

## The Impact of Oxytocin Vaginal Gel on Sexual Function in Postmenopausal Women: A Randomized Controlled Trial

Parvin Abedi, Ilnaz Zohrabi, Somayeh Ansari, Elham Maraghi, Nader Shakiba Maram & Gholamreza Houshmand

To cite this article: Parvin Abedi, Ilnaz Zohrabi, Somayeh Ansari, Elham Maraghi, Nader Shakiba Maram & Gholamreza Houshmand (2020): The Impact of Oxytocin Vaginal Gel on Sexual Function in Postmenopausal Women: A Randomized Controlled Trial, Journal of Sex & Marital Therapy, DOI: [10.1080/0092623X.2020.1738606](https://doi.org/10.1080/0092623X.2020.1738606)

To link to this article: <https://doi.org/10.1080/0092623X.2020.1738606>



Published online: 13 Mar 2020.



Submit your article to this journal [↗](#)



Article views: 40



View related articles [↗](#)



View Crossmark data [↗](#)



# The Impact of Oxytocin Vaginal Gel on Sexual Function in Postmenopausal Women: A Randomized Controlled Trial

Parvin Abedi<sup>a</sup>, Ilnaz Zohrabi<sup>b</sup>, Somayeh Ansari<sup>b</sup>, Elham Maraghi<sup>c</sup>, Nader Shakiba Maram<sup>d</sup>, and Gholamreza Houshmand<sup>e</sup>

<sup>a</sup>Midwifery Department, Menopause Andropause Research Center, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran; <sup>b</sup>Menopause Andropause Research Center, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran; <sup>c</sup>Faculty of Public Health, Department of Biostatistics and Epidemiology, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran; <sup>d</sup>Pharmaceutics Department, Nanotechnology Research Center, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran; <sup>e</sup>Department of Pharmacology, School of Medicine, Mazandaran University of Medical Sciences, Sari, Iran




## ABSTRACT

Many postmenopausal women suffer from sexual dysfunction mostly due to the vulvovaginal atrophy. The aim of this study was to assess the effect of vaginal oxytocin gel on sexual function of postmenopausal women. This study was conducted on 96 postmenopausal women with symptoms of vaginal atrophy and sexual dysfunction who were randomly recruited into two groups of oxytocin vaginal gel (400 IU, n = 48) or placebo (n = 48). The PH, vaginal maturation index, and sexual function (using Female Sexual Function Index) of the participants were measured at the beginning of the study and eight weeks later. The vaginal maturation index and the PH of the vagina improved in the oxytocin group compared to those of the placebo. All domains of sexual function including desire, arousal, lubrication, pain, sexual satisfaction, and total score of sexual function improved significantly in the oxytocin gel compared to the control group ( $p < 0.0001$ ). The results of this study showed that the administration of oxytocin vaginal gel could significantly improve vaginal atrophy as well as sexual function in postmenopausal women. Therefore, using vaginal oxytocin gel for sexual dysfunction in postmenopausal women who are not interested in hormone therapy is recommended.

## Introduction

Menopause is defined as permanent cessation of menstruation that lasts for at least one year and usually occurs in age 50–52 (Phipps et al., 2010). Postmenopausal complications that are mainly caused by lack of estrogen include; vasomotor symptoms (hot flashes and night sweats), vulvovaginal atrophy, osteoporosis, depression, sexual dysfunction, and cardiovascular diseases (Dalal & Agarwal, 2015).

Lack of estrogen causes decreased blood flow to vagina, and the mucus of vagina becomes thinner with lower elasticity. Such mucus is vulnerable to inflammation, infection and may initiate bleeding under any pressure such as sexual intercourse (Harvard Women's Health Watch, 2019). Vaginal atrophy can be diagnosed on the basis of symptoms such as itching, burning, pallor, urine frequency, increased vaginal PH, reduced superficial cells in the vaginal cytology and dyspareunia (Lee et al., 2018; Simon, 2011). Studies showed that the prevalence of vaginal atrophy

**CONTACT** Ilnaz Zohrabi  [ilnaz.zohrabi67@gmail.com](mailto:ilnaz.zohrabi67@gmail.com); Parvin Abedi  [parvinabedi@ymail.com](mailto:parvinabedi@ymail.com)  Menopause Andropause Research Center, Ahvaz Jundishapur University of Medical Sciences, Golestan Ave, Ahvaz, Iran.

in postmenopausal women is around 62% to 67%. Despite the high prevalence of vaginal atrophy only a small percentage of women seek treatment (Cagnacci et al., 2016).

Because of vulvovaginal atrophy, most postmenopausal women experience sexual dysfunction. The prevalence of sexual dysfunction in postmenopausal women in different studies has been reported to be 67% to 85.2% (Cagnacci et al., 2016; Masliza et al., 2014). The most impaired domains are sexual satisfaction, arousal and sexual desire (Masliza et al., 2014). Evidence shows that sexual dysfunction in postmenopausal women can impair their quality of life (Nazarpour et al., 2018). Also there is a significant relationship between sexual dysfunction, stress, anxiety and depression in postmenopausal women (Yazdanpanahi et al., 2018). Hormone replacement therapy (systemic or topical), ultra-low-dose topical estriol, selective estrogen receptor modulators, vaginal lubricants and non-hormonal therapies are examples of treatments for vaginal atrophy (Naumova & Castelo-Branco, 2018, Caruso et al., 2017).

Oxytocin is a hormone that causes the milk to flow in lactating women (Moberg & Prime, 2013). But evidence shows other important roles of oxytocin such as improvement of social life (Algoe et al., 2017), friendship and making social relationship with individual or group (Anacker & Beery, 2013).

In recent years, the role of oxytocin in the reduction or treatment of vaginal atrophy has received scholarly attention. Al-Saqi et al., for example, in a study on postmenopausal women found that treatment of vaginal atrophy using oxytocin vaginal gel 400 IU for seven weeks could significantly improve vaginal atrophy, decrease vaginal PH, and increase the superficial cells (Al-Saqi et al., 2015). Jonasson et al. (2011), also conducted a study on 20 postmenopausal women who were given vaginal oxytocin gel for seven days and found that oxytocin vaginal gel could improve vