

WHAT IS THE EFFECT OF MATERNAL EATING DISORDERS ON PREGNANCY
OUTCOME, BIRTH DEFECTS AND DEVELOPMENTAL DELAYS?

A Research Project by

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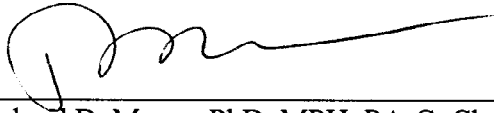
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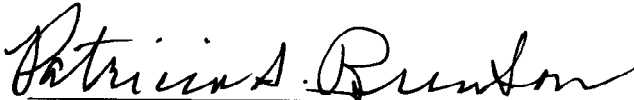
Wichita State University
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We hereby recommend that the research project prepared under our supervision by Kristle Elizabeth Neuhalphen entitled What is the effect of maternal eating disorders on pregnancy outcomes, birth defects and developmental delays? be accepted as partial fulfillment for the degree of Master of Physician Assistant.

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5/7/07
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DEDICATION

To my parents for whom I would not be who I am or where I am today without

ACKNOWLEDGEMENTS

I would like to thank my family for their support and love throughout this challenging journey. You have all inspired and helped me in your own ways. Without them I truly would not be where I am today. I would also like to thank Pat Bunton, my research advisor for keeping me on my toes guiding me through this portion of the PA program at Wichita State. Thanks for all the hard work and feedback you put into this research, it is much appreciated.

ABSTRACT

Introduction: The prenatal period is critical in determining the quality of fetal development and how the infant responds outside of the womb. Many known teratogens exist, but the medical literature evaluating fetal outcome in the presence of maternal eating disorders shows conflicting data. Methodology: The purpose of this study was to compare the prevalence of birth defects, developmental delays and adverse pregnancy outcomes in infants born to mothers with eating disorders to those without eating disorders. This was an evidence-based literature review using the following inclusion criteria; women meeting DSM-IV criteria for anorexia nervosa, bulimia or eating disorders not otherwise specified; studies must have made an attempt to eliminate confounding factors such as cigarette smoking or chronic disease; all articles were published in peer reviewed journals from 1980 to present. Results: Seventeen articles met the inclusion criteria as stated above. The evidence was not found to establish a relationship between maternal eating disorders and the occurrence of fetal birth defects or delays in developmental milestones. Evidence did support a relationship between the occurrence of adverse pregnancy outcomes in women with eating disorders. Conclusion: To avoid adverse fetal outcomes, including therapeutic and spontaneous abortions, clinicians should screen patients for eating disorders prior to conception and educate women on the possible effects of eating disorders on pregnancy outcome.

PREFACE

This evidence based review aims to review the literature to date concerning pregnancy and neonatal outcome in women diagnosed with eating disorders. There are currently a limited number of published trials concerning this area of research. What is available shows variable and even contradicting results. By evaluating each pertinent study individually, this literature review will determine whether infants born to women with eating disorders are at a greater risk of suffering from birth defects, delays in developmental stages and adverse pregnancy outcomes when compared to infants born to women without eating disorders. Eating disorders such as AN and BN most commonly occur in women of childbearing age [9]. According to Courtney Jonson Ph.D, the mean age of women with eating disorders is 18, with a range from 12-35 years of age.

This literature review seeks to determine if these infants are at a greater risk of suffering from the above stated outcomes than the general population, solely due to the maternal eating disorder and independent of other possible teratogenic events. After gathering and evaluating all pieces of information I hope to have a clearer answer to the research question proposed.

