

# A Review of the Effects of Anxiety During Pregnancy on Children's Health

Zohreh Shahhosseini<sup>1</sup>, Mehdi Pourasghar<sup>2</sup>, Alireza Khalilian<sup>3</sup>, Fariba Salehi<sup>4\*</sup>

<sup>1</sup>Department of Midwifery and Reproductive Health, Mazandaran University of Medical Sciences, Sari, Iran

<sup>2</sup>Department of Psychiatry, Mazandaran University of Medical Sciences, Sari, Iran

<sup>3</sup>Department of Biostatistics, Mazandaran University of Medical Sciences, Sari, Iran

<sup>4</sup>Student Research Committee, Mazandaran University of Medical Sciences, Sari, Iran

Corresponding Author: Vesal street, Amir Mazandarani Boulevard, Mazandaran Province, Iran, Tel: +98-151-33367342, E-Mail: salehy.fariba@yahoo.com

## ABSTRACT

**Background:** Although pregnancy is often portrayed as a time of great joy, that's not the reality for all women. The adverse, long-term, stable, and sometimes, irreparable effects of anxiety during pregnancy can change pregnancy into an agonizing and unpleasant event of women's life span. Aim: The aim of this study was to explore the adverse effects of anxiety in pregnancy on children's health in order to promote child health. Methods: In this narrative review the researchers searched in public databases like Google Scholar general search engine, and then more specific: Science Direct, Scientific Information Database, Magiran, Irandoc, Pubmed, Scopus, Cochrane library, and Psych info using Medical Subject Headings (MeSH) keywords: anxiety, maternal anxiety, pregnancy, pregnancy outcome, control and prevention restricted to English / Persian language, during the 20 years ago. Then those articles written by renowned experts were selected. At first, a list of 60 papers generated from the initial search. Then reviewers studied titles and abstracts and finally, quality assessment of full text studies was performed by two independent reviewers. Researchers reviewed summary of all articles sought, ultimately used data from 25 full articles to compile this review paper. Results: The findings were classified into four groups: Biological, Mental, Behavioral, and Medical effects of anxiety during pregnancy. Conclusions: The effects of anxiety during pregnancy on offspring's health are serious and thought-provoking to which the need for identifying and screening of anxiety disorders in prenatal care is necessary.

**Keywords:** Anxiety, Pregnancy, Pregnancy outcome, Narrative review

## 1. INTRODUCTION

Pregnancy is one of the most important events in women's lives. Being pleasant, it is one of the most stressful events in a woman's life (1), as psychologists have cited, pregnancy as an emotional crisis (2, 3). If this crisis is not properly managed and controlled, it will turn into a prolonged crisis and will leave countless undesirable consequences on mother and her baby (4-6). Prevalence of anxiety disorder during pregnancy, in developed and developing countries are 10% and 25%, respectively (4, 7, 8).

High levels of anxiety, during pregnancy, have adverse effect on mother and baby (3, 9, 10). Anxiety, in early pregnancy, results in loss of fetus and in the second and the third trimester leads to a decrease in birth weight and increased activity of the Hypothalamus – Hypophysis–Adrenal axis (3, 4). It causes a change in steroidogenes, destruction of social behavior and fertility rate in adulthood. Also anxiety during pregnancy is accompanied by emotional problems, hyperactivity disorder, decentralization and disturbance in cognitive development of children (4, 11).

A study suggested that the level of the heart rate variability in the offspring of anxious mothers be less than the control group (12). Such children show more fear in dealing with everyday events in their life. Mother's anxiety, during pregnancy, is also associated with poor maternal- child interaction. In this way it's reported that anxiety and negative mood of mother has been stated as one of the mechanisms of this problem (13).

As regards high prevalence of anxiety and its serious consequences (3, 7) the researchers, in this study, have focused upon the complications of mother's anxiety during pregnancy, on offspring, according to findings of related studies.

## 2. METHODOLOGY

The current narrative review followed the five steps, which are: 1. identifying the research question; 2. Search methods for identifying relevant studies; 3. Study selection; 4. Charting the data, collating, summarizing 5. Reporting the results (14).

### 2.1 Identifying the research question

What are the effects of anxiety during pregnancy on children's health?

