



## ΠΕΡΙΓΕΝΝΗΤΙΚΟ ΜΗΤΡΙΚΟ ΣΤΡΕΣ ΚΑΙ ΝΕΥΡΟ-ΣΥΜΠΕΡΙΦΟΡΙΣΤΙΚΗ ΑΝΑΠΤΥΞΗ ΤΟΥ ΕΜΒΡΥΟΥ ΚΑΙ ΤΟΥ ΠΑΙΔΙΟΥ

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### ΠΕΡΙΛΗΨΗ

**Εισαγωγή:** Το περιγεννητικό μητρικό άγχος είναι η έκθεση μιας εγκύου γυναίκας στο άγχος, από διάφορους παράγοντες, που δημιουργούν συναισθηματικά φορτία κατά τη διάρκεια της περιόδου της κύησης. Το στρες επηρεάζει τη δραστηριότητα πολλών συστημάτων του σώματος: ΚΝΣ, καρδιο-αναπνευστικό, μεταβολικό, ενδοκρινικό συν ανοσοποιητικό σύστημα. Το μητρικό προγεννητικό και το περιγεννητικό στρες θα μπορούσε να έχει άμεσο αντίκτυπο στο έμβρυο και μακροχρόνιες επιπτώσεις στο παιδί. **Στόχος:** Αυτή η ανασκόπηση της βιβλιογραφίας αποσκοπεί στον εντοπισμό της συσχέτισης του περιγεννητικού μητρικού στρες με τις επιδράσεις στη νευρο-συμπεριφοριστική ανάπτυξη του εμβρύου και του παιδιού. **Μεθοδολογία:** Πραγματοποιήθηκε μια βιβλιογραφική ανάλυση με σκοπό την εξεύρεση πληροφοριών σχετικά με το θέμα, μέσω βάσεων δεδομένων Pubmed, Google Scholar, Scientific Direct και αναγνωρισμένων επιστημονικών πηγών συν κατευθυντήριων γραμμών, στον τομέα της υγείας. **Αποτελέσματα:** Το μητρικό άγχος κατά τη διάρκεια της εγκυμοσύνης οδηγεί σε αύξηση των μητρικών γλυκοκορτικοειδών στα επίπεδα των οποίων τα περισσότερα απενεργοποιούνται στον πλακούντα. Αυτό είχε ως αποτέλεσμα σημαντικές επιπλοκές στον οργανισμό του παιδιού στη μετέπειτα ζωή του. Μερικές από τις αλλαγές που συμβαίνουν είναι προβλήματα συμπεριφοράς, μαθησιακές δυσκολίες, εύκολη προσοχή, άγχος, αλλά πιο σοβαρές αλλαγές όπως αυξημένες πιθανότητες για διαβήτη, καρδιαγγειακά προβλήματα ακόμη και άσθμα, είναι μερικές από τις επιπτώσεις του περιγεννητικού μητρικού στρες. **Συμπεράσματα:** Η διεθνής βιβλιογραφία των τελευταίων 15 ετών καταδεικνύει ότι το μητρικό άγχος, η κατάθλιψη και το άγχος επηρεάζουν την ανάπτυξη του νευρικού συστήματος του εμβρύου μέσω μιας διαδικασίας γνωστής ως «προγραμματισμός εμβρύου». Τέλος, το περιγεννητικό μητρικό άγχος μπορεί να αντιμετωπιστεί με την κατάλληλη βοήθεια, η οποία θα δοθεί από τη μαία και άλλους επαγγελματίες του συστήματος υγείας στη γυναίκα, μέσω ψυχο-προφυλακτικών προγραμμάτων κατά τη διάρκεια της εγκυμοσύνης, τεχνικών διαχείρισης του στρες και προγραμμάτων ψυχοεκπαίδευσης όχι μόνο για τις εγκύους γυναίκα αλλά και για τους συγγενείς της που μεταναστεύουν πιο ομαλά από το ένα στάδιο της ζωής τους στο άλλο.

