

# ERGONOMICS & PREGNANCY



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**IF YOU ARE A WORKING WOMAN AND ARE PREGNANT OR ARE THINKING ABOUT BECOMING PREGNANT, THE FOLLOWING WILL BE OF PARTICULAR INTEREST TO YOU.** This fact sheet is

about pregnancy and ergonomics. Ergonomics is the science of fitting the job to the worker, rather than fitting the worker to the job. You should also be aware of the possible dangers from chemical exposures in your workplace, which can be the most harmful during the first trimester (three months) of pregnancy. The Occupational Health Clinics for Ontario Workers, Inc. can give you chemical hazard information. This factsheet is about ergonomic hazards which are a problem mainly in the last trimester (three months) of pregnancy.

You need to understand some basic health issues before you can understand the importance of ergonomic factors related to pregnancy. Pregnancy is a normal, healthy condition during which the woman's body changes in many ways. During the first trimester (*the first three months*), the different parts of the baby are formed and the baby is at the greatest risk for harm. In the second and third trimesters the baby's organs develop and mature, and the size and weight increase.

The body's changes during pregnancy are caused by special hormones or "chemical messengers", two of which are progesterone and estrogen. Progesterone relaxes muscles of the uterus (*where the baby develops*), the stomach and the blood vessels. Progesterone may also cause some unwanted effects such as indigestion, constipation, heartburn and varicose veins. The second hormone, estrogen, plays an important role in the baby's

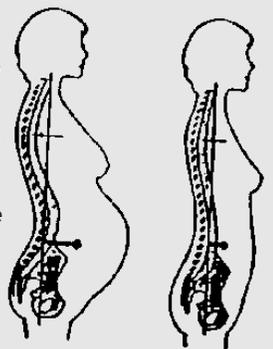
growth, as well as the woman's breast development. During the latter stages of pregnancy, the growing uterus causes pressure beneath the lungs. For this reason pregnant women often find themselves short of breath.

Throughout the pregnancy, the muscles of the pelvis relax, softening and stretching to increase pelvic size. Several joints, especially in the spine, become less stable and show signs of separation and movement to accommodate the growing baby. The back muscles have additional strain added to them, causing some of the low back pain often experienced during pregnancy. In a non-pregnant woman the centre of gravity is located just in front of the spine and level with the kidneys. In a pregnant woman the centre of gravity is shifted forward, straining the spine and throwing the woman off balance (see *Figure 1*). This may cause her to throw back her shoulders, lean backward on her heels, and place additional strain on her lower back. The ligaments, which add support and strength, are weakened, so the woman relies only on the muscles of the back to stand upright. The back muscles become tight and tired, leading to low back pain. Postures that would further weaken and stretch her muscles, such as leaning forward at the waist, should be avoided during the pregnancy.

**Figure 1.**

*During pregnancy the large abdomen causes the centre of gravity to move forward. A curve in the spine results causing backache and strain.*

*From: John T. Queenan and Carrie Neber Queenan; (Eds.) A New Life, Toronto; Stoddart Publishing Co., 1989; 40.*



## WHAT ABOUT THE PREGNANT WOMAN AT WORK?

Pregnant working women are raising concerns about ergonomic risk factors that may affect them as well as their baby. An ergonomic risk factor is any imbalance between the worker and the work environment which results in extra demands on the worker. The main ergonomic risk factors include: awkward postures, high force, no rest and repetitive work. Every person responds to ergonomic risk factors in different ways; for example, one worker may have symptoms of a repetitive strain injury while another worker doing the same work may not have symptoms. To reduce the risk of injury, ergonomic risk factors should be identified and reduced as much as possible.

### Ergonomic Risk Factors

- Awkward Postures
- High force (e.g. heavy lifting)
- No Rest
- Repetitive Work

Today, many women work during pregnancy and continue to do so until the birth of their child. However, working in unfavourable conditions may have adverse effects on the woman as well as her baby. The most common pregnancy outcomes studied in relation to ergonomics are gestational age, birthweight and spontaneous abortion. Maternal health is also important and is discussed in this paper.

## RISK FACTORS AND PREGNANCY OUTCOME

**Gestational age is the age from conception to birth as counted from the first day of the last normal menstrual period. Normal gestational age at birth is 37-41 weeks.**

Low birthweight, gestational age before 37 weeks and prematurity are considered to be harmful to the baby.

Gestational age has been shown to be affected by prolonged standing<sup>12, 13</sup> and heavy physical exertion<sup>1</sup>. Gestational age is not affected by heavy lifting<sup>2</sup>.

**Birthweight is the weight of the baby at birth. Low birthweight is less than 2500 g (5.5 lbs), normal birthweight is 2500-4500g (5.5-10 lbs).**

Women who worked in metal, electrical, clothing and manufacturing industries, in food and drink services, or as janitors or chambermaids tended to have babies born with a lower birthweight<sup>7</sup>.

Low birthweight was thought to be related to fatigue, heavy lifting and long work hours in the women who worked in the two service and three manufacturing industries<sup>7</sup>. Low birthweight also tended to occur more frequently when the women were standing for more than 3 hours at a time during the later stages of pregnancy<sup>10</sup>. Exposure to high noise levels (over 85 dB) may also cause low birthweight<sup>9, 5</sup>.

