

PREGNANCY AND CHANGES IN FEMALE SEXUAL DESIRE: A REVIEW

PAMELA C. REGAN

California State University, Los Angeles, CA, USA

JAMES L. LYLE

California State University, Dominguez Hills, CA, USA

AMY L. OTTO

Albion College, MI, USA

ANUPAMA JOSHI

California State University, Los Angeles, CA, USA

The recognition that sexual desire is associated with relationship quality and other important interpersonal experiences has led to a corresponding interest in identifying the correlates and causes of this aspect of human sexual response. Most researchers have focused on intraindividual factors, including hormonal processes. The present review explores the relationship between one hormonally mediated female life event - pregnancy - and sexual desire. Sexual desire is defined, and distinguished from other sexual experiences (e.g., arousal, activity), and its common operationalizations are discussed. Next, the hormonal changes that characterize each trimester of pregnancy are considered. Empirical research conducted then to determine whether these hormonal changes correspond to alterations in the experience of desire is then reviewed. It is concluded that the hormonal fluctuations that occur during pregnancy are reliably associated with progressive decreases in feelings of sexual desire in the majority of women.

A growing body of evidence indicates that sexual desire - the motivational component of sexual response - is related to several significant human life events. For example, feelings of sexual attraction prompt men and women to

Pamela C. Regan, PhD, Department of Psychology, California State University, Los Angeles, California, USA; James L. Lyle, PhD, Department of Chemistry, California State University, Dominguez Hills, Carson, California, USA; Amy L. Otto, PhD, Department of Psychology, Albion College, Michigan, USA; Anupama Joshi, PhD, Department of Child & Family Studies, California State University, Los Angeles, California, USA.

Appreciation is due to anonymous reviewers.

Key words: sexual desire, hormones, pregnancy, maternal sexuality.

Please address correspondence to: Pamela C. Regan, PhD, Department of Psychology, CSU-Los Angeles, Los Angeles, CA 90032, USA.

Phone: 323 343 2289; Email: <pregan@calstatela.edu>

enter liaisons with both casual sex partners and romantic partners; desire therefore has implications for reproduction and species survival. Sexual desire is also closely associated with relationship quality. Most adults associate feelings of desire with passionate love, and research reveals that dating partners who experience higher levels of desire for each other are more satisfied with the relationship, less likely to consider leaving the current partner, and less likely to engage in infidelity than are partners who feel lesser amounts of desire (Regan, 2000). The recognition that sexual desire has implications for a variety of important individual life events as well as for the emotional tenor and the adjustment of romantic relationships has led to an increased interest in delineating the causes and correlates of this particular sexual experience. Some researchers have examined external causes (e.g., erotic media), whereas others have explored interpersonal causes (e.g., conflict; for a review, see Regan & Berscheid, 1999). However, most have focused on causes located within or under the control of the individual. Of the myriad intraindividual causes that have been targeted as possible precursors to sexual desire, hormones and hormonal processes have received the lion's share of empirical attention.

Four major classes of hormone - the sex hormones - have been implicated in the experience of sexual desire. The sex hormones are produced by several of the various glands that comprise the endocrine system, including the adrenal glands, the pituitary gland, the ovaries in women, and the testes in men. Androgens, or masculinizing hormones, are primarily synthesized in the testes and the adrenal cortex and to a lesser extent in the ovaries. The primary naturally occurring androgens are testosterone, androstenedione, and dehydroepiandrosterone. Estrogens, or feminizing hormones, are secreted by the ovaries, with lesser amounts manufactured in the testes, adrenal cortex, and peripheral tissues. During pregnancy, the placenta is a major source of estrogens. The primary naturally occurring estrogenic hormones are estradiol, estrone, and estriol. Progesterone, like the estrogens, is primarily produced by the ovaries (and, during pregnancy, the placenta), with lesser amounts manufactured in the adrenal cortex and testes. And finally, prolactin is produced by the pituitary gland in both sexes.

Researchers interested in examining the association between hormones and hormonal processes and sexual desire have followed one of two methodological approaches. The first method involves measuring the serum or plasma level of free (unbound or bioavailable) hormone and then correlating that level with subjective reports of sexual response (for a review of this literature, see Regan, 1999). A second method involves focusing on life events and changes known to be hormonally mediated, such as menstruation. Researchers who use this method typically rely upon what is generally known about the hormonal changes associated with the life event of interest and infer a relationship between sexual desire

and the underlying hormonal pattern. For example, some women experience increased sexual desire around the time of ovulation, a menstrual cycle phase characterized by relatively high androgen levels, rising progesterone levels, and rapidly descending estrogen levels (Regan, 1996).