**Λέξεις Κλειδιά:** Περιγεννητικό Στρες, Μητρικό Άγχος, Εγκυμοσύνη, Προγραμματισμός, Νευρο-συμπεριφοριστική Ανάπτυξη, Αναπτυξιακή Ψυχοπαθολογία



## PERINATAL MATERNAL STRESS AND THE NEUROBEHAVIORAL DEVELOPMENT OF THE FETUS AND CHILD

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### ABSTRACT

**Background:** Perinatal maternal stress is the exposure of a pregnant woman to stress, by various factors, which create emotional loads during the gestation period. Stress system affects the activity of many systems of the body: CNS, cardio-respiratory, metabolic, endocrine plus immune system. The maternal prenatal and perinatal stress could have a direct impact on the fetus and long-lasting effects on the child. **Aim:** This literature review aims to identify the correlation of perinatal maternal stress with the effects on the neurobehavioral development of the fetus and child. **Methodology:** A literature analysis was conducted with the aim of finding information on the topic, through databases of Pubmed, Google Scholar, Scientific Direct and recognized scientific sources plus guidelines, in the field of health. **Results:** Maternal stress during pregnancy leads to an increase in maternal glucocorticoids levels most of which is deactivated in the placenta. This has resulted in significant complications in the child's organism in his later life. Some of the changes that happen are behavioral problems, learning difficulties, easy attention, stress, but more serious changes such as increased odds for diabetes, cardiovascular problems even asthma, are some of the effects of perinatal mother stress. **Conclusions:** The international literature of the past 15 years demonstrates that maternal stress, depression and anxiety affect the development of fetal's nervous system through a process known as "fetal programming". Finally, Perinatal maternal stress can be managed with the appropriate help, which will be given by the midwife and other professionals in the health system to the woman, through psycho-prophylactic programs during pregnancy, stress management techniques and psychoeducation programs not only for the pregnant woman but also for her relatives migrating more smoothly from one stage of their lives to the other.

**Keywords:** Perinatal Stress, Maternal Stress, Pregnancy, Programming, Neurobehavioral Development, Developmental Psychopathology

## INTRODUCTION

Pregnancy is an important and determining factor in a woman's life. In most cases, it is once the only purpose in her life, and a reason to be completed as a woman, as her personal value depended on bringing a child to the world. During the period of pregnancy, apart from the adjustment a woman has to make with physical changes of her body, there are also psychological changes that she may have to deal with. This fact is the result of internal struggles, the anxiety of reproduction, pregnancy as well as the postpartum period (Moraitou, 2007).

Nature, through physical and hormonal changes during the pregnancy period, prepares for growth, not only the fetus but also the mother. This is achieved through changes that are vital to the woman and lead her smoothly towards the journey to maternity (Lothian, 2008). However, there are women who are not ready to become mothers. Specifically, women who have been pressured by external factors, or by reproductive problems, women who at the beginning of pregnancy did not experience any difficulty, but later on, they became anxious, a fact that had an impact on their psychology (NIH, 2017). Thus, all above mentioned women, come face to face with perinatal maternal stress.

Perinatal maternal stress is defined as the exposure of a pregnant woman to anxiety. Anxiety can be due to stressful life events or environmental problems during pregnancy. Perinatal anxiety of the mother is closely linked to the neurobehavioral development of the fetus and its subsequent development as a child, according to the existing bibliography. In particular, changes in maternal hormone and immune function resulting in stress can impair the immune function and neural development of the fetus and the infant (Charila et al., 2010).

