



# Complementary therapies to reduce physiological stress in pregnancy

Denise Tiran<sup>a,\*</sup>, Harry Chummun<sup>b</sup>

<sup>a</sup>*Complementary Medicine/Midwifery, School of Health & Social Care, University of Greenwich, Mansion Site, Avery Hill Campus, Avery Hill Road, Eltham, London SE9 2PQ, UK*

<sup>b</sup>*Acute and Continuing Care/Life Sciences and Nursing, School of Health & Social Care, University of Greenwich, London SE9 2PQ, UK*

**Summary** Pregnancy is a period of enormous physio-pathological and psychosocial adaptation in a woman's life. Although it is usually a time of joy and anticipation, many women experience some degree of anxiety, concern and fear regarding their own health and that of their babies, as well as the approaching labour. Worry about social, financial, occupational and relationship issues can often add to their stress levels which increases the possibility of pregnancy complications. However while mild to moderate stress facilitates successful adjustment to these demands, a significant increase in the levels of stress hormones may compromise the health of both mother and fetus.

Complementary therapies are increasingly popular with expectant mothers and are gradually being integrated into conventional maternity care, primarily by midwives. However, there is debate about whether these therapies simply provide a form of relaxation for pregnant women with psychological stress or whether they could—or should—be used more constructively to deal with physio-pathological stress.

This paper considers the physiological effects of certain complementary therapies in reducing the impact of stress in pregnancy.

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## Introduction

Pregnancy is associated with psychological as well as physiological stress. Psychological stress, such as fear and anxiety, increases production of several stress hormones, including adrenaline and cortisol, to enable the mother to cope with stress and the physical changes which occur as a normal part of pregnancy induce physiological stress. While mild stress is desirable, significantly high levels of stress may cause hypertension and other pathologies, which may compromise the mother or fetus. This

paper focuses on the physiological stress adaptation responses to pregnancy and the maternal and fetal benefits of complementary therapies particularly, massage and reflexology.

Pregnancy is normally associated with some degree of stress, related to factors such as anticipation of parenthood, the hormonal changes associated with the implantation of the blastocyst and the embryonic oxygen and nutritional demands on the mother. The emotional turmoil of an unplanned pregnancy, anxiety, fear or self-doubt affects psychological well-being and increases physiological stress, but these reactions are common and desirable as mild stress improves the coping ability of the pregnant woman. However, significant increases in stress levels disrupt daily

\*Corresponding author. Tel.: +44-20-8331-8494; fax: +44-20-8331-9161.

E-mail address: m.d.tiran@gre.ac.uk (D. Tiran).

activities, eventually leading to a deterioration in health and well-being,<sup>1</sup> particularly if the mother resorts to inappropriate coping strategies such as smoking and alcohol consumption as these indirectly raise stress further, contributing to increased perinatal and infant mortality and morbidity.<sup>2,3</sup> If these psychological factors become more pronounced, the resulting rise in stress hormones further exacerbates the physiological changes, leading to complications such as pre-eclampsia, intrauterine growth retardation, gestational diabetes or preterm labour.<sup>4</sup>

### The stress adaptive response in pregnancy

Stress is an unpleasant experience resulting from disturbances in the body's dynamic balance and affecting normal functioning. Such experiences can be psychological, such as fear, physical, such as hunger, sociological such as work-related or spiritual such as conformity to the demands of religious requirements. As long as these remain within manageable parameters, they contribute to our well-being but when the parameters are exceeded, they become stressors. Dr. Hans,<sup>5</sup> a physiologist, described the General Adaptation Syndrome, involving the alarm or flight-or-fight response, the resistance and the exhaustion stages. The alarm response occurs within seconds of experiencing a stressor, in which headaches, fatigue, nausea, tachycardia and muscle tension are often experienced. The resistance stage causes an increase in production of endocrine hormones such as cortisol and thyroxine, which maintain the adjustment to the continued presence of the stress. The exhaustion or "burnout" stage occurs when these resources are exhausted, eventually weakening several body systems, increasing morbidity and mortality.