The present review examines the relationship between sexual desire and the hormonally mediated life event of pregnancy. This female life event is a time of sudden and dramatic shift in levels of circulating hormones, particularly progesterone and the estrogens, and therefore peri- and postpartum women make ideal participants for researchers interested in the association between the sex hormones and sexual desire.

DEFINITION AND OPERATIONALIZATION OF SEXUAL DESIRE

Sexual desire is a subjective, psychological experience that can be understood broadly as *an interest in sexual objects or activities, or as a wish, need, or drive to seek out sexual objects or to engage in sexual activities* (see Regan & Berscheid, 1999). This experience is distinct from physiological/genital sexual arousal (i.e., a state of reflex activation involving the sex organs and nervous system), subjective sexual arousal (i.e., the subjective awareness of physiological/genital arousal), sexual activity (i.e., overt behavioral responses; e.g., intercourse), and sexual feelings that are associated with these responses (e.g., satisfaction, fulfillment). Although desire, arousal, and activity can and often do co-occur, the latter do not themselves constitute adequate indicants of sexual desire. For example, the occurrence of sexual activity does not necessarily imply a desire for such activity, nor does the absence of sexual activity necessarily reflect a lack of desire.

A variety of operationalizations for sexual desire exist and are utilized in the literature. Most researchers directly ask their participants about sexual desire or sexual interest. Others employ various euphemisms for desire (e.g., sex drive, sexual appetite). We selected articles for this review only if the author(s): (1) specifically mentioned sexual desire or sexual interest in the body of their article and/or included these terms in the measures administered to participants, or (2) invoked such motivational terms as sex drive, sexual appetite, and libido and were clearly referring to sexual desire.

PREGNANCY: HORMONAL CHANGES

The nine months of pregnancy are characterized by a rapidly changing hormonal environment marked by dramatic increases in estrogen and progesterone production. Pregnancy is conventionally described in terms of three trimesters, each with its own distinct hormonal characteristics. The first trimester comprises the first three months after conception. Upon ovulation, the developed egg leaves the ovary and the ruptured follicle undergoes luteinization and becomes a

progesterone- and estrogen-secreting structure known as the corpus luteum. If fertilization does not occur after ovulation, the corpus luteum regresses and plasma estrogens and progesterone decrease to low levels during the late luteal phase, prior to the beginning of the menstrual flow. If fertilization does occur, the corpus luteum does not regress but rather continues to secrete estrogens and progesterone, maintaining these hormones at relatively stable levels over the first few weeks of the trimester. By the 8th or 9th week, however, the placenta begins to take over the production of estrogens and progesterone, and estriol, estradiol, and progesterone levels begin to undergo a rapid increase. The second trimester is characterized by an enormous increase in plasma levels of progesterone (mostly of placental origin) and of estradiol, with a smaller increase and/or a plateau in estriol. Estradiol and to a lesser extent progesterone concentrations continue to increase in the third trimester, although progesterone levels may show evidence of a slight decline in some women. Estriol production in particular leaps in this trimester, undergoing a sharp rise during the last two months. Prior to labor, then, sex hormone values have increased tremendously. As an example, consider that plasma from a healthy woman in her final weeks of pregnancy may reveal progesterone levels of 17,500 ng/100 ml and estradiol levels of 1500-1600 ng/100 ml compared to prepregnancy levels of 31-1500 ng/100 ml and 3-57 ng/100 ml, respectively.

PREGNANCY: CHANGES IN SEXUAL DESIRE

A growing body of research suggests that pregnancy, with its progressive increase in progesterone and estrogen levels, is characterized by a more or less progressive decrease in sexual desire.

RECALL MEASURES: RETROSPECTIVE STUDIES

The majority of work in this area is retrospective in nature, with researchers asking samples of women at various postpartum times to recall their sexual desire levels during one or more trimesters of pregnancy. A fairly reliable pattern emerges with most women retrospectively reporting that they experience a moderate decrease in sexual desire during the first trimester, followed by another decrease during the second trimester (with some exceptions), and then a greater decline in sexual interest during the third trimester. For example, in one of the earliest documented studies, Landis, Poffenberger, and Poffenberger (1950) distributed questionnaires to a sample of 212 married women who had recently given birth to their first child. Approximately 27% of the women recalled experiencing less "sexual desire" (as compared to prepregnancy levels) during the first trimester; this proportion jumped to 43.4% and 79.1% for the second and third trimesters, respectively.