Particularly, high levels of anxiety and stress can affect the embryo during pregnancy. The majority of studies demonstrate that perinatal period is a critical time as this interval develops the nervous system of the fetus. A series of facts can cause long-term effects in both behavioral and mental health of the child (Kinsella & Monk, 2009). Furthermore, in

recent studies has been found, that symptoms of stress and anxiety, which can also cause depression, are more frequent not only after childbirth but also during pregnancy. These results carried out by novel surveys which aimed at finding the effects of the psychological discomfort of pregnant women on fetal behavior plus development (Shetter & Tanner, 2012).

Moreover, these surveys are matched by the wide-ranging literature that suggests that mother's psychological changes and perinatal environmental reports, which are based on changes in utero physiology, affect the fetal origins hypothesis and then have an impact throughout its life (Kinsella & Monk, 2009).

In addition, as it has been found in most recent studies, maternal stress during pregnancy affects fetal development in many parameters. In this review, the main issues to be discussed are that women's psychology during pregnancy and during postpartum period affect the neurobehavioral development of the fetus and in long-term the child. Finally, we will focus on the crucial support that can be offered by midwives and other health professionals.

## MATERIALS & METHODS

In this literature review, we studied articles of the past few years of international literature. The majority of studies, as already mentioned, show that severe perinatal maternal stress could affect the fetal neurodevelopment and could have also negative long-term effects on infant's development, behavior plus psychology.

The aim of this literature review was to investigate the connection between perinatal maternal stress and the neurobehavioral development of the fetus and child. Factors such as definitions, causes, symptoms of perinatal maternal stress and its connection with the development of fetus and child, plus management and treatment that a midwife could offer, were analyzed. Additionally, we studied the recent international literature and found missing parts of bibliography so that to make suggestions

for future research.

Finally, various sources were used in order to write the dissertation such as literature, scientific research papers, journals and guidelines to be found through database of PubMed, Google Scholar, Science Direct and recognized organization on public health such as WHO. Findings were selected, and data was retrieved that provide information on perinatal stress and its effects on neurobehavioral development of the fetus and child, causes and symptoms of perinatal maternal stress, management of perinatal maternal stress and the midwife's support.

## RESULTS

### Perinatal stress and fetal programming

When a woman is pregnant, as the months pass, she slowly becomes aware of the changes in her body and she experiences more and more her pregnancy. During these months, the woman recounts various stages of her life, such as memories from childhood, school, her friends, even moments with her mother ((Moraitou, 2007). Moreover, this period of time her mind is alert, as she re-evaluates the events and facts through the echoes of the past. In pregnancy, women have an opportunity for personal development as their welfare develops and therefore matures, but this does not mean that it is a necessary consequence of pregnancy. Also, during this period if she does not overcome any psychological problems, then pregnancy could be a traumatic experience (Bjelica, 2004).

What is more, it is very important to take into consideration the psychological background of the woman before pregnancy, as stress is not necessarily acquired by pregnancy. Also, a critical factor is under which circumstances the woman got pregnant, namely if it was with her consent or under pressure (Bussel et al., 2006). In addition, many women experience problems of chronic anxiety and mental disorders, which are important factors in the subsequent treatment of the psychosomatic changes that may occur in pregnancy. Studies have shown that stress, depression and neurotic episodes before pregnancy have a result of

increased emotional disturbances in descendants (Sheng, 2017).

As defined by Chroussos (2009), "stress is a state in which homeostasis is actually threatened or perceived to be so; homeostasis is re-established by a complex repertoire of behavioral and physiological adaptive response of the organism" (Chroussos, 2009). Thus, stress is an adaptive mechanism that aims to keep the person up to speed in order to concentrate on the problem, to assess situations and set priorities and subsequently to have direct response to the problem finding a solution (Folkman, 1984). However, if stress is permanent and severe, the effects of the immune system cells may influence the body and cause changes in the brain resulting in mental disorders (RUHR, 2014).