## 2.2 Search methods for identifying relevant studies

The researchers searched in public databases like Google Scholar general search engine, and then more specific: Science Direct, Scientific Information Database, Magiran, Irandoc, Pubmed, Scopus, Cochrane library, and Psych info using Medical Subject Headings (MeSH) keywords: anxiety, maternal anxiety, pregnancy, pregnancy outcome, control and prevention.

## 2.3 Study selection

A list of 60 papers generated from the initial search. Then reviewers studied titles and abstracts. Finally, quality assessment of full text studies was performed by two independent reviewers. Researchers reviewed summary of all articles sought, ultimately data from 25 full articles to compile this review paper were used. Researchers assessed for inclusion all titles and abstracts without language limitations in English and Persian language during the 20 years ago. Then those articles written by renowned experts were selected.

## 2.4 Charting the data, collating, summarizing

Data extracted and were summarized in result section.

## 2.5 Reporting the results

Reporting data were four categories.

## 3. RESULTS

Findings from studies on the effects of anxiety during pregnancy on children can be classified into four groups: Biological; Mental; Behavioral and Medical effects.

### 1. Biological effects of anxiety during pregnancy

The biological effects of anxiety on children's health were mentioned to be different. It is claimed there is a significant relationship between height of infant and maternal anxiety in a way that in mothers with high levels of anxiety, the birth height is shorter than birth height in non-anxious mothers (6, 15). It is also reported that maternal anxiety has a significant impact on birth weight (3, 10, 16), while in some other studies significant difference among fetus's growth restriction, neonatal Apgar score, birth weight, birth length; and head circumference among anxious and non-anxious women has not been reported (1, 9, 15, 17, 18).

### 2. Mental effects of anxiety during pregnancy

According to the results, the high level of maternal anxiety has a significant relation with mental disorders, emotional problems, lack of concentration and hyperactivity (4, 19, 20) and impaired cognitive development of children (4, 21). In this way it's mentioned that increased stress hormones like Corticotrophin particularly Cortisol and androgens which induce anxiety could lead to cognitive changes, changes in language development, ability to classify the contents and speech in girls (4, 22, 23). Increase of these hormones has a significant relation with gingerly in preschool boys too. The results of these studies indicate that extreme anxiety in pregnancy will be accompanied with proliferation of too neuroblasts and also schizophrenia and dyslexia (22).

### 3. Behavioral effects of anxiety during pregnancy

The results show that anxiety during pregnancy can lead to prolonged crying in the neonatal period(24), irritability and restlessness (25), individual differences in reaction to stressful life events (26); the weak interaction between mother-child (13), and more fear in dealing with life events (12). The other effect of anxiety is a negative impact on children's nervous system growth and development. This issue is associated with negative

behavioral consequences including: infants' responses to normal and standard sounds in the first nine months of infant's life which is more irritable and nervous response (23, 25).

### 4- Medical effects of anxiety during pregnancy

Findings show that children with anxious mothers face serious illnesses both in childhood and adulthood such as Shortness of breath, Rash; Asthma (20, 27), Coronary disease in adulthood and Reduction of heart rate variability in children(12). A study suggests that endocrine disorders, to be significant as the result of increasing the activity of the Hypothalamic-Pituitary-Adrenal axis in response to the high maternal anxiety. This process in turn may affect Glucose metabolism and causing Hyperglycemia in male offspring, although this relationship has not been established in female children (28). In other words, the effects of prenatal stress on Glucose metabolism in adulthood are related to sex (10). Other medical problems associated with anxiety during pregnancy, are increase abnormalities such as cleft lip and cleft palate (29).

## 4. DISCUSSION

Anxiety is one of the widespread health problems, especially during pregnancy. Considering its high incidence and serious complications, no identification and screening occur in prenatal care during pregnancy (30). According to the results, severe anxiety has a significant impact on biological indicators of newborn such as height, weight, and head circumference (6). In this way it's reported that chronic or extreme maternal anxiety may also cause changes in the blood flow to the baby, making it difficult to carry oxygen and other important nutrients to the baby's developing organs (31, 32). In addition, chronically or severely anxious mothers may feel overwhelmed and fatigued which might impact their diet and sleep habits and consistency of prenatal care. All of these factors may help explain how maternal anxiety during pregnancy can have long-term effects on the unborn child. The results of the studies in this reviewed article are not related to biological indicators in a way that some are repudiated. Hence it should be kept in mind as have been proved in many studies, there is a significant difference with regard to these parameters between anxious and non-anxious mothers which claims attention and focus for the health care providers.

