

Chapter 2

Effects of Maternal Exercise on Labor and Delivery

Abstract Despite popular belief, exercise while pregnant does not initiate labor, or preterm labor. Exercise is associated with delivering closer to the due date. Further, maternal exercise is associated with either no change, or shorter labor and delivery overall. Women who exercised had less complications during labor and delivery than those who did not exercise. More importantly, measures of the fetus during the labor and delivery process did not indicate fetal distress. Measures of fetal distress showed either no difference or improvements related to exercise exposure, such as increased apgar scores. Exercised mothers and their children had shorter hospital stays relative to nonexercisers. Overall, these findings of possibly shorter labor, less preterm labor, less complications, and decreased hospital stay all add up to decreased health-care costs. Further research is needed in this area.

Keywords Preterm • Post-term • Gestational age • Labor • Delivery • Fetal distress • Apgar scores

Finally, the time comes for the baby to arrive. Labor and delivery is one of the most physiologically challenging times in woman's life. The demands of the labor process are strenuous for mother and child. In light of this fact, it is common to monitor mother and child during this event and immediately after to ensure both have endured the stress well.

Popular belief among pregnant women and the public is that exercising will initiate labor, i.e., preterm labor. Preterm labor is defined as delivering before 37 weeks gestation. Full term is defined as 37–42 weeks gestation at delivery. Post-term delivery occurs after 42 weeks gestation. The length of gestation, or gestational age, refers to how long the fetus grows in utero. The general idea is that the longer the fetus spends in utero, more development will occur and the likelihood of survival and improved health at birth increases.

Many studies have found maternal physical activity during pregnancy is not associated with the occurrence or increased occurrence of preterm labor (Curet et al. 1976; Collings et al. 1983; Jarrett and Spellacy 1983; Botkin and Driscoll 1991; Hatch et al. 1993; Clapp 1994; Florack et al. 1995; Sternfeld et al. 1995; Horns et al. 1996; Rao et al. 1998; Clapp 2000; Magann et al. 2002; Leiferman and Evenson 2003; Misra et al. 2003; Gavard and Artal 2008). Likewise, research reporting gestational age at delivery finds no difference between neonates of exercising or non-exercising women (Koemeester et al. 1995; Sternfeld et al. 1995; Horns et al. 1996). Further, studies found the risk of preterm delivery decreased related to physical activity throughout pregnancy, whereas sedentary activities, mainly TV watching, increased risk of preterm birth (Misra et al. 1998; Clapp 1991, 1998). This risk may be decreased by almost 50% after controlling for maternal body morphometry and socioeconomic status (Juhl et al. 2012; Domingues et al. 2008). Further, there is no association with a woman's activity prior to pregnancy and likelihood of preterm or post-term delivery (Gavard and Artal 2008). One study found women who exercised during pregnancy began labor significantly earlier than those who did not exercise during pregnancy, though all babies were born full term (Clapp 1990). Another study showed similar trends ($p = 0.06$), a tendency toward earlier (~ 5 days) birth and decreased gestational age, though these values are still within the normal ranges (Jarrett and Spellacy 1983). Since the initiation of labor and delivery can be considered a communication of physiological "readiness" between mother and child, these data further support the thought of improved maturation of the exercise-exposed fetus. Thus, participation during pregnancy, not before, increases a woman's likelihood of delivering closer to her due date.

About as long as an average runners marathon finish, the entire labor and delivery process for nulliparas lasts approximately 9 h, while multiparas lasts about 7 h (Murray and Huelsmann 2009). One study suggests that exercise during pregnancy may result in shorter labor and delivery for all women (Clapp 1994). Another study found shorter labor in multiparas, but not nulliparas (Pomerance et al. 1974). On the other hand, other studies found no difference in length of labor regardless of activity during pregnancy (Botkin and Driscoll 1991; Kardel and Kase 1998). There are other factors, such as mode of delivery, which make it even more difficult to conclusively state how maternal exercise during pregnancy influences the length of labor and delivery.