Furthermore, maternal stress during pregnancy leads to an increase in glucocorticoids (cortisol, catecholamines etc) levels in the mother's circulation most of which is deactivated in the placenta and only 10-20% of it passes on the embryonic circulation. Placenta's role is crucial for normal development of fetus and child; 11 $\beta$ -hydroxysteroid dehydrogenase type 2 (HSD11B2) is an enzyme that regulates the effect of glucocorticoids by converting them to inactive metabolites avoiding any negative effects on child. However, in conditions of excess maternal prenatal stress, specific placenta genes can be modified, and stress passes from the placenta barrier to the fetus. This increase of glucocorticoids in fetal circulation suppresses the embryonic Hypothalamus Pituitary Adrenals axis and affects the "fetal programming" (O' Donnell, 2009; Harris, 2011).

Moreover, stress and depression of the mother, affect the development of the neonatal system of the newborn through a process, which is called "embryonic programming / imprinting". Embryonic programming is defined as series of adaptive mechanisms due to stimuli during critical stages of endometrial life with effects on gene expression and consequences on structure, function as well as corresponding proteins (O' Donnell, 2009).

### **Perinatal stress and fetal neurobehavioral development**

Many animal and human studies show that the developing embryo is directly affected by the physiological changes associated with perinatal stress. The maternal perinatal stress and the changes in endocrine and inflammatory activity are related to maternal health and its outcome to pregnancy and subsequently to the development of the embryo. Perinatal stress has a long-term effect on the health of offspring, both directly and indirectly. The problems that maternal stress can cause are related to the appearance of adverse effects associated with significant genetic effects, as well as the quality of postnatal care (Mary, 2013).

Specifically, prenatal stress changes the course of neurobiological development of the fetus and the mother's exposure to glucocorticoid has long-lasting effects on the behavior and physiology of the fetus. Also, pre-natal anxiety, which has been caused by external factors such as psychosocial cultural and environmental factors, might cause consequences for generations. Impacts can range from mild to very serious, with changes in the child's life, experiences of daily annoyances or even injuries. Stress factors may be psychosocial in the face of changes in personal life, or worry about pregnancy, and anything that is directly related to it and requires adaptive behavior (Mary, 2013).

Each trimester of pregnancy is very important for women and for the development of the fetus. This depends on controlling and maintaining congenial status during pregnancy. According to a recent research that carried out, chronic anxiety can change and prevent normal brain development, and this has the effect of increasing mental disorders (Giordana, 2015). The studies were conducted on embryos, in the twelve days of pregnancy on the anterior cerebellum, and in the seventeen and twenty-one days of pregnancy, on the hippocampus in the dentate gyrus and the cortex. The results of this study showed statistical differences only on the twenty-first day of pregnancy, by decreasing proliferation in the cortex and dentate gyrus of the embryos that participated in this research. In these changes, a decrease in prolactin

concentration and corticosterone increased in plasma (Giordana, 2015).

Additionally, the development of human embryonic brain is associated with several disorders, such as disturbances in learning, behavioral problems, and the availability of the child in his later life, which can even cause depression or other mental disorders. There are mechanisms that record the effects of prenatal stress, but they are not fully understood. For this reason, studies are being carried out to investigate perinatal stress and its effects on premature post-natal development of the cerebellum. This disruption of the human embryonic brain may contribute to increasing the sensitivity of psychopathology (Van den Hove, 2006).

Following studies of the effects of prenatal stress, there has been a reduction in body weight; there are elevated levels of corticosterone and reduction in the proliferation of cerebral cells immediately after birth. In particular, a reduction in the protein content of the neuropsychic factor derived from the cerebellum, olfactory bulbs and hippocampus in postnatal days was observed. These changes explain in some way the mood disorders, including depression of the child in his later life (Van den Hove, 2006).

