregnant women with a history of eating disorders. The review procedure identified relevant studies from 1987 to 2018 on diet quality, nutrition, and eating behavior in pregnant women with eating disorders using the “Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA)” (Dörsam et al., 2019, p. 840).

The consolidated data show that women with anorexia did not have significantly different types of macronutrient and micronutrient intake compared to healthy controls. In fact, their diet had a greater proportion of health-conscious foods such as fruit and salads. However, anorexic women consumed a substantially higher amount of caffeine during their pregnancies. Regarding nutritional biomarkers, anorexia was correlated with a significantly increased risk of “iron deficiency anemia (IDA)” (Dörsam et al., 2019, p. 840), in which low iron leads to insufficient red blood cells and oxygen transportation throughout the body.

These results from Dörsam et al. (2019) show that the reduced quantity of food consumed by anorexic women can lead to deficiencies such as low iron, despite potentially having a similar quality of diet. Women with anorexia often opt for a healthier diet, including vegetables and low-fat foods, to reduce caloric intake and prevent weight gain. The exceedingly high average caffeine consumption by pregnant women with anorexia is linked to miscarriage; their average consumption is almost double the daily amount recommended

by the American College of Obstetricians (ACOG) and the European Food Safety Authority (EFSA). Caffeine is often used by eating disorder patients to suppress their appetite, feel satiated, enable purging, facilitate weight loss, and boost metabolism to increase energy expenditure (Dörsam et al., 2019). Additionally, an increased risk of anemia is caused by numerous factors including low vitamin A, B12, dietary iron, and folate, which is a type of B vitamin necessary for red blood cell production. Iron intake should increase during pregnancy because it is critical to the fetus, placenta, and increases in red blood cell count. Iron deficiency can lead to premature birth, low birth weight, and permanent damage to the fetus by causing cognitive disabilities and memory impairments later in life. Many pregnant women with current or past eating disorders increase food restriction due to elevated anxiety about weight gain.

Dörsam et al. (2019) is the first systematic review on pregnancy nutrition and health issues in women affected by eating disorders. Strengths of the study include the fact that the selection and analysis of papers are transparent and systematic following the PRISMA protocol. It illuminated gaps in eating disorder research on nutrition. However, limitations include the fact that the referenced studies were very different from each other in terms of time period, diagnosis, and more. This prevents the review from creating a standardized, high-quality rating and meta-analysis system. Due to the 30-year time span of the texts, diagnostic criteria for eating disorders were inconsistent. Some identification of eating disorders may have been biased by self-reports, leading to misidentification of eating disorders. In addition, some articles did not differentiate between active and previous eating disorders, limiting comparison between heterogeneous samples. Some studies also had small sample sizes and relied on retrospective recall, which may produce inaccuracies and weaken generalizability.

THE EFFECT OF ANOREXIA NERVOSA ON OFFSPRING PERINATAL HEALTH OUTCOMES

Not only does anorexia have a substantial effect on maternal health outcomes during pregnancy, but it also has serious consequences on fetal development and newborn health. Bulik et al. (1999) compared fertility and reproductive patterns in women with a history of anorexia based on the DSM-III-R criteria versus a randomly selected control sample. The subjects included 66 cases of women with anorexia, selected from the records of an eating disorder center at a hospital in Christchurch, New Zealand. The control sample included 98 women randomly selected from the 1993 Christchurch mandatory voter registration list who did not have a history of anorexia. Researchers matched these controls to the women with anorexia based on gender and age from 23 to 45 years old. They then conducted one-on-one structured interviews with all subjects to collect information on reproductive history, fertility, and pregnancy or childbirth complications.

The authors found that women with anorexia had significantly lower body weight and BMI than their counterparts in the control group. They experienced twice as many miscarriages and more abortions than the control group. They also had significantly greater delivery complications and cesarean deliveries. Pregnant women with anorexia also had more high-risk pregnancies, difficult labors that required medical intervention, and premature babies. Most concerning, anorexic women gave birth to babies with alarmingly low gestational weights.

These results from Bulik et al. (1999) provide essential insight into the risks that both the mother and fetus face during pregnancy and labor due to anorexia. They highlight the fact that women with a history of anorexia and women with anorexia during pregnancy faced many of the same obstetric disorders. Low offspring birth weight is likely due to inadequate calorie consumption, even in recovered anorexic patients. Insufficient food quantity and nutritional quality can have drastic, long-term effects on development.