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LIST OF ABBREVIATIONS / NOMENCLATURE

AN	Anorexia Nervosa
BN	Bulimia Nervosa
ED-NOS	Eating Disorders Not Otherwise Specified
DSM-III	Diagnostic and Statistical Manual of Mental Disorders, 3 rd Edition
DSM-IV	Diagnostic and Statistical Manual of Mental Disorders, 4 th Edition
IUGR	Intrauterine Growth Retardation
SGA	Small for Gestational Age

CHAPTER I

INTRODUCTION

The prenatal period is essentially critical in determining the quality of fetal development as well as how the infant responds and develops outside of the womb after birth. Prenatal care and vitamin supplementation are encouraged to be started early in pregnancy to provide optimal conditions for the fetus. Factors such as physical and emotional maternal stress and substance abuse during pregnancy have all been linked to increase risk of harm to an infant during development [citation]. During critical times of prenatal development certain physiologic structures and systems are considered to be highly plastic and easily influenced by the environment the mother provides for the fetus. After periods of plasticity have passed, critical developmental milestones are over and structures become anatomically fixed. These structures are often now “programmed” for life and the child may or may not notice side effects as a result later in life. Research is also suggestive that extreme life influencing psychological issues prospectively effecting behavior and cognition are also influenced [18].

The impact of eating disorders on obstetric health begins at the time of conception. Women with AN have decreased fertility rates at 1/3 of the normal population due to amenorrhea and sexual inactivity [18].

Anorexia nervosa is thought of clinically as a refusal to maintain normal body weight. In the DSM-IV, anorexia nervosa is diagnosed when the following criteria are met: body weight <85% of what is expected for an individual, intense fear of gaining weight, body image disturbance, or amenorrhea. Bulimia nervosa is characterized by recurrent episodes of binge eating followed by self-induced vomiting, laxative use or other purgative behaviors. This binge/purge behavior must be occurring at least two times per week for three months to be

diagnosed as presented in the DSM-IV. Several articles included in this review occurred before the 4th edition of the DSM-IV and therefore meet inclusion criteria outlined in the 3rd edition of the DSM [1,2]. A third category recently recognized by the DSM-IV is Eating Disorders Not Otherwise Specified (ED-NOS). This category includes all other eating disorders that do not fully meet criteria for either anorexia nervosa or bulimia [2]. One must suspect that eating disorders and pregnancy often occur simultaneously because eating disorders typically occur in women of child bearing age. The literature to date concerning pregnancy outcome in women with anorexia nervosa or bulimia is not definitive. There are very few studies available and the sample sizes of most are fairly small. Some studies suggest results of pre-term delivery, small for gestational age (SGA) birth weights, intrauterine growth retardation (IUGR) and low Apgar scores in babies born to mothers with eating disorders [5, 7,9, 10, , 11, 13, 14, 16, 20, 21, 23]. SGA is defined as an infant born with a birth weight and size that falls below the tenth percentile of appropriate for gestational age infants. IUGR is an occurrence in which the infant development and maturation is slowed more than two deviations below the mean for its gestational age, sex and ethnicity. The relationship of these outcomes and their effects in the development of more severe conditions later in life is hard to determine and controversial due to possible confounding factors and the length of study requiring patient follow up several years beyond birth age.

CHAPTER 2

METHODOLOGY

The question of whether or not maternal eating disorders show a direct relationship on pregnancy outcome, neonatal birth defects and child development later in life was addressed using an evidence based literature review technique. Topics addressed in evaluation of the literature are; pregnancy outcome, congenital malformations and appropriate developmental progression after birth. Studies in this review evaluated child development from birth up to age. Developmental milestones such as the age at which the child sets up, crawls, walks and uses single words were recorded in studies. Altered pregnancy outcomes include terminated of therapeutic abortions and spontaneous abortions. Terminated pregnancies are similar to therapeutic abortions in the sense that they both occur at less than 20 weeks gestation. They are electively performed either my means of oral medication or surgical curettage. Spontaneous abortions also take place before 20 weeks gestation and occur without intentional intervention and cannot be stopped. Deliveries occurring after 20 weeks gestation but before 37 weeks are considered to be preterm. Congenital malformations or birth defects develop while the baby is maturing in the mother's womb. They most commonly occur during the first 3 months of pregnancy while the developing fetus is the most sensitive, and are usually detected within the first year of life.