During the 40-week pregnancy, the embryo, apart from its physical development, focuses on aesthetics, thus preparing for its extraterrestrial life. This preparation is the basis of the early contact of the fetus with his mother. The sensations of touch, the sight, the sound are some of the sensations that the embryo acquires mainly in the second trimester of its endometrial life (Morgan, 2017). In the second trimester of pregnancy, small gestational age is infected, which is associated with increased perinatal mortality risk, neonatal developmental, diabetes and hypertension even with low birth weight (Body Mass Index). These effects can be caused by maternal exposure to severe stress that creates an antioxidant endometrial environment (Khashan, 2014).

Also, the effects on the fetus, due to the increased anxiety experienced by mothers in pregnancy, according to recent data show that they are harmful (Mueller and Bale, 2008) (Talge et al., 2007). In specific, high levels of stress, hormones

and cortisol have an effect on the development of neural pathways in fetus brain. The autonomic nervous system and the female endocrine system affect their emotions during pregnancy due to the chronic activation of the sympathetic nervous system and the increased release of catecholamines, which increase maternal vasoconstriction and arterial pressure (Glover & O'Connor, 2002).

Furthermore, the development of the embryonic brain and hypothalamic pituitary adrenal axis is affected due to the maternal cortisol that penetrates through the placenta. Thus, chronic anxiety has an impact on the normal and behavioral function of the fetus and the recent review has shown that babies from stressful women were more irritable; they were not quite active and had a lower kinetic ton, due to elevated levels of basal cortisol. They also did not respond to the expressions of other persons, they had disturbed sleep, and at the age of two to four months there was intense reactivity (Bergner et al., 2008).

In addition, maternal embryos with increased anxiety were delayed in development, experienced higher right frontal and lower vagal tone, electroencephalography and levels of dopamine and serotonin were lower (Field et al., 2003). Newborn babies from stressed mothers had more sleepy sleep and more active energy, and the Neonatal Behavioral Assessment Scale (NBAS) was less optimized than the rest. Elements show that stress hormones in the womb have increased and have a direct relationship with low cognitive development, although this is dependent on maternal and infant relationships (Bergman et al., 2010).

Last but not least, one of the most serious types of anxiety that a woman can face in her pregnancy is post-traumatic stress disorder. This type of anxiety occurs after a painful and excessive stressful event, such as sexual abuse, an environmental disaster or the loss of a loved one, as well as a traumatic previous experience of birth. Post-traumatic stress disorder in pregnancy poses a threat to the health of the developing fetus, as well as prenatal birth and consequently low birth weight. (NIH, 2017).

Regarding the effects of perinatal maternal stress on children and adolescents, it has been observed that children who have experienced high levels of anxiety and depressive episodes during their development are directly linked to the effects on their mental health (Pietro et al, 2006). Psychosis is an increased risk for offspring with perinatal stressed mothers, as well as being associated with increased stressful incidents (Fineberg , 2015).

Psychological and social stress is the result of genetic changes in endometrial life. It has been shown that high levels of corticotropin released into the placenta and affecting the fetal brain are responsible for developmental difficulties. Also, many functional and morphological changes are responsible for daily problems of the life of a child that he may experience in adolescence. One of these problems is behavioral problems, learning difficulties and lack of attention. In addition, it has been observed that this child has a hyperactivity disorder, and is more likely to be born with autism, as well as having schizophrenia. Finally, many of the immune and metabolic lesions that may have suffered from the pernicious stress progeny have been correlated with lesions such as increased arterial pressure and hyperlipidemia, diabetes mellitus, and concerning immunological changes, child has more chances of having asthma as well as allergic disorders (Douros, 2017).

### **Consequences of improper perinatal stress management**

The symptoms that every woman experience in pregnancy are different; however, when there is anxiety, the woman makes a retrospective in the past and in the event, has nightmares and body reactions such as race heart beat and sweating. In addition, these women are more vulnerable and have more influence on smoking, drinking alcohol as well as street drugs. These abuses increase the probability of problems in pregnancy. There are several ways in which a woman can cope with the situation she is experiencing, that is accomplished by trying to understand what is causing her anxiety. Only by this means she can control it and then fight against it (Wenzel, 2016).