Stressors elicit a controlled adaptation response to the hormonal and physical changes of pregnancy, which are detected by local and central chemo- and baroreceptors. Neural stimuli are then transmitted to the limbic system, the emotional and affective centre in the brain, as well as to the hypothalamus. Activation of the hypothalamus stimulates the sympathetic neurones of the autonomic nervous system, increasing synthesis and release of the catecholamines, adrenaline and noradrenaline (the 'fight or flight' response). Norepinephrine level increases at the time of fertilisation and is associated with an immediate adjustment to blastocyst implantation<sup>6</sup> producing hyper-arousal, alertness, palpitation, heightened

cognition and vigilance and generalised peripheral vaso-constriction resulting in an increased heart rate, blood pressure and cardiac output,<sup>7</sup> a process also resembling the "fight or flight" response.

A sustained period of adaptation follows implantation of the blastocyst, resulting in the *resistance* response in which the production of several other hormones, including cortisol, thyroxine and aldosterone, is increased. These physiological changes also stimulate the hypothalamic-pituitary-adrenal (HPA) axis, increasing production and release of adrenocorticotrophic hormone (ACTH) from the pituitary gland. ACTH stimulates adrenal cortisol and corticosterone production, to increase serum glucose and potentiate the vaso-constrictive effect of catecholamines thus increasing blood pressure and cardiac output further.

Normal cortisol levels have an anti-inflammatory influence, suppressing release of immune complexes such as eosinophils and interleukins in order to minimise the risk of maternal rejection of paternal protein in the fetus.<sup>8</sup> In addition catecholamines are involved in producing interleukins 1 (IL-1) which causes mild pyrexia while IL-4 and IL-5, produced by activated T-cells during pregnancy, increase production of antibodies IgE and IgA, respectively. Production of antibodies is increased in the presence of foreign proteins. The immune system down-regulates potentially dangerous T-cell-mediated immune responses, while activating monocytes and neutrophils in order to facilitate implantation of the blastocyst and maintenance of the pregnancy.

However raised blood cortisol over a prolonged period leads to hyperglycaemia and glycosuria, causing lethargy and tiredness and are associated with the ketosis and severe weight loss of hyperemesis gravidarum, which is often attributed to psychological stress.<sup>9</sup> Significantly raised catecholamines and cortisol levels may also lead to spontaneous abortion during the first trimester<sup>10</sup> or preterm labour.<sup>4</sup>

ACTH stimulates production of mineralo-corticoids, particularly aldosterone, which facilitates re-absorption of sodium, under the influence of chemoreceptors, promoting passive reabsorption of fluid from the renal tubules to maintain a stable fluid volume. Aldosterone increases significantly towards term, raising blood pressure and fluid retention.<sup>11</sup> However, this does not appear to contribute to the pathogenesis of pregnancy-induced hypertension since third trimester aldosterone levels fall in pre-eclamptic women.<sup>12</sup>

In normal pregnancy, blood pressure decreases in response to the vaso-dilatory effects of progesterone. Hypotension occurs in approximately 20% of

women, but most compensate by increasing systematic vascular resistance.<sup>13</sup> The blood pressure may rise to the pre-pregnancy baseline in cases of mild stress, due to the vasoconstrictive effects of raised catecholamine levels.<sup>14</sup> However severe stress precipitates tachycardia, palpitations, hypertension and may ultimately lead to pre-eclampsia.<sup>15</sup> Fetal growth and well-being may also be compromised due to the combined effects of hypertension which may trigger significant increases in adrenaline and noradrenaline, reducing effective development of the utero-embryonic junction.<sup>16</sup>

The normal physical and psychological discomforts of pregnancy may be exacerbated by the "fight or flight" response to excessive stress, in which tension, headache, muscle spasms, insomnia, fatigue and loss of concentration occur.<sup>7</sup> Resulting tiredness and sleep deprivation cause an increase in the secretion of substance P, which exacerbates pain perception, whereas quality deep sleep leads to an increase in somatostatin which antagonises the production of substance P.<sup>17</sup>