The initial literature search was conducted utilizing the Medline and FirstSearch electronic databases. Literature chosen for this review included women meeting DSM-III or DSM-IV criteria for anorexia nervosa, bulimia nervosa or eating disorders not otherwise specified [1,2]. Studies attempting to eliminate other possible confounding factors such as cigarette smoking or chronic disease were desirable as well as articles highly relevant to the

research question under consideration. Studies evaluated were all published in peer reviewed journals no earlier than 1980. Anorexia nervosa and bulimia were indicated as separate DSM-III diagnosis in the year 1980. The search was performed using the following keywords: fetal growth and eating disorders, eating disorders and offspring, intrauterine malnutrition in humans, pregnancy and eating disorders, and obstetric effects of eating disorders. From articles meeting the above criteria data was extracted and evaluated in an unbiased manner for statistical significance.

CHAPTER 3

LITERATURE REVIEW

Further research pertaining to the events of pregnancies in women with eating disorders is needed, but until additional studies with larger sample sizes are conducted, it is important to evaluate the literature to date so that health care providers can safely educate women of child bearing age on this issue and make patients aware of potential consequences. Proper maternal nutrition and dietary behaviors are important for fetal growth and well-being during the perinatal period. Research to date has reviewed antenatal complications, complications during the birthing process and postnatal complications of the children up to 10-15 years of age.

The question of whether or not physicians should be screening all pregnant women who walk into their clinic for the presence of an eating disorder should be evaluated due to the possibility of harmful side effects infants may suffer. In 1989 Fahy and Treasure recommended that all young pregnant women be questioned about binge eating, self induced vomiting and laxative abuse [9]. Studies to date have individually evaluated the risks of these infants for low birth weight, low Apgar scores, behavioral difficulties, pregnancy outcomes, congenital malformations and developmental delays after birth [5, 7, 10, 9, 11, 13 14, 16, 20, 21, 23].

The risk of altered pregnancy outcomes in these women has been looked at and weighed against population norms at the time of study. In a study conducted by Brinch et al in 1987, 140 women with a former diagnosis of AN gave birth to 86 infants. This fertility rate was approximately 1/3 that of the general population at the time the study was conducted. Fifty of the original 140 eating disordered women gave birth to 86 children. Seven of these children died within the first week of life resulting in a perinatal mortality rate of 81 per thousand. This number is nearly 6 times greater than the rate estimated in the same region at the time of this

study. One child was still born and five died from complications of being born prematurely. The seventh child had a congenital malformation, hydrocephalus, resulting in death [5].

Another study by Stewart et al. 1987, evaluated pregnancy outcomes in women previously diagnosed with AN or BN, further dividing the participants into three groups; 1) AN patients who maintained weight through restrictive eating habits, 2) BN patients who engaged in binge eating followed by self-induced vomiting, and 3) patients with a previous AN or BN diagnosis in remission at the time of conception and with no reoccurrence of symptoms during the course of their pregnancy. The participant with subject ID # S(12) lost 8 pounds during the course of her pregnancy resulting in a spontaneous abortion at 12 weeks gestation. The remainder of the pregnancies resulted in 20 live births, 1 intrauterine death and 1 elective abortion. The remainder of the data produced in this study lead the researchers to advice women that waiting until their AN or BN is in remission is the best way to avoid adverse pregnancy outcomes [21].

The occurrence of miscarriage and terminated pregnancies, including total abortions and spontaneous abortions is debatable. Another large study conducted in 2000 by Blais et al. looked at 82 pregnancies of women with AN and BN. Although slightly higher rates of total abortions and slightly lower rates of live births were seen, results indicated no statistical significance in the rate of live births, total abortions and spontaneous abortions when comparing this study group to population based statistics put out by the U.S. Health and Human Services in 1995 [4, 15].

The incidence of infants of mothers with eating disorders born SGA or below the tenth percentile appropriate for gestational age has been given a lot of attention in the literature. Several studies support an increased risk for the occurrence of SGA infants in this population [5, 13, 20, 22]. Brinch and et al in 1988 showed twice the rate of SGA infants when compared to

the population norm at the time of this study. Another study not only showed statistically significant results for increased rates of SGA infants, but also significance in the occurrence of low birth weight, decreased head circumference and microcephaly [13]. It is likely that these findings are related to the eating behaviors of the mothers and result in poor intrauterine nutrient supplies. Preterm delivery after 20 weeks gestations and before 37 weeks gestation does not seem to be of concern in the majority of the larger scale studies to date [10, 11, 14].