Studies conducted two decades later corroborate these findings. Solberg,

Butler, and Wagner (1973) interviewed a sample of 226 women in the immediate postpartum period. When asked to compare their level of "sexual interest" during pregnancy to their prepregnancy baseline, 28% of the women recalled decreased interest in the first trimester, 44% remembered a reduction in the second trimester, and 70% felt they had experienced a decrease in the third trimester. Kenny (1973) found similar results with a sample of 33 postpartum women who were interviewed about their sexual experiences during their most recent pregnancy. Many women reported decreased sexual desire during the first (30%) and third (42%) trimesters; however, unlike the sample of Solberg et al., the majority (73%) of Kenny's participants noted a return of desire to prepregnancy levels in the second trimester. Another postpartum interview study, conducted by Baxter (1974), revealed that many women (47%) recalled a decrease in their "interest in intercourse" at some stage during pregnancy (although the exact timing of the decrease was not specified). And finally, Holtzman's (1976) data also suggest a linear decrease in sexual desire during pregnancy, with 60% of the sample remembering that they were "very interested in sex" during the first trimester, 40% recalling the same interest level in the second trimester, and only 24% remembering experiencing the same high level in the third trimester.

More recently, Perkins (1982) surveyed 155 postpartum women about aspects of sexuality before and during pregnancy. Reduced "interest in sex" was reported by increasing proportions of women as the pregnancy progressed through the first (10%), second (31.6%), and third (67.8%) trimesters. Bogren's (1991) postpartum interview of 112 women also revealed a more or less progressive decline in desire, with 42% recalling decreased "desire for intercourse" during the first trimester, 37% during the second, and 75% during the third. Similarly, more of the participants in the study by Hart, Cohen, Gingold, and Homburg (1991) retrospectively reported experiencing low "libido" (defined as sexual desire) in the third trimester (56.8%) than did so in the second (26.4%) or first (23.9%) trimesters (also see Ryding, 1984).

CONCURRENT MEASURES: CROSS-SECTIONAL DESIGNS AND PROSPECTIVE STUDIES

There are a number of methodological disadvantages associated with retrospective studies. For example, women must accurately recall particular instances of desire during a period of time in which they are experiencing an array of major physical and psychological changes. In addition, desire that is experienced toward the end of one trimester may become confused with desire that occurs at the beginning of the following trimester; and parturition itself may serve as a convenient marker during pregnancy to the extent that sexual events that occur at or around birthing (i.e., during the final trimester) may be recalled more easily than those occurring during earlier months. Consequently, some researchers

have chosen to collect data on sexual desire as it is currently experienced by pregnant women at one or more points in time. These studies provide another lens through which to view changes in desire during pregnancy and they also tend to corroborate the results of retrospective studies.

In one cross-sectional study, Tolor and DiGrazia (1976) asked women in their first, second, or third trimester to classify their present "desire for sexual intercourse" in relation to their prepregnancy baseline. Similar to the retrospective results reviewed earlier, not only was decreased sexual desire reported by all three groups of pregnant women, but reduced desire for intercourse was most prevalent in the third trimester (with 54% of third trimester women reporting reduced sexual desire, as compared to 39% of the first trimester group and 47% of the second trimester group). Another set of concurrent data was collected by Robson, Brant, and Kumar (1981), who interviewed 119 women at the 12th week of pregnancy about various aspects of sexual experience, including sexual desire. Each woman was asked to comment on the extent to which she had been "interested in engaging in sex during the previous month" and to compare her "sex drive" at the current time with her usual prepregnancy level. Over half (55%) reported a reduction in sexual interest/sex drive during this (first) trimester. Similar results were noted by Bartellas, Crane, Daley, Bennett, and Hutchens (2000); 58% of the women in their cross-sectional study indicated experiencing decreased sexual desire during pregnancy (although the authors do not give the percentages for each of the three trimester subsamples, they state that the responses were not different across trimesters).