Moderate-to-severe anxiety, during pregnancy, has a significant effect on children's cognitive and psychiatric disorders, which are, sometimes, stable and seriously endanger the health of children (19-21). Hence, the results of studies in this paper are coordinated, and make the problem more serious.

Behaviorally, anxiety creates a lot of problems for children, due to personal communication and social interaction, The increased activity of this core is associated with increased Cortisol (26), which is associated with reduced brain growth. The effect of cortisol is more associated with the growth of two sides of hippocampus, especially, the right side of hippocampus, in the first six months of infant's life. Individual differences in response to stressful events of life are related to the development of the right part of hippocampus. Finally, a wide range of medical problems associated with moderate- to- severe levels of anxiety is seen in children of this group of mothers that are considerable, sometimes remains lifelong and steady.

The evidences of some inconsistent studies provide the fact that further studies and researches in the field of the effects of anxiety during pregnancy on the health of children is a serious

point. Also it can be concluded that adverse effects resulting from high levels of maternal anxiety in children is a serious and thought-provoking in which the necessity of identifying and screening of anxiety disorders in periodic care during pregnancy seems to be urgent. In this regard, the identification of contexts and influencing factors on anxiety during pregnancy is essential.

*Acknowledgments: The authors wish to thanks Mazandaran University of Medical Sciences for funding this project (Grant Number: 93-1411).*

CONFLICT OF INTEREST: NONE DECLARED.