The occurrence of congenital anomalies such as heart defects was reviewed in a small amount of the literature. The relationship does appear to exist in two of the studies looked at in this review [5, 6]. The occurrence of impaired vision, neural tube defects, undescended testes, persistent hyperplastic vitreous and heart defects such as a VSD was seen throughout the research in the evaluation of birth defects in infants born to mothers with eating disorders [5, 6, 11].

In a study that look at children and their progression through major developmental milestones, no differences were seen in the age at which case and control children reached these points in their development. Any difference that did seem to be present at birth no longer existed after 6 weeks of age [23].

Often along with anorexia nervosa and bulimia in young women comes shame and reluctance to admit to a health care provider that they may have a problem. Because of such shame caused by public stereotyping of the disease, there are many eating disorder cases that go undiagnosed and therefore are not followed in studies like the ones evaluated in this literature review. Some of the sample sizes in these studies were too small to result in any statistical significance therefore yielding only clinical significance. Sample sizes in these studies ranged from 7 to 452 experimental subjects. Therefore, the estimated number of undiagnosed cases of

maternal eating disorders in our country and around the world is likely much higher than the numbers available for evaluation in this study. Whether or not these additional numbers would significantly alter the conclusive data in this report needs to be evaluated through further study.

Table 1: Number of articles showing relationships between fetal birth defects, developmental delays and adverse pregnancy outcomes occurring in eating disordered pregnancies.

	<i>Fetal Birth Defects*</i>	<i>Delayed Developmental Progression**</i>	<i>Adverse Pregnancy Outcomes***</i>
# Articles Showing Association	2	2	7
# Articles Showing No Association	1	1	3

*Includes problems encountered with the infant that may effect how the body looks or works.

**Includes abnormalities in the progression of developmental milestones, i.e. sitting, crawling, walking and speech of single words.

***Includes terminated pregnancies or therapeutic abortions and spontaneous abortions occurring before 20 weeks gestation.

CHAPTER 4

DISCUSSION

5.1 Evidence in the literature

After reviewing the articles found in this search I realized that the literature on the topic under review is rather scarce. Literature concerning pregnancy outcome revealed one Level 1 article, three Level 2 articles, one Level 3 and one Level 4 articles supporting increased risk of altered pregnancy outcome in women with eating disorders. One Level 2 and two Level 4 articles denies any correlation between maternal eating disorders and increased rates of altered pregnancy outcomes including terminations and abortions. Literature that looked at developmental delays in the study group revealed one Level 2 and 2 Level 3 articles that supported an increase in risk of delays in the development of children of eating disordered mothers. Two Level 3 articles found there to be no increased risk in the occurrence developmental delays of the children in the study population. One Level 2 and two Level 3 articles support an increased risk of birth defects in mothers with eating disorders. Two Level 3 articles concluded there is no increased risk in the occurrence of birth defects in the study population.

5.2 Weaknesses in the Literature

The evidence evaluating the occurrence of birth defects was very weak and contained no Level 1 articles, not allowing us to make a strong conclusion about its occurrence. There was not enough evidence available in the literature to make a statement on the occurrence of developmental delays either way due to lack of Level 1 studies. We can generally conclude that maternal eating disorders do increase the risk of altered pregnancy outcomes. Some studies had unequal populations of anorexia nervosa and bulimia nervosa patients; therefore generalization of these

results across the two disease groups may not be valid. Further research may want to study the two groups separately. Due to public stereotyping and shame associated with these diseases, many cases go undiagnosed. These undiagnosed cases certainly leave some gaps in the literature concerning this topic.

5.3 Gaps in the Literature

The major finding in this article is that women with eating disorders as previously described are at increased risk for adverse pregnancy outcomes. There was no evidence found in this review that suggests an increased risk of congenital birth defects in these patients. A challenge in evaluating congenital birth defects in the presence of maternal eating disorders is eliminating all other confounding factors. There are several known teratogens that women are strongly advised to avoid during pregnancy. Some teratogens we are the most familiar with include cigarette smoking, alcohol use, named prescription medications as well as several over the counter medications. A chart review method of data collection was used in several studies included in this literature review [5, 6, 11]. This limits researchers to data available in the patient charts only. Hopefully providers documented thorough reports including over the counter medication use, tobacco or alcohol use and history of additional maternal health problems of disease.