What is more, an equally serious result of intense anxiety is the choice on how each woman wants to give birth. The memories of each woman, whether positive or negative, from the experience of their childbirth, depends on whether they give birth in the way they wanted but also on the control they had during childbirth based on her birth plan. This experience is not only important for the well-being of women but also for the direction of the relationship that will develop in the future with her child (Cook & Loomis, 2012). In particular, an unpleasant experience on the birth day of her child, such as a complicated childbirth, or an urgent Caesarean section, can cause birth trauma. This often affects the relationship with the baby or even with the companion. Due to the acute frustration and anger that the mother may feel at the moment, she can develop post traumatic stress disorder (MIND, 2013).

Additionally, one more reason that a woman may have anxiety is at the time of her childbirth. Anxiety related to the genitals is a common phenomenon for women, due to the disorder of neurosomal convolution and the mechanism that controls the levels of anxiety. This fear is defined as a tokophobia. Tokophobia is a pathological fear that a pregnant woman feels a little before she gives birth. Fear is so powerful that it can prevent her from giving birth. Tokophobia is characterized as primary or secondary. In the case of primary tokophobia, the skeleton has no previous labor experience, and fear may have begun either from adolescence or from early adulthood. The secondary tokophobia, you create either from a previous difficult experience that the woman had during childbirth, or through a miscarriage of pregnancy (Bhatia & Jhanjee, 2012). In any case, there are indications that define tokophobia as a serious fear that can cause short-term and long-term adverse effects, both to the mother and the baby. (Connel et al., 2017).

#### **Perinatal stress management and the importance of a midwife's support**

The period of gestation, period of birth and also the post-natal period, are very important for the psychological change of the woman and for her plus baby's emotional well-being (Biaggi, 2016). There

is an increase in evidence that there is premature growth of the brain and that infants develop an emotional and behavioral relationship with their mothers from an early stage. For this reason, it is argued that early health care is essential for the unborn baby. There are many factors in which mothers have the ability to influence the development of their child. In particular, because of the biological and psychological changes that take place between the fourth and the seventh month of pregnancy, and the embryo are experiencing some mental representations. These representations are also related to the memories of the mother, the first relationships, family moments and traditions, as well as fears or sightings about her baby. Some women are only fed with beautiful emotions, and some with negative feelings (Bornstein et al., 2012).

Also, it is important, at this time, that midwives may encourage mothers to engage with their babies. In this way the woman realizes her pregnancy and creates a strong attachment from the beginning. Specifically, the first thing she can learn is to put her in the process of imagining her baby, and to create in her mind beautiful pictures with him. This avoids her from negative images and negative thoughts. In addition, ultrasound tests, give the women the opportunity to see all the movements and expressions that their baby takes in her mother's womb, this is a way of getting acquainted with him before he is born (Royal College of Midwives, 2012).

The midwife also needs to emphasize that from the twentieth -week the baby understands sounds and can recognize his parents from the different voices. Likewise, a baby can hear music through the mother and respond to the same sounds as soon as he is born (Hepper and Shahidullah, 1994). Lastly, it is important to consider that mothers who think very negatively about their babies should be examined by a psychologist.

Furthermore, what a pregnant woman needs to know is that the afflictions and the stressful situations that she is experiencing during her pregnancy are not permanent. With the help of health benefits, the difficulties can be handled more easily. Some changes as in

everyday life, such as healthy eating, particularly, the treatment for reducing and fighting stress is based on proper nutrition and hydration ( $\Omega$ -3, vitamin antioxidant, and tryptophan-rich foods (Dunkel & Tanner, 2012). Also it is necessary to get enough rest and restraint of unnecessary activities. Women can ask for help as of their daily life, such as housework, shopping and the preparation of their baby later. (Underdown, 2012).