The strengths of Bulik et al. (1999) include the fact

that it used randomly selected controls and identical patient reports in the structured interviews for all participants. Since it was a retrospective controlled cohort, researchers were able to determine the actual frequency of occurrences rather than risk ratios. Limitations include the fact that they could not establish the precise timing of pregnancy in relation to episodes of anorexia behavior. They also did not have data on the exact reason behind cesarean sections or premature births, leaving them unable to discover the specific cause of the higher rates. Furthermore, diagnostic criteria for anorexia have changed since the DSM-III-R, affecting the generalizability to patients today under the DSM-V (American Psychiatric Association, 2013).

DIFFERENCES BETWEEN ACTIVE ANOREXIA AND REMISSION ON PREGNANCY

Meanwhile, other studies have found differences in the pregnancies and newborn health of women who have active anorexia compared to those in remission with diminished signs of anorexia. Stewart et al. (1987) investigated the pregnancies and infant health of women treated for eating disorders to determine the impact of anorexia on pregnancies and infants. The sample consisted of 74 women from North America who received treatment for anorexia between 1970 and 1978 at the University of Toronto Eating Disorders Clinic. There were 23 conceived pregnancies within this population. Patient interviews and charts gathered information on these women's eating disorders, pregnancy and delivery process, and infant health. These participants were categorized based on whether they had anorexia at the time of conception or were in remission without any symptoms.

The data from Stewart et al. (1987) showed that healthy maternal weight gain was significantly greater in remitted women than in anorexic women during pregnancy. Some anorexic women even lost weight during pregnancy and suffered "spontaneous abortions" (Stewart et al., 1987, p. 1195), or miscarriages. Most anorexic patients at conception reported intensified disorder symptoms and psychological distress throughout pregnancy.

Regarding the health of the infants, women in remission had babies with significantly heavier birthweights and higher Apgar scores. The Apgar score rates newborn health at one minute and five minutes after birth based on “respiratory effort, heart rate, muscle tone, reflex irritability, and color” (Hauser-Cram et al., 2013, p. 138). They are scored from worst to best on a scale of zero to two. Infants with low Apgar scores require immediate assistance and may face long-term consequences. Fetal mortality was more prevalent in women with active anorexia. These infants also experienced more respiratory distress and jaundice, which is caused by excess bilirubin in the blood when the liver does not process red blood cells efficiently (Brits et al., 2018).

The results from Stewart et al. (1987) show that all pregnancy and delivery complications were in women with active anorexia. This means that current eating disorders carry a greater risk than merely a prior history, contradicting the conclusion of Bulik et al. (1999) that there was little difference in the negative maternal and perinatal outcomes. This contradiction may arise because they measured different specific health outcomes, revealing that anorexia affects various aspects of pregnancy differently. For example, Stewart et al. (1987) explored maternal weight gain, miscarriages, psychological distress, birthweights, Apgar scores, fetal mortality, and respiratory distress. Meanwhile, Bulik et al. (1999) examined high-risk pregnancies, cesarean deliveries, abortions, and premature babies. This may also be due to the different lifestyles and health levels of women who are technically in remission from anorexia. Notably, both articles support that women affected by anorexia face more pregnancy complications.

One strength of Stewart et al. (1987) is that they measured important factors that are typically unreported, including Apgar scores, gestational period, newborn birth weight, maternal weight increase, current state of the eating disorder, and psychological complications during and after pregnancy. The Apgar scores and other measurements were standardized, which decreases variability and facilitates comparison between

the subjects. They received ethical approval to interview 74 women for the study. However, limitations include the fact that the sample groups were small, thus reflecting the results of the few studied women and reducing its generalizability to different populations. The exact definition and starting point of remission for anorexia vary, influencing the results and making comparisons with other studies difficult. The results for women in remission contradict some other existing literature, necessitating further investigation into the topic.

DISCUSSION

The review of the six articles provides a holistic view of the implications of anorexia on pregnancy. Figure 1 summarizes the commonly discussed effects in the reviewed articles. In regards to maternal health outcomes, both Mantel et al. (2020) and Ante et al. (2020) found that comorbid disorders, including anxiety, substance abuse, and mood disorders, are significantly higher in women with anorexia. This means that pregnant women with anorexia face symptoms from both the eating disorder itself and associated disorders that negatively impact their health and the health of their child. For example, pregnant women with anorexia and anxiety may face even greater distress over gaining weight during pregnancy. As a result, self-starvation methods may increase and lead to nutritional deficiencies for the woman and fetus. Even after Ante et al. (2020) adjusted for these comorbidities, the results still indicated that pregnant women with anorexia suffered from more health complications like antepartum hemorrhage and anemia. Eagles et al. (2012) supported these two articles that antepartum hemorrhage is one of the most frequent abnormalities in pregnant women with anorexia, most likely due to a vitamin K deficiency. It is important to focus on ensuring that pregnant women with anorexia receive both a balanced diet and an increased quantity of food to support their bodily demands during pregnancy. Antepartum hemorrhage is more likely to be fatal in women with anorexia since malnutrition impairs the formation of proper blood clots (Eagles et al., 2012; Mantel et al., 2020). Not only does

anorexia increase the likelihood of various health complications, but it also heightens their severity. Thus, these articles provide consensus on the effects of anorexia on pregnancy.