**Premature birth is birthweight less than 2500 g or less than 37 weeks gestational age. Preterm birth is birth before 37 weeks.**

High fatigue, shiftwork, rotating or changing schedules were found to be related to preterm birth<sup>9, 11</sup>.

Preterm birth may be caused by noise exposure<sup>9, 5</sup>, prolonged standing<sup>13</sup>, frequent heavy lifting (*more than 50 times per week*)<sup>2</sup> and strenuous working postures<sup>1</sup>.

## PREGNANCY LOSS

**Spontaneous abortion (miscarriage) is the termination of pregnancy without apparent cause.**

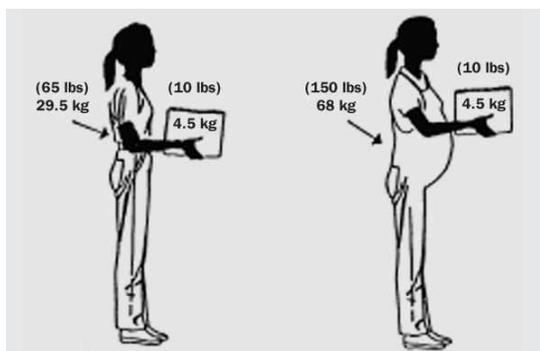
Occupational ergonomic risk factors for spontaneous abortion were shiftwork, piecework, posture, heavy lifting or physical effort<sup>4</sup>. Heavy lifting and physical effort, especially bending movements in early pregnancy was associated with an increase in spontaneous abortion<sup>3</sup>. An elevated risk of spontaneous abortion was found to be related to shift work<sup>8</sup>. Occupations that may be more at risk for spontaneous abortion include metal and electrical workers<sup>6, 8</sup>, as well as sales and service occupations<sup>8</sup>.

## Stillbirth is the birth of a dead baby

An increase in the risk of stillbirth in leather workers and other manufacturing industries was found. There has been an increase in the risk of stillbirth and spontaneous abortion in nursing assistants and aides, saleswomen, and food and beverage service workers, which may be associated with heavy lifting, physical effort and long working hours<sup>7</sup>.

## MATERNAL HEALTH

The pregnant worker is at her greatest risk for injuries during her third trimester when her abdomen is at its greatest size. The amount of stress on the lower back is greater when the object carried or lifted is further away from the lower back due to the increased size of the abdomen (see *Figure 2*). The further away from the body the object is, the less weight that can be lifted. In *Figure 2*, a woman lifting a 4.5 kg (10 lb) object close to her body has about 29.5 kg (65 lbs) of pressure on her low back. The same woman lifts the same load when she is pregnant. Due to the larger stomach size, the object is lifted further away from her body. This causes about 68 kg (150 lbs) of stress on her low back when lifting the same amount of weight.



**Figure 2.**

*This figure shows the amount of stress that occurs on the lower back increases when the object is lifted further away from the body.*

As mentioned earlier, during the later stages of pregnancy, the curve in the lower back increases. Because of this change, the pregnant worker's lower back muscles have to work harder in order to keep her balance. The muscles have to work harder to stand, so the worker often feels discomfort in the lower back after standing for long periods of time.

The pregnant worker should also be aware of developing symptoms of carpal tunnel syndrome. Some symptoms are pain, tingling, numbness, and reduced strength of the hand. Pregnancy-related carpal tunnel syndrome is caused by the swelling of the hands and the arms.

## RECOMMENDATIONS

Generally, workers whose work is physically strenuous should be considered to be at increased risk when pregnant. Physically strenuous work includes prolonged standing for more than 3 hours per day, working on industrial machines, repetitive lifting more than 10 kg (22 lbs), assembly line jobs (*repetitive work*), and working in cold, hot, or noisy environments.

Women in the third trimester should not perform jobs that require balance or lifting heavy weights. Exposure to loud noise, rotating shiftwork and long working hours should be avoided.

The workstation should be adjustable to reduce any awkward postures and to accommodate the pregnant woman's changing body. Women in jobs where they sit a lot may develop low back pain which may be relieved with the use of a proper chair with a supporting lumbar back rest, as well as a foot rest. The work station should be adjustable so the woman may work either sitting or standing, to allow frequent change in posture.

Walking should be encouraged throughout the pregnancy, but in moderation. Prolonged sitting or standing are leading risk factors for problems in pregnancy. Walking causes the leg veins to pump blood upward from the feet and helps prevent minor swelling of the ankles. Pressure from the firm edge of seat pans that can

obstruct leg veins when sitting should be avoided because it may cause blood clots.

Electromagnetic fields (EMF's) are invisible lines of force that occur wherever electricity is being conducted. They are made up of both an electric field and a magnetic field. Electric fields are present when appliances or equipment are plugged in, as well as when they are turned on or off. Magnetic fields are present only when the equipment is turned on. Electric fields can be blocked, but magnetic fields cannot. The electromagnetic fields that are of concern from Video Display Terminals (VDT) are very low frequencies (VLF's) and extremely low frequencies (ELF's).