During pregnancy, hormonal factors and diversion of blood supply to vital reproductive organs causes nausea, vomiting, indigestion, heartburn and constipation. However, prolonged stress may induce gastric irritation, enhance colon motility with depletion of mucin content and may initiate or exacerbate pre-existing irritable bowel syndrome.<sup>18</sup>

Serotonin (5 Hydroxytryptamine), a neurotransmitter in the cerebral cortex, hypothalamus, limbic system and in circulating platelets, is associated with mood changes, pain appreciation, sexual activity, appetite, endocrine and cardiac functions which are all affected during pregnancy. Significantly reduced serotonin levels have been implicated in gestational depression and the aetiology of mental depressive psychosis.<sup>6</sup>

Hypothalamic stimulation triggers the release from the pituitary gland of thyroid stimulating hormone. The resulting raised thyroxin increases conversion of serum glucose into adenosine triphosphate for increased cellular functions although there is very little published research clearly explaining the role of thyroxin in the maintenance of pregnancy or its effects on fetal growth and development. However, the increased serum thyroxin level elevates the maternal metabolic rate to ensure adequate growth and developing of the fetus.<sup>19</sup>

Stimulation of the hypothalamus produces beta-endorphins,<sup>20</sup> the natural opiates, which reduce pain perception by blocking pain transmission to the central nervous system.<sup>21</sup> Pain increases stress

levels further and during intense physiological stress such as labour, production of beta-endorphins may be insufficient to provide adequate relief for some women, leading to exaggerated pain control behaviours.

### Complementary therapies to reduce the adverse effects of stress hormones in pregnancy

Complementary therapies are increasingly being incorporated into conventional health services, particularly maternity care, when the majority of women are undergoing a normal physiological process and are fundamentally healthy but are suffering a variety of physical symptoms for which medication is actively discouraged in order to protect the fetus. There is also a growing recognition amongst orthodox health professionals of the inter-relationship between body, mind and spirit, and the impact of psycho-emotional and spiritual factors on health (Fig. 1).

Within midwifery practice holistic care focuses on facilitating the mothers' psycho-social well-being as well as helping them to cope with the impact of physiological symptoms. Complementary therapies can enhance routine antenatal care and may be used either as a means of relaxation or to treat specific pregnancy conditions.<sup>22</sup> The psychological effects of regular relaxation therapies can be invaluable, offering the mother "time out" and the opportunity to discuss some of her anxieties, particularly when the therapies are provided by midwives, and may help in the prevention of stress-induced complications.<sup>23</sup> It is important however to acknowledge the *physiological* as well as the psychological effects of complementary therapies which are often viewed simply as "relaxation" strategies, but which may consequently reduce the physio-pathological impact of stress to achieve a more successful pregnancy outcome.

Touch therapies, such as massage and reflexology, assist in alleviating maternal stress by stimulating vagal activity to reduce cortisol and norepinephrine and increase insulin, serotonin 5-HIAA and immune functioning, indirectly enhancing fetal growth,<sup>24</sup> although the intensity and cause of stress and massage duration produce variable responses.<sup>25</sup> Relaxation therapies such as yoga and Qi Gong reduce catecholamine levels, cholesterol, serum glucose, triglycerides and blood pressure and consequently lower oxidative stress.<sup>26,27</sup>

Physiology of stress in pregnancy	Possible impact on pregnancy	Complementary therapies to reduce stress in pregnancy
↑ adrenaline ↑ noradrenaline ↑ cortisol	lethargy, tiredness pregnancy-induced ↑ BP heartburn hyperemesis gravidarum increased serum glucose spontaneous abortion	massage reflexology acupuncture yoga tai chi & qi gong
↑ substance P	insomnia ↑ pain perception: headache, backache, labour pain	massage reflexology acupuncture hypnotherapy aromatherapy
↓ immune function	spontaneous abortion impaired wound healing ↑ risk of infection	acupuncture reflexology massage aromatherapy
↓ serotonin	mood swings, depression	therapeutic touch hypnotherapy acupuncture
↓ insulin	↑ blood glucose tiredness intra-uterine growth retardation	therapeutic touch yoga qi gong
↓ aldosterone	oedema, carpal tunnel syndrome pre-eclampsia	reflexology

Figure 1 Complementary therapies to reduce stress in pregnancy.