One of the studies evaluated the use of alcohol, drugs, prescription medications and laxatives. Three women in the case group reported use of alcohol, 3 reported the use of psychotropic medications and 4 reported laxative use during the course of their pregnancies. After comparing data from the cases with the above reported substance abuse with the rest of the case subjects, no significant differences were discovered. They excluded subjects with evidence of organic brain syndromes or terminal illness. Although the study made the above adjustments

to make attempts at eliminating confounding factors, it failed to collect data and compute comparisons on the use of tobacco products during the pregnancies [11].

There are some differences between AN patients and BN patients that may lead to different results when evaluating the factors looked at in this study. AN patients typically have lower body weights and decreased amounts of sexual activity, assumingly leading to decreased rates of fertility. BN patients are less likely to have lower body weights and are known to be hypersexual [8]. Some studies had sample sizes that did not represent AN and BN equally [11]. These differences may provoke the need for the two conditions to be evaluated separately and suggests that these results may not be able to be applied to both diseases studied.

5.4 Validity of Review

The original article selection process was performed in a systematic fashion searching Medline and FirstSearch databases using the key words mentioned above. Once the articles were obtained they were closely evaluated for validity and assigned a level of evidence. They were also reviewed for compliance with previously established inclusion criteria noted in the methodology section of this review. There were 8 articles discarded after the article search was performed. Refer to appendix B for a complete listing of excluded articles. Data was then extracted from included articles and organized into Appendix A included in this review.

CHAPTER 5

CONCLUSION

Women with eating disorders, including anorexia nervosa, bulimia and eating disorders not otherwise specified, may be at increased risk for terminated pregnancies, miscarriages and abortions when compared to women without eating disorders. No differences in the developmental delay were seen in the case group that did not resolve within 6 months after birth. Due to the lack of Level 1 studies concerning birth defects and developmental delays in infants born to women with eating disorders, this review is unable to make statements regarding their occurrences in the study group. Women with active disease should be advised by their health care providers to avoid pregnancy until their eating disorder is in remission to decrease the risk of unfavorable pregnancy outcome.

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APPENDIX A

LIST OF EXCLUDED ARTICLES

Abraham S, Taylor A, Conti J. Postnatal depression, eating, exercise, and vomiting before and during pregnancy. *Int J Eat Disord.* 2001;29:482-487.

Abrams BF, Laros RK, Jr. Pregnancy weight, weight gain, and birth weight. *Am J Obstet Gynecol.* Mar 1986;154(3):503-509.

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APPENDIX B

RAW DATA

Study/Year	Research Address	Level of Evidence	Demographics	Pertinent Findings	Supportive of Research
	1. Birth Weight 2. Birth Length 3. Head Circumference 4. Apgar Scores 5. Behavior/ Temperamental Domains 6. Pregnancy Outcome 7. Antenatal Complications (IUGR) 8. Gestation Length 9. Mode of Delivery 10. Congenital Malformations 11. Developmental Progression (sit, crawl, walk, single words)	1. Randomized Controlled Trial 2. Non-randomized Control Trial 3. Observational (case control, cohort, systematic review, meta-analysis) 4. Observational (case study, cohort without control, case series) 5. Non-Experimental 6. Expert Opinion	Main Data (containing numbers and characteristics)		1. Anorexia Nervosa Associated w/ 2. Bulimia Associated w/ 3. EDNOS Associated w/ 4. No Association between Anorexia Nervosa, Bulimia or EDNOS 5. Background Article
Abraham S. 1998: Sexuality and reproduction in bulimia nervosa patients over 10 years.	6	1	43 patients were followed 10-15 years following presentation for treatment of bulimia nervosa and compared to a control group of 43 women attending the same clinic for well women exams. Data was collected using interviews based on the Eating Disorder Exam and DSM-IV criteria.	Upon completion of the 10-15 year study period 26% of the women still had an eating disorder and 74% had recovered. The number of terminated pregnancies in the experimental group of 15 was statistically significant with a p value <.05. The 15 occurrences of miscarriage among the case group had a statistically significant p value of <.001 when compared to	2 (terminated pregnancies & miscarriages)