Studies concerning EMF's on pregnancy have been inconclusive. The question still remains as to whether pregnant women exposed to VDT radiation face a higher risk of miscarriage or birth defects. The consensus is that VDT-associated ELF's do not adversely affect pregnancy. Recent human and animal studies, however, have linked ELF's with an increase in certain types of cancer, such as leukemia and male breast cancer.

If you are pregnant and you are concerned about EMF's, you may want to take the following precautions:

## Avoid or Limit

- *Physical Strenuous Work*
- *Work Requiring Balance*
- *Heavy Lifting*
- *Loud Noise*
- *Shift Work*
- *Long Working Hours*
- *Unadjustable Work Stations*
- *Prolonged Sitting*
- *Prolonged Standing*
- *Electromagnetic Field Exposure*

- Take regular breaks away from VDT work. This will reduce the exposure time to EMF's.
- Radiation-reducing glare screens (or shields) can reduce the electric component of the EMF's. Do not use a shield that distorts the image on the monitor in any way.
- Turn off the VDT when it is not in use.
- Do not use lead aprons.

Ergonomic principles that apply to non-pregnant workers must also be applied to pregnant workers for the duration of their pregnancy. If the risks cannot be reduced or decreased, then the pregnant worker should be given other suitable work for the duration of their pregnancy.

## LEGAL RIGHTS

Under Sec. 25(2)(a) of the Occupational Health and Safety Act of Ontario, an employer shall provide information, instruction and supervision to a worker to protect the health or safety of the worker. Under Sec. 25(2)(h), the employer shall take every precaution reasonable in the circumstances, for the protection of a worker. Under current legislation the baby is not recognized under the Occupational Health and Safety Act of Ontario, but the pregnant worker can act on behalf of the baby as a part of her body.

This fact sheet is intended to be used as a guideline when considering pregnancy and ergonomics. If you have any other questions or concerns, contact your Family Doctor or the Occupational Health Clinics for Ontario Workers, Inc.

## RECOMMENDED EMF PRECAUTIONS FOR VDT'S

- Sit about an arm's length from the computer 70 cm (28 inches), and about 120 cm (4 feet) from the backs and sides of co-worker's monitors. Electromagnetic emissions fall off with distance and the magnetic part of the fields are not blocked by baffles or walls.

## REFERENCES

- Ahlborg, G. (1995). *Physical Work Load and Pregnancy Outcome*. Journal of Occupational and Environmental Medicine. 37 (8): 941-945.
- Ahlborg, G., Bodin, L., and Hogstedt, C.. (1990). *Heavy lifting during pregnancy: a hazard to the fetus?* International Journal of Epidemiology. 19: 90-97.
- Florack, E.I.M. Zielhuis, G.A., Pellegrino, J.E.M.C., and Rolland, R.. (1993). *Occupational physical activity and the occurrence of spontaneous abortion*. International Journal of Epidemiology. 22: 878-884.
- Goulet, L., Theriault, G., (1987). *Association between spontaneous abortion and ergonomic factors: A literature review of the epidemiologic evidence*. Scandinavian Journal of Work Environment and Health. 13: 399-403.
- Hartikainen, A-L, Sorri, M., Anttonen, H., Tuimala, R., and Laara, E.. (1994). *Effect of occupational noise on the course and outcome of pregnancy*. Scandinavian Journal of Work Environment and Health. 20: 444-450.
- McDonald, A.D., Armstrong, B., Cherry, N.M., and Robert, D., (1986). *Spontaneous abortion and occupation*. Journal of Occupational Medicine. 28 (12): 1232-1236.
- McDonald, A.D., McDonald, J.C., Armstrong, B., Cherry, N.M., Delorme, C., Nolin, A.D., and Robert, D.. (1987). *Occupation and pregnancy outcome*. British Journal of Industrial Medicine. 44: 521-526.
- McDonald, A.D., McDonald, J.C., Armstrong, B., Cherry, N.M., Cote, R., Lavoie, J., Nolin, A.D., and Robert, D.. (1988). *Fetal death and work in pregnancy*. British Journal of Industrial Medicine. 45: 148-157.
- Nurminen, T.. (1995). *Female noise exposure, shift work and reproduction*. Journal of Occupational and Environmental Medicine. 37 (8): 945-950.
- Schneider, K-T.M., and Deckardt, R.. (1991). *The implication of upright posture on pregnancy*. Journal of Perinatal Medicine. 19: 121-131.
- Scott, A.J., and Ladou, J.. (1990). *Shiftwork: effects on sleep and health with recommendations for medical surveillance and screening*. Occupational Medicine: State of the Art Reviews. 5 (2): 273-299.
- Simpson, J.L.. (1993). *Are physical activity and employment related to preterm birth and low birth weight?* American Journal of Obstetrics and Gynecology. 168(4): 1231-1238.
- Teitelman, A.M., Welch, L.S., Hellenbrand, K.G., and Bracken M.B.. (1990). *Effect of maternal work activity on preterm birth and low birth weight*. American Journal of Epidemiology. 131: 104-113.

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