Reflexology increases sensitivity of the aortic baroreceptors resulting in greater diuresis, thus reducing circulating blood volume and potential hypertension.<sup>28</sup> Women with gestational hypertension may benefit from these anti-hypertensive effects, although it *may* be contraindicated in mothers with fulminating pre-eclampsia due to the possibility of renal damage from stimulating excessive micturition. Acupuncture also lowers blood pressure, notably systolic pressure, in those with pre-existing hypertension, but does not appear to have a significant effect in normotensive people.<sup>29</sup>

CAM therapies which aid relaxation and promote sleep, such as acupuncture, acupressure, hypnotherapy, massage, reflexology or aromatherapy, increase endorphin release, thus adding to the mother's ability to cope with painful stimuli. The analgesic effect of therapeutic touch is attributed to beta-endorphin (serotonin) release<sup>30</sup> and the gate control mechanism<sup>31</sup> but may also be due to local circulatory improvement, skeletal muscle relaxation via stimulation of the parasympathetic nervous system and reduction in ischaemia produced by changes in cerebral blood flow.<sup>32</sup> Antenatal conditions such as headache, backache or labour pain often respond well to touch therapies,

although the positive impact of the client–therapist relationship cannot be discounted.<sup>33</sup>

During labour, massage is relaxing but may only intercept pain stimuli during the latent phase, rather than the active and transitional phases of the first stage.<sup>34</sup> Using essential oils may enhance the analgesic action of massage by their effects on the limbic system and by “closing” the gate control mechanism, thus reducing the experience of pain.<sup>35</sup> Acupuncture is thought to induce analgesia by increasing the release of opioids, such as endorphins and enkephalins and reducing catecholamine and plasma cortisol levels, blood pressure and heart rate,<sup>36</sup> thus suppressing the release of substance P, although Ramnero et al.<sup>37</sup> attribute the altered perception of pain as much to psychological relaxation as to interception of physiological mechanisms. Regular antenatal reflexology appears to reduce pain perception and duration of labour,<sup>38</sup> although the mechanism of action is not clear. Hypnotherapy has also been shown positively to affect beta-endorphins and serotonin, lowering pain, anxiety and depression,<sup>39</sup> although any decrease in psychological distress may not be related directly to specific physiological adaptations.<sup>40</sup> Hypnosis appears to be merely comparable

with other stress-relieving techniques to reduce pain and anxiety and may best be used in conjunction with one or more other strategies.<sup>41</sup>

## Conclusion

Midwives frequently argue that time constraints preclude them from providing massage, reflexology and other touch therapies, even when they are appropriately qualified to do so, but an evaluation and adaptation of the process of traditional antenatal care may facilitate a more successful outcome. The overall holistic aim of antenatal care is to help the expectant mother through as safe and satisfying an experience of pregnancy and childbirth as possible and to prepare her for parenthood. The time taken to monitor the woman's physiopathological state is minimal compared to that required to attend to their psycho-emotional and educational needs. Better utilisation of the time spent with pregnant women, incorporating touch or relaxation therapies into normal antenatal care, may be more productive, resulting in women who enter labour in a more relaxed state, consequently normalising the childbearing experience. Relief of physiological disorders of pregnancy, easing of pain in labour, successful breastfeeding and prevention or alleviation of postnatal depression may all be possible, through the use of complementary therapies known to affect stress hormones. Reduction of stress in pregnancy contributes to improved fetal as well as maternal well-being and has ongoing implications for the health of the mother, her infant and family.

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