				the 4 in the control group.	
Blais 2000: Pregnancy: Outcome and impact on symptomatology in a cohort of eating-disordered women.	6	4	Out of 554 women 48% (n=268) met criteria for anorexia nervosa or bulimia. 54 women of these women reported a total of 82 pregnancies (n=82). The p value for pregnancy outcome showed that these women were not at increased risk for altered pregnancy outcomes. 46 LB, 25 TAB, and 11 SAB were reported.	The statistics show no significant difference in pregnancy outcome for women diagnosed with AN or BN at or before the time of conception. Slightly higher rates of TAB and slightly lower rates of LB were seen when compared to numbers from the U.S. Health and Human Services, 1995.	4 (pregnancy outcome)
Brinch 1988: Anorexia nervosa and motherhood: reproduction pattern and mothering behavior of 50 women.	1, 5, 6, 10	3	Of 140 women with AN, 50 gave birth to 86 children. Information was gathered about the pregnancies, deliveries and development of the children at a mean age of 7 through interviews, questionnaires, telephone interviews and review of hospital reports.	Results: 7 children died within 1 week post-partum; 1 was still born, 1 was born with hydrocephalus, 5 were born premature and died from related complications. This perinatal mortality rate (81/1000) is 6 x greater than estimated at the time of this study. 14.3% of the children were born SGA (general population 6.8%). 1 child was visually impaired, 17% of the children were reported with failure to thrive during the first year of life, and 3 of the children were mentally ill.	1
Carmichael 2003: Dieting Behaviors and Risk of Neural Tube defects.	10	3	Data on 454 case mothers defined as having restricted food intake, diets to lose weight, fasting diets, eating disorders or other special diets and 462 control women were obtained through review of medical records and with the use of the Health Habits and History Questionnaire.	18 cases and 11 controls reported having eating disorder classification during the 1 st trimester of pregnancy, with the occurrence of NTD having a odds ration of 1.7 and 95% CI. During the 3 months preceding pregnancy 7 cases and 4 controls reported having eating disorder classification, with the occurrence of NTD having an odds ration of 1.8 and 95% CI. This study suggests that women who fall under the classification of having a	1 (NTD)

				restrictive type eating disorder during the first trimester of pregnancy are at an increased risk of	
Conti 1998: Eating behavior and pregnancy outcome.	1	2	This study evaluated 88 women who delivered low birth weight infants for a possible association between the occurrence of LBW infants and the presence of maternal eating disorders. Active disease AN mothers delivered 6 SGA infants and active diseaseBN mothers delivered 6 SGA infants. The control group who had no active disease had 4 SGA infants.	There was no increase in the occurrence of SGA infants born to mothers with eating disorders in this study when compared to the mothers without a history of an eating disorder. This study did exclude subjects who had any of the following confounding factors: hypertension, gestational diabetes, incompetent cervix, ante partum hemorrhage, multiple births, drug and alcohol abuse or a history of significant medical or psychiatric illness.	4
Fairburn 1992: Eating habits and eating disorders during pregnancy.	1, 4, 7, 8	1	A general population sample of n=100 primigravid women were interviewed at 2 different times throughout pregnancy (once at early to middle pregnancy, and once in the third trimester) using the Eating Disorder Examination (EDE) to determine eating disorder status. Data on the course and outcome of each pregnancy were obtained from hospital computer records and compared for relationships to eating disorder status obtained from the EDE.	3 of the women met criteria for diagnosis of EDNOS prior to conception, 2 had a history of AN and 3 had a history of both AN and BN. No significant relationships were found between the occurrence of low birth weight, gestation and APGAR scores for the infants born to the women who met diagnostic criteria for an eating disorder throughout the study.	4
Fahy 1993: The clinical significance of eating disorders in obstetrics.	Background Article	5			5
Fahy	1, 8, 9, 11	4	This study is in addition to Stein	Results show only one pregnancy	4