## REFERENCES

- Astrid C RF, Claude De, Nathali th, Spitz E. Anxiety symptom and coping strategies in the perinatal period. *Journal of BMC pregnancy and children*. 2013; 13(233): 14710.
- Rubertsson C, Hellström J, Cross M, Sydsjö G. Anxiety in early pregnancy: prevalence and contributing factors. *Archives of women's mental health*. 2014; 17(3): 221-228.
- Ding XX, Wu YL, Xu SJ, Zhu RP, Jia XM, Zhang SF, et al. Maternal anxiety during pregnancy and adverse birth outcomes: a systematic review and meta-analysis of prospective cohort studies. *Journal of affective disorders*. 2014;159:103-110.
- Glover V. Maternal depression, anxiety and stress during pregnancy and child outcome; what needs to be done. *Best practice & research Clinical obstetrics & gynaecology*. 2014; 28(1): 25-35.
- Bayrampour H, Salmon C, Vinturache A, Tough S. Effect of depressive and anxiety symptoms during pregnancy on risk of obstetric interventions. *Journal of Obstetrics and Gynaecology Research*. 2015.
- Glover V. Prenatal Stress and Its Effects on the Fetus and the Child: Possible Underlying Biological Mechanisms. *Perinatal Programming of Neurodevelopment*: Springer; 2015: 269-283.
- Martini J, Petzoldt J, Einsle F, Beesdo-Baum K, Höfler M, Wittchen H-U. Risk factors and course patterns of anxiety and depressive disorders during pregnancy and after delivery: A prospective-longitudinal study. *Journal of affective disorders*. 2015; 175: 385-395.
- Waqas A, Raza N, Lodhi HW, Jamal M, Muhammad Z, Rehman A. Psychosocial factors of antenatal anxiety and depression in Pakistan: Is social support a mediator. *PloS one*. 2015; 10(1): e0116510.
- Shahhosseini Z, Abedian K, Azimi H. Role of anxiety during pregnancy in preterm delivery. *Zanjan University of Medical Sciences Journal*. 2008; 16(63): 85-92.
- Brunton PJ. Effects of maternal exposure to social stress during pregnancy: consequences for mother and offspring. *Reproduction (Cambridge, England)*. 2013; 146(5): 175-189.
- Tarabulsky GM PJ, Vaillancour MP, Bussieres EL, et al. Meta-analytic finding of the relation between maternal prenatal stress and anxiety cognitive outcom *Dev behav psychiatr*. 2014; 35(1): 38-43.
- Braeken MAK, Kemp AH, Outhred T, Otte RA, Monsieur GJ, Jones A, et al. Pregnant mothers with resolved anxiety disorders and their offspring have reduced heart rate variability: Implications for the health of children. *PloS one*. 2013; 8(12): e83186.
- Webb R, Ayers S. Cognitive biases in processing infant emotion by women with depression, anxiety and post-traumatic stress disorder in pregnancy or after birth: A systematic review. *Cognition and Emotion*. 2014(head-of-print): 1-17.
- Cowley S, Whittaker K, Malone M, Donetto S, Grigulis A, Maben J. Why health visiting? Examining the potential public health benefits from health visiting practice within a universal service: A narrative review of the literature. *International journal of nursing studies*. 2015; 52(1): 465-480.
- Broekman BF, Chan YH, Chong YS, Kwek K, Sung SC, Haley CL, et al. The influence of anxiety and depressive symptoms during pregnancy on birth size. *Paediatric and perinatal epidemiology*. 2014; 28(2): 116-126.
- Dunkel Schetter C, Tanner L. Anxiety, depression and stress in pregnancy: implications for mothers, children, research, and practice. *Current opinion in psychiatry*. 2012; 25(2): 141-148.
- Andersson L, Sundström-Poromaa I, Wulff M, Åström M, Bixo M. Neonatal outcome following maternal antenatal depression and anxiety: a population-based study. *American Journal of Epidemiology*. 2004; 159(9): 872-881.
- Bunevicius A, Cesnaite E, Kusminskas L, Mockute I, Bunevicius R. Antenatal mental state and anthropometric characteristics of the neonates: I. Impact of symptoms of depression and anxiety. *Biol Psychiatry Psychopharmacol*. 2007; 9(1): 7-10.
- Santos IS, Matijasevich A, Barros AJ, Barros FC. Antenatal and postnatal maternal mood symptoms and psychiatric disorders in pre-school children from the 2004 Pelotas Birth Cohort. *Journal of affective disorders*. 2014; 164: 112-117.
- Teyhan A, Galobardes B, Henderson J. Child allergic symptoms and mental well-being: the role of maternal anxiety and depression. *The Journal of pediatrics*. 2014; 165(3): 592-9. e5.
- Buitelaar JK, Huizink AC, Mulder EJ, de Medina PG, Visser GH. Prenatal stress and cognitive development and temperament in infants. *Neurobiology of aging*. 2003;24 Suppl 1: S53-60.
- Huizink AC, Mulder EJ, Buitelaar JK. Prenatal stress and risk for psychopathology: specific effects or induction of general susceptibility? *Psychological bulletin*. 2004; 130(1): 115-142.
- van den Heuvel M, Johannes M, Henrichs J, Van den Bergh B. Maternal mindfulness during pregnancy and infant socio-emotional development and temperament: The mediating role of maternal anxiety. *Early human development*. 2015; 91(2): 103-108.
- Petzoldt J, Wittchen HU, Wittich J, Einsle F, Hoffer M, Martini J. Maternal anxiety disorders predict excessive infant crying: a prospective longitudinal study. *Archives of disease in childhood*. 2014; 99(9): 800-806.
- van den Heuvel MI, Donkers FC, Winkler I, Otte RA, Van den Bergh BR. Maternal mindfulness and anxiety during pregnancy affect infants' neural responses to sounds. *Social cognitive and affective neuroscience*. 2015;10(3): 453-460.
- Qiu A, Rifkin-Graboi A, Chen H, Chong YS, Kwek K, Gluckman PD, et al. Maternal anxiety and infants' hippocampal development: timing matters. *Translational psychiatry*. 2013; 3: e306.
- Rafei B, Akbarzadeh M, Asadi N, Zare N. Comparison of Attachment and Relaxation Training Effects on Anxiety in Third Trimester and Postpartum Depression among Primipara Women. *Hayat*. 2013; 19(1): 76-88.
- de Weerth C, Buitelaar JK, Beijers R. Infant cortisol and behavioral habituation to weekly maternal separations: links with maternal prenatal cortisol and psychosocial stress. *Psychoneuroendocrinology*. 2013; 38(12): 2863-2874.
- Carmichael SL, Shaw GM. Maternal life event stress and congenital anomalies. *Epidemiology*. 2000; 11(1): 30-35.
- Kane HS, Schetter CD, Glynn LM, Hobel CJ, Sandman CA. Pregnancy anxiety and prenatal cortisol trajectories. *Biological psychology*. 2014; 100: 13-19.
- Weinstock M. The long-term behavioural consequences of prenatal stress. *Neuroscience & Biobehavioral Reviews*. 2008; 32(6): 1073-1086.
- Hobel C, Culhane J. Role of psychosocial and nutritional stress on poor pregnancy outcome. *The Journal of nutrition*. 2003; 133(5): 1709S-1717S.