Moreover, the midwife is one of the most important people during the pregnancy period for the women. She is one to trust and be advised from more than any one else. When there are problems during pregnancy, such as intense anxiety and difficult management, the presence of the midwife is necessary. First of all, the midwife has to support the woman, be a good listener and inspire confidence. Secondly, encouragement is necessary in this period of her life and thirdly, working with the woman's gynecologist is essential, as decisions must be taken jointly. Last but not least, midwife should be able to understand when she has to refer to a psychologist, as well as to be discreet and to carefully approach the sensibilities of the woman (March of Dimes, 2018).

Additionally, midwife is the person who prepares the woman not only for pregnancy, but also for labor, as well as for the postpartum period. This preparation is the most important assistance for the future mothers in terms of anxiety and smooth transition to motherhood. Prenatal visits to Transition to Parenthood, and the training courses provided by health professionals, are very helpful. In these centers the woman can discuss and express concerns that have arisen in pregnancy. With upbringing and relaxation exercises that involve breathing techniques, women begin to experience more self-esteem, less anxiety and fear, and in this way, there is a better progression in their pregnancy (Svensson et al, 2008).

What is more, midwife prepares the pregnant woman for the most important day of her life, giving birth and the chance to create her birth plan. By doing the birth plan, the woman will feel she has some of the control, and the fact that she will know the steps she will take before her child's

birth will reduce her anxiety for that day (Medforth et al., 2013).

Also, in the preparation centers, are used methods such as exercise in order to reduce woman's stress. It has been shown that mild to moderate exercise in pregnancy, a few days a week, is extremely beneficial for both the mother and the fetus. Exercise reduces levels of cortisol, the hormone that causes anxiety (American Pregnancy Association, 2016). Besides, other methods of stress management, suitable for gestation period are diaphragmatic breaths and guided visualization. Diaphragmatic breathing helps the pregnant woman with deep breaths, enlarges the belly and not the breast. With this method, she manages her respiration and thus the consumption of oxygen, heartbeat and the blood pressure are reduced. These have the effect of reducing anxiety and rejuvenating sensation. These breaths are taught by a trained professional and to benefit directly, they must practice it a lot of times a day for a few minutes.

What is more, guided visualizations taught by a trained professional, who has an audio or written script of up to eight weeks, which takes practice ten minutes a day. The images of the subject that the trainer creates to the participant give her the opportunity to develop knowledge about her health, behavior, and see immediate physiological changes. Through the aesthetic endeavor to do with the audiovisual, the olfactory, the optic and the kinesthetic relaxation, the woman experiences an inner image with all the means and thus with her imagination she achieves calmness and relaxation (Varvogli & Darviri, 2011). With all above mentioned techniques, sleep improves as well as heart rate and the person has better communication with other people. The woman is trained individually by a professional and performs these techniques for about twenty minutes a day, two to three times. With this practice the patient can relax alone and quickly as soon as she needs it.

However, there are women who have so severe stress, that may need help from a psychologist. A psychologist can help with psychotherapy to find the problem, through meeting and debates about women's worries and concerns. Also,



healthy ways of feeling emotions are what we want for pregnant women (American Pregnancy Association, 2016). There are several models of psychotherapy that could be used for anxiety disorders, but most commonly used is Cognitive Behavioral Therapy. In any case, however, the choice of therapy treatment depends on women's needs.

Furthermore, the last solution, to help a pregnant woman, is anxiolytic or antidepressant drugs, as it is a burden to the pregnant woman. Anxiolytic drugs should be taken only in cases that is ultimately needed, and pregnant women have weighed the benefit and the cost of taking medication, not only during pregnancy but also during lactation and breastfeeding. Then, women should be based on the correct instructions they are administered. Psychotropic drugs are easy to penetrate the placenta and negatively affect the development of the fetus. Information on the effects of drugs on the embryo is low, although there is widespread use of psychotropic drugs such as antidepressants. Per the literature, there is no evidence to suggest that these drugs solve the problem with the pregnant patient (Rubinckik et al., 2005).