1989: Children of mothers with bulimia.			& Fairburn 1989. 5 additional cases were reviewed for problems in children of mothers with bulimia nervosa.	went without complications. Case #1; gestation 38 weeks, 2170 g, Case #2; forceps used in delivery, gestation 43 weeks, child had learning disability, Case #4; gestation 33 weeks, 2130 g. This study alone lacks complete records pertaining to the outcome of the pregnancies and children in cases #3 & #5. The sample size is too small to make any conclusions about the relationship between a maternal eating disorder and pregnancy outcome.	
Franko 2001: Pregnancy Complications and Neonatal Outcomes in Women With Eating Disorders.	1, 4, 8, 9, 10	3	Data obtained from women with AN or BN who were either symptomatic or asymptomatic during pregnancy (n=102). Statistics were non-significant for differences in birth weight, gestation, and Apgar scores. The occurrence of Caesarean section was statistically significant; p value <.04.	Women of both groups gave birth to infants with normal birth weights, Apgar scores and gestation length. The occurrence of birth defects was 6.1% (1 undescended right testicle, 1 persistent hyperplastic vitreous, and 1 VSD). This is higher than the population based estimate at the time of the study of 2.5%. When these 3 charts were reviewed for possibly medication or substance use, 2 of these 3 mothers participated in possibly teratogenic events during their pregnancies. Therefore no conclusion can be made as to the etiology of these birth defects. Symptomatic women can be determined to be at increased risk for Caesarian delivery.	4
James 2001: Eating disorders, fertility, and pregnancy:	Background Article	5			

Relationships and complications .					
Kouba 2005: Pregnancy and Neonatal Outcome in Women With Eating Disorders.	1, 2, 3, 4, 7, 8, 9, 10	2	Total Pregnancies (n=49), (24 anorexia nervosa, 20 bulimia and 5 EDNOS). Control group (n=67). Results: Significant P value for birth weight, head circumference, SGA status and microcephaly. Non-significant P value for IUGR, birth length, Apgar score at 5 min., malformations, weeks of Gestation and delivery mode and events.	Findings indicate significant increase in the risk of low birth weight, decreased head circumference, occurrence of SGA and microcephaly in infants born to women with previously diagnosed or currently active eating disorders. No significant risk for IUGR, low birth length, low Apgar scores, congenital malformation, complications or significant events during delivery or altered mode of delivery was concluded. Smoking was excluded as a factor among participants in this study. No abuse such as stress, alcohol or substance abuse was known among the participants of this study.	1, 2, 3
Lacey 1987: Bulimia Nervosa: The impact of pregnancy on mother and baby.	1, 6, 8, 9, 10	4	Total Pregnancies (n=22) to 20 untreated bulimic women. Results: 1 born prematurely at 29 wks weighing 950 g and dying after birth. All others born between 2500-3700g. 2 malformations (cleft palate and cleft lip). Deliveries; 8 breech, 4 delivered with forceps, 3 Caesarian section.	The results of this study do not imply that binge eating of bulimics during pregnancy is associated with fetal abnormalities. The mother of the infant whom died shortly after birth had a Hx of alcohol and drug abuse.	4
Mitchell 1991: A retrospective study of pregnancy in bulimia nervosa.	1, 6, 7, 8,	2	Evaluated first pregnancies (n=18) of experimental bulimic group and total first pregnancy (n=29) of non-eating disordered control group. Experimental results; 10 live births, 7 miscarriages, 1 neonatal death, 8 complications and 1 congenital malformation. Control	This study retrospectively examined the first pregnancies of the two groups and then all subsequent pregnancies separately. Results showed no statistical significance between the two groups and their pregnancy or neonatal outcome.	4