Research has been done to determine if exercise during pregnancy affects the mode of delivery. Some studies have found no relationship between mode of delivery and maternal activity during gestation (Sternfeld et al. 1995; Horns et al. 1996; Kennelly et al. 2002b; Magann et al. 2002; Barakat et al. 2009b). Other research, however, has found participation in exercise while pregnant is associated with lower rates of cesarean section and less complications (Curet et al. 1976; Dale et al. 1982; Hall and Kaufmann 1987; Clapp 1990; Clapp and Capeless 1990; Hatch et al. 1993). Women who exercise during pregnancy also report lower perceived exertion during labor, than women who did not exercise (Rice and Fort 1991).

More importantly, the influence of labor and delivery on fetal outcomes can provide insight as well. Evidence of fetal distress can be determined based on

clinical markers prior to and after birth. Common markers used to evaluate distress of the fetus are meconium staining, fetal heart rate patterns, fetal oxygenation, cord entanglement, and apgar scores (Clapp 1991). In fact, studies have shown that there is a significant reduction in the incidence of the clinical markers of fetal stress/distress during the labor of women who exercised (Clapp et al. 2003). Research has noted that there is neither an increase in fetal distress, nor a correlation with incidence of fetal distress and maternal exercise (Clapp and Capeless 1990; Kennelly et al. 2002b). Evidence purports no difference in fetal oxygenation during labor regardless of exposure or not to exercise throughout gestation (Clapp 1990, 1994; Clapp et al. 1995). Even walking during labor is associated with more favorable fetal oxygenation and heart rate, whereas in the classical supine and side position there seemed to be lower fetal oxygenation (Braun et al. 2004).

This is evidenced by a decreased incidence of meconium staining, abnormal fetal heart patterns, and cord entanglement (Clapp 1990, 1994; Clapp et al. 1995). Anecdotal stories of women who exercised while pregnant describe a scenario in which the health care provider noted lower fetal heart rate during labor and delivery. Based on typical paradigm this was cause for concern. However, these anecdotal stories have all had the similar outcome of a baby born in good health. These stories lead one to ponder if the lower HR (and increased HRV) seen in the fetus as a result of maternal exercise may be enough to be noted during labor and delivery. If this is indeed the case, then health care providers may need to consider maternal activity level when analyzing fetal heart rate and its variability during labor and delivery; especially as it influences the providers' decisions of course of action for mode of delivery. A uniquely designed study found that an automated quantification of fetal heart rate accelerations and variability are predictors of apgar scores and to a lesser degree fetal acidemia (Ayres-de-Campos and Bernardes 2004; Ayres-de-Campos et al. 2004). Considering offspring of women who exercised during pregnancy have improved fetal heart maturation and similar or increased apgar scores relative to offspring of women who did not exercise, the utilization of automated quantification may be a better predictor of pregnancy outcome. This is an area where further study is necessary for the field of obstetrics. A few researchers are beginning to study this area of fetal health during labor and delivery.

The first postnatal indicator of offspring well-being is the 1- and 5-min apgar scores. Many studies show that maternal exercise has no effect on neonatal apgar scores (Curet et al. 1976; Collings et al. 1983; Clapp and Dickstein 1984; Botkin and Driscoll 1991; Kardel and Kase 1998; Kramer 2000; Marquez-Sterling et al. 2000; Magann et al. 2002). Even obese women who exercised while pregnant delivered babies who had normal apgar scores (Lindholm et al. 2010). While two studies found improved apgar scores related to maternal exercise (Hall and Kaufmann 1987; Clapp and Capeless 1990).

The last indicator of maternal and fetal health related to the labor and delivery process is the length of hospital stay. Women who exercise while pregnant have notably decreased length of hospitalization after delivery (Hall and Kaufmann 1987). These findings not only speak to the overall physiological healthiness of

mother and child, but also influence overall health care costs. Thus, regular physical activity during pregnancy, either does not affect or is beneficial for labor and delivery outcomes and may reduce health care costs associated with this event. In summary, these data of possibly shorter labor, less preterm labor, less complications, and decreased hospital stay all add up to decreased health care costs.

Physiology of Prenatal Exercise and Fetal Development

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2012, VIII, 44 p., Softcover

ISBN: 978-1-4614-3407-8