In regards to perinatal health of the offspring, Bulik et al. (1999), Stewart et al. (1987), and Dörsam et al. (2019) found that women with anorexia were more likely to give birth to babies with alarmingly low gestational weights. This may be due to a variety of characteristics that are common to anorexia, including iron deficiency and inadequate caloric consumption. Although women who do not have anorexia but have iron deficiency may also experience negative perinatal outcomes, it is the combination of all of the behaviors and symptoms of anorexia that exacerbate these complications. Low birthweights and birth defects contribute to lower Apgar scores, indicating that the baby requires medical interventions to survive outside of the womb. Furthermore, Dörsam et al. (2019), Bulik et al. (1999), and Stewart et al. (1987) have revealed that fetal mortality and miscarriages are more common in women affected by anorexia. One

potential reason for this is the excessive amount of caffeine that women with anorexia are likely to consume, which can constrict blood supply to the fetus or prevent the fetus from being able to eliminate caffeine from its body (Dörsam et al., 2019). It is important to monitor the overconsumption of certain substances and beware of tendencies that anorexia makes women more susceptible to, such as caffeine toxicity. Anorexia can have long-lasting, potentially fatal consequences on fetal and newborn development.

CONCLUSION

Anorexia can produce serious health problems in both the pregnant mother and the fetus or newborn. The majority of maternal health conditions arise from nutritional deficiency due to prolonged self-starvation. Some of the most pervasive outcomes found across studies are anemia and antepartum hemorrhage, which can cause shock and death from excessive blood loss. Anorexia affects numerous organ systems and increases the risk of heart, liver, and kidney failure in pregnant women.

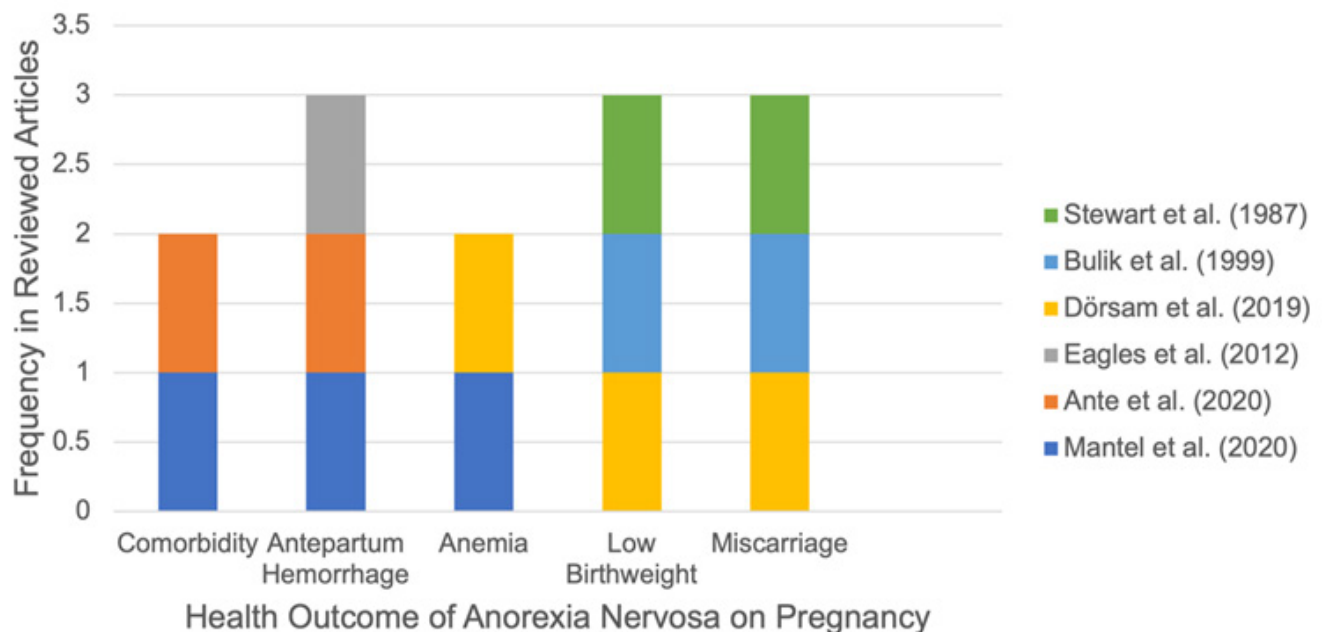


Figure 1. Commonly discussed effects of anorexia nervosa on pregnancy in the reviewed articles.