However, some psychotropic drugs are indicated for safe use during pregnancy, yet there is no comprehensive research into the risks they pose to the prenatal period. As far as suckling women are concerned, a personalized analysis should be made for the continuation of the donation and the benefits and the burden on them. If treatment is necessary, then the dose to be prescribed should be as low as possible. In addition, nursing women should be aware of how they can detect levels of drug toxicity in their own and their baby's bodies. Since the patient and the doctor are aware of the risks of administration, the responsibility in the end belongs only to the patient. From that moment on, women will have to receive consistent holistic monitoring from a coordinated multidisciplinary team, which will aim to optimize care and manage their condition (Menon, 2008).

Finally, it is very important for the woman to share her concerns with other people and most of all with her partner and with her relatives. The relatives in their turn

must consult a healthcare professional. When a woman experiences an anxiety problem, she needs special treatment, during and after pregnancy. There are few weekly adult preparation programs for this period. Preparatory courses are done by skilled staff and in this way the transition from one stage of their life to the next is made easier (NCT, 2011).

There are local groups that support pregnant women and their relatives who are facing various problems such as anxiety. These centers also work with other health scientists, conducting psychoeducational programs. In Greece, since 2006 there has been a non-profit corporation called "Fenareti". This company was founded to promote health to women who need it. It organizes actions and provides high-level services. The philosophy of Fenareti is that health benefits should not be a luxury but a right for every woman (Fenareti, 2006).

## DISCUSSION

Exploring the international literature of the past few years we found that stress in a person's life can be damaging, and that biological and psychological health depends on one another. There are several elements that prove that perinatal maternal stress has a direct correlation with the effects on the neurobehavioral development of the fetus and child. The factors that cause stress during pregnancy may come from all the stages of her life, even from when she was the fetus.

Particularly, the majority of studies indicate that maternal stress, depression and anxiety of pregnant woman may affect the development of fetal's nervous system through a process known as "fetal programming". This fetal programming caused by excessive maternal stress may result in substantial disorders in the child's organism in his later life. Some of the changes that happen are behavioral problems, learning difficulties, destruction of attention, anxiety and mental plus mood disorders.

Furthermore, perinatal maternal stress can be managed with the appropriate help, which will be given by the midwife and other professionals in the health system to the woman, through psycho-prophylactic

programs during pregnancy, stress management techniques and psychoeducation programs not only for the pregnant woman but also for her relatives migrating more smoothly from one stage of their lives to the other.

The midwife is the person who will play the most significant role as she will advise and support the woman, her partner and even her relatives if needed. Even with the support of multidisciplinary team's that are skilled staff with the knowledge and skills they possess whenever the woman needs medical help, psychological help or simple advice. With the help of the midwife and the rest of the staff her fear and the responsibilities that she feels and causes her anxiety, will be decreased and will be able to experience one of the most important goods of nature, maternity.

In addition, the father's role is very crucial for pregnant women not only during gestation period but also during lactation. It is very helpful for a pregnant woman to have a tender, supportive partner who is sensitive to listen to her needs. Thus, woman would be safer and calmer throughout the pregnancy and the possibilities for the fetus to have some disorder would be reduced.

Finally, further study is required, to understand the connection between fetus, placenta and mother and how exactly glucocorticoids secretion affects the embryo. Moreover, studies about how healthy eating, contributes to the reduction of anxiety during pregnancy and finally, if women, whose mothers had a history of perinatal stress, are more likely to experience the same in their own pregnancy. These surveys will help us to improve our knowledge and how we will help women in the future holistically, in order to have a healthy pregnancy and therefore a healthy child.

What we should never forget, is that stress is a situation that we will always face because of the flow of everyday life, although the most important thing is not to let it affect us and as the scientist Hans Selye says, "It's not stress that 'kills' us, it's our reaction to it".

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