			<p>results; 24 live births, 5 miscarriages, 0 neonatal deaths, 23 complications and 4 congenital malformations.</p> <p>Total experimental pregnancies (n=38), and total control pregnancies (n=50). Experimental results; live births 22, miscarriage 10, neonatal deaths 2, and 4 abortions. Control results; live births 41, miscarriage 7, neonatal deaths 0, and 2 abortions.</p>		
Morgan 2006: Risk of postnatal depression, miscarriage, and preterm birth in bulimia nervosa: retrospective controlled study.	6, 8	3	<p>Women with active BN (n=122) were compared with women (n=82) whose previous diagnoses of BN was in remission through data collection using the EDE. The case women delivered 90 infants and miscarried 32 infants. The control group Delivered 72 infants and miscarried 10 infants.</p>	<p>Women with active BN had a miscarriage rat of 26%, nearly twice that of the control group without active disease. Active bulimia nervosa during pregnancy is associated the occurrence of miscarriage and preterm delivery.</p>	2
Park 2003: The offspring of mothers with eating disorders.	Background Article	5			5
Patel 2002: The Children of Mothers with Eating Disorders.	Background Article	5			5
Sollid 2004: Eating disorder that was	1,6, 8	2	<p>302 women previously hospitalized for AN, BN or feeding disturbance unspecified, conceiving n=504 pregnancies, and</p>	<p>The risk of low birth weight in children born to mothers with an eating disorder had a odds ration of 2.2; with a 95% CI, the risk of</p>	1,2

diagnosed before pregnancy and pregnancy outcome.			control group of 900 women representing a random sample of all women not previously diagnosed with any psychiatric illness conceiving n=1552 pregnancies. Information was obtained by prospective follow-up using coding forms designed for this study and filed by the midwife responsible for each birth.	gestation <37 weeks had a odd ration of 1.7; with a CI of 95%, and the risk of the occurrence of SGA had an odds ration of 1.8; with a 95% CI.	
Stewart 1987: Anorexia nervosa, bulimia, and pregnancy.	1,4, 6	4	Of 74 women in 3 different groups (active AN, active BN and patients in remission from illness at the time of conception) 15 had conceived 23 pregnancies (n=23). Results: 20 resulted in LB, 1 elective abortion, 1 intrauterine death and 1 spontaneous abortion. Infant birth weight (p value <.008) and 5 minute Apgar scores (p value <.001) were statistically significant between the active groups of women and those in remission.	This report suggests that women with active anorexia nervosa and bulimia are at increased risk for having infants of low birth weight and decreased Apgar scores at 5 minutes when compared to women in remission from the diseases. Note that all complications of pregnancy and delivery occurred in women with active disease during their pregnancy. This study supports advising women to wait until their AN or BN is in remission to become pregnant.	1,2
Treasure 1988: Intrauterine growth and neonatal weight gain in babies of women with anorexia nervosa.	7,11	4	The pregnancies of n=7 women diagnosed with AN were examined for intrauterine and postnatal growth. Intrauterine growth was determined during the third trimester by serial ultrasonography in 5 of the pregnancies by measuring fetal abdominal circumference. Postnatal growth was determined by gathering weights from birth to six months for 4 infants, one baby at 4 weeks and 3 babies at 20 weeks.	Abdominal growth rate decreased during the third trimester and fell below the third percentile at birth. Accelerated or catch up growth was seen in these infants within the first few months of life showing no permanent effects from maternal eating disorders on develop in these children after they have left the maternal womb.	1 (AN associated with IUGR; AN not associated with developmental delays)
Waugh 1999: Offspring of	1, 2, 4, 5, 8, 11	3	Women with anorexia nervosa or bulimia (n=10) were compared to a control group (n=10). The birth	Case infants were 13% lighter than control infants and 8% shorter. At 6 weeks no significant difference	1, 2

<p>women with eating disorders.</p>			<p>weight and birth length of the case infants showed a significant p value. Non-significant p values for Apgar scores at 1 and 5 minutes and for scores on the Taller Temperament Scale. Gestation for all infants ranged from 30-42 weeks.</p>	<p>was seen between the groups in weight. Differences in length did not become insignificant until 3 months of age. There was no significant difference in the time the case and control children reached developmental milestones. The # of mothers who smoked during pregnancy was non-significant when comparing the case and control groups.</p>	
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Vita

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