Antepartum hemorrhage, low birthweight, and miscarriage are included in three of the six articles reviewed, while comorbidity and anemia are explored in two articles. This demonstrates consensus on relevant health outcomes, as well as identifies important complications to investigate in relation to anorexia and pregnancy.

Anorexia impairs fetal health and is positively correlated with fetal mortality. For instance, low iron contributes to anemia that hinders the development of the fetus and placenta, leading to premature births and low gestational weight. This is associated with future cognitive impairments and memory problems. Pregnant women with anorexia are also more likely to have miscarriages and require cesarean sections. Their newborns typically perform worse on the Apgar test.

Many studies compared the rates of complications in women with active anorexia versus past anorexia. Mantel et al. (2020) and Stewart et al. (1987) found that women with anorexia during pregnancy faced greater health risks and consequences than recovered women. This means that certain conditions can be improved without permanent damage after recovery. However, Bulik et al. (1999) found equal levels of complications in current and past anorexia, emphasizing its long-lasting effects. These studies measured slightly different outcomes, and all provide evidence of the detrimental effects of anorexia.

RECOMMENDATIONS

Due to the wide-ranging causes and effects of anorexia, a multidisciplinary treatment approach combining psychotherapy, behavioral therapy, weight restoration, and family involvement may be the most effective for pregnant women (Ante et al., 2020). Healthcare professionals should be aware of the increased risks that pregnant anorexic women face, focusing on the identification of eating disorders and treatment like nutritional rehabilitation (Ante et al., 2020). Most of these pregnancies should be labeled high-risk so they receive increased care to reduce the likelihood of miscarriages, cesarean deliveries, and fetal mortality. Many recovered anorexic patients still follow dietary restrictions and exhibit the same complications as women with active anorexia. Thus, recovered pregnant women would benefit from intensive prenatal care as well, despite some conflicting research on the subject (Bulik et al., 1999).

Pregnant women affected by eating disorders should focus on increasing the quantity of food

intake. Many women with anorexia face the dangers of not gaining enough weight or even losing weight during pregnancy, which significantly exacerbates adverse reactions and the risk of miscarriage. The fetus may not develop properly physically or cognitively due to low birth weight and insufficient nutrients.

FURTHER RESEARCH

Due to contradicting findings, more research and meta-analyses should be performed on the effects of a history of anorexia compared to anorexia at the time of pregnancy. Gestational weight gain is one of the least measured variables but also the most important to fetal development and the chance of miscarriages or birth defects. Further studies should collect this information or analyze retrospective cohorts that report BMI or weight change. Pregorexia, an unofficial term for pregnancy and anorexia, describes a debilitating fear of weight gain during pregnancy. Worsened anxiety and anorexia symptoms throughout pregnancy should be further examined. This would allow medical professionals to better assist women with eating disorders or comorbid mental disorders throughout pregnancy.

CONFLICTS OF INTEREST

The author has not disclosed any conflicts of interest.

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Victoria strives to conduct and publish psychology research to make a positive impact in the field, particularly pertaining to the topic of mental health. Since her first year at Vanderbilt, Victoria has been working in the BRAINS (Brain Research And Internalizing Symptoms) Lab to investigate the neurobiological causes of mental disorders and improve the effectiveness of diagnosis and treatment. In the lab, she collects fMRI and EEG data from participants with anxiety and depression versus control groups. Additionally, Victoria has published a psychology paper in the annual Vanderbilt Scaffold journal. It was an incredibly rewarding experience and she has sought other opportunities, including this Vanderbilt Undergraduate Research Journal, to publish research and learn from other talented authors. Victoria hopes to continue exploring psychology research and potentially work in

healthcare policy.

During Victoria's freshman year, she completed a writing seminar on the psychology of eating disorders. She chose to research anorexia nervosa due to the vast impact she has seen it have on individuals. Unfortunately, its prevalence has been increasing and it is often glamorized throughout the media. Victoria had previously written an overview of anorexia nervosa and became inspired to focus on pregnant women due to its disproportionate effect on women compared to men. She wanted to analyze the existing research on its long-term effects, particularly on both maternal and fetal health. In addition to learning more about the science behind eating disorders, Victoria aims to reduce the stigma around eating disorders and advocate for seeking help for mental health.