Prospective studies in which pregnant women are asked to report on their sexual experiences over time are rare. Falicov (1973) interviewed a small sample of 19 women at three points during their pregnancies: before the 16th gestational week (first trimester), between the 24th and 27th weeks of pregnancy (second trimester), and between the 36th and 37th gestational weeks (third trimester). At each interview session, the participants evaluated their "degree of sexual desire or interest" relative to prepregnancy levels. More than half of the women (53%) reported decreased sexual desire levels during the first trimester, 63% noted a reduction in desire during the second trimester, and 65% experienced a decrease during the final trimester of pregnancy. Similar results were found by Lumley (1978), who also prospectively interviewed a small group of women throughout their pregnancy and into the postpartum period. These interviews revealed reduced sexual desire in most women across pregnancy. Specifically, 43% and 44% of the sample reported lower sexual desire in the first and second trimesters, respectively; by the third trimester, the proportion noting reduced desire had jumped to 86%. And finally, Reamy, White, Daniell, and Le Vine (1982) found that the number of women who experienced "no desire" rose from roughly 20% in the first and second trimesters to 30% in the final weeks of pregnancy (also

see Barclay, McDonald, & O'Loughlin, 1994; Elliott & Watson, 1985). Thus, prospective studies suggest a progressive decrease in desire during gestation.

CONCLUSION

Retrospective, cross-sectional, and prospective research indicates that the hormonally mediated life event of pregnancy is reliably associated with changes in sexual desire in most women. Women in the first trimester of pregnancy, whose relatively stable levels of estrogenic hormones and progesterone undergo a sharp increase toward the end of the trimester, generally report or recall a decline from their prepregnancy levels of sexual desire. This trend continues during the second trimester, a time of enormous elevation in progesterone and estradiol, with most women reporting or recalling less sexual interest than during the first trimester. However, for a small proportion of women, the second trimester is marked by no additional reduction in desire (i.e., sexual interest remains at the lowered first trimester level) or by a return of desire to prepregnancy levels. Both retrospectively and prospectively, women experience the greatest decline in sexual interest during the last few months of pregnancy, particularly as delivery draws increasingly near. Hormonally, this trimester is characterized by rising estradiol levels, smaller increases or sometimes decreases in progesterone, and large increases in estriol production.

The general pattern of decreased sexual desire that characterizes gestation is at least partially the result of changes in a woman's normal hormonal milieu. However, nonhormonal factors may also play a role. A normal, full-term pregnancy is marked not only by increases in progesterone and estrogen, but also by a variety of somatic and psychological changes that may in themselves significantly alter sexual desire. For example, many women experience nausea, bloating, fatigue, lower back ache, breast tenderness, and other physical conditions that can render sexual activities uncomfortable and reduce the desire for sexual contact (e.g.; Oga et al., 1995; Zib, Lim, & Walters, 1999). Similarly, mood fluctuations are relatively common throughout pregnancy (Steiner, 1998), and depression, irritability, and other mood disturbances are linked to reduced sexual desire (see Regan & Berscheid, 1999). In addition, although sexual activity during a normal pregnancy generally will not harm the mother or developing child (von Sydow, 1999), some women may hold negative beliefs concerning such activity while pregnant. Indeed, over half of the women who participated in Falicov's (1973) study specifically reported that fear of harming the fetus contributed to their decreased interest in sex throughout the first trimester (also see Bogren, 1991, and Lumley, 1978).

The fact that much of the gestation period is associated with decreased sexual desire may be unsettling for many women and their partners. Consequently, it is

important that pregnant women, their partners, and their health care practitioners recognize some common patterns. First, changes in sexual response are common during pregnancy. In fact, decreased sexual desire is so common as to constitute a normative part of the gestation process. Second, these sexual changes are to a large degree the result of the physical (e.g., elevated hormone levels; somatic alterations) and psychological events associated with pregnancy. Consequently, decreased sexual desire does not necessarily reflect problems with the relationship or with the sexual life of the couple. Third, the sexual changes that occur during pregnancy are usually not permanent. Most women report a return to pre-pregnancy levels of sexual desire at some point after delivery. For example, by the third postpartum month, 84% of the women in Lumley's (1978) prospective study indicated that their levels of desire were the same as or higher than pre-pregnancy levels. Thus, couples with a healthy sexual relationship prior to pregnancy are likely to return to this state after delivery.

The results of the present review underscore the pivotal role that sex hormones play in the experience of sexual desire. The alterations (i.e., increases) in levels of estrogenic hormones and progesterone that occur during pregnancy are associated with corresponding changes (i.e., decreases) in sexual appetite. Future research might profitably explore the relationship between other hormonally mediated female life events and this component of human sexual response.

REFERENCES

- Barclay, L. M., McDonald, P., & O'Loughlin, J. A. (1994). Sexuality and pregnancy: An interview study. *The Australian & New Zealand Journal of Obstetrics & Gynaecology*, *34*, 1-7.
- Bartellas, E., Crane, J. M. G., Daley, M., Bennett, K. A., & Hutchens, D. (2000). Sexuality and sexual activity in pregnancy. *British Journal of Obstetrics and Gynaecology*, *107*, 964-968.
- Baxter, S. (1974). Orgasm and labour in primiparae. *Journal of Psychosomatic Research*, *18*, 357-360.
- Bogren, L. Y. (1991). Changes in sexuality in women and men during pregnancy. *Archives of Sexual Behavior*, *20*, 35-45.
- Elliott, S. A., & Watson, J. P. (1985). Sex during pregnancy and the first postnatal year. *Journal of Psychosomatic Research*, *29*, 541-548.
- Falicov, C. J. (1973). Sexual adjustment during first pregnancy and post partum. *The American Journal of Obstetrics and Gynecology*, *117*, 991-1000.
- Hart, J., Cohen, E., Gingold, A., & Homburg, R. (1991). Sexual behavior in pregnancy: A study of 219 women. *Journal of Sex Education & Therapy*, *17*, 86-90.
- Holtzman, L. C. (1976). Sexual practices during pregnancy. *Journal of Nurse-Midwifery*, *21*, 29-38.
- Kenny, J. A. (1973). Sexuality of pregnant and breastfeeding women. *Archives of Sexual Behavior*, *2*, 215-229.
- Landis, J. T., Poffenberger, T., & Poffenberger, S. (1950). The effects of first pregnancy upon the sexual adjustment of 212 couples. *American Sociological Review*, *15*, 766-772.
- Lumley, J. (1978). Sexual feelings in pregnancy and after childbirth. *The Australian & New Zealand Journal of Obstetrics & Gynaecology*, *18*, 114-117.

- Oga, M., Shono, H., Kohara, M., Ito, Y., Tanaka, T., & Sugimori, H. (1995). Chronological changes in subjective symptoms during pregnancy in nulliparous and multiparous women. *Acta Obstetrica et Gynecologica Scandinavica*, **74**, 784-787.
- Perkins, R. P. (1982). Sexuality in pregnancy: What determines behavior? *Obstetrics and Gynecology*, **59**, 189-198.
- Reamy, K., White, S. E., Daniell, W. C., & Le Vine, E. S. (1982). Sexuality and pregnancy: A prospective study. *The Journal of Reproductive Medicine*, **27**, 321-327.
- Regan, P. C. (1996). Rhythms of desire: The association between menstrual cycle phases and female sexual desire. *The Canadian Journal of Human Sexuality*, **5**, 145-156.
- Regan, P. C. (1999). Hormonal correlates and causes of sexual desire: A review. *The Canadian Journal of Human Sexuality*, **8**, 1-16.
- Regan, P. C. (2000). The role of sexual desire and sexual activity in dating relationships. *Social Behavior and Personality*, **28**, 51-60.
- Regan, P. C., & Berscheid, E. (1999). *Lust: What we know about human sexual desire*. Thousand Oaks, CA: Sage.
- Robson, K. M., Brant, H. A., & Kumar, R. (1981). Maternal sexuality during first pregnancy and after childbirth. *British Journal of Obstetrics and Gynaecology*, **88**, 882-889.
- Ryding, E. (1984). Sexuality during and after pregnancy. *Acta Obstetrica et Gynecologica Scandinavica*, **63**, 679-682.
- Solberg, D. A., Butler, J., & Wagner, N. N. (1973). Sexual behavior in pregnancy. *The New England Journal of Medicine*, **288**, 1098-1103.
- Steiner, M. (1998). Perinatal mood disorders: Position paper. *Psychopharmacology Bulletin*, **34**, 301-306.
- Tolor, A., & DiGrazia, P. V. (1976). Sexual attitudes and behavior patterns during and following pregnancy. *Archives of Sexual Behavior*, **5**, 539-551.
- von Sydow, K. (1999). Sexuality during pregnancy and after childbirth: A metacontent analysis of 59 studies. *Journal of Psychosomatic Research*, **47**, 27-49.
- Zib, M., Lim, L., & Walters, W. A. (1999). Symptoms during normal pregnancy: A prospective controlled study. *The Australian & New Zealand Journal of Obstetrics & Gynaecology*, **39**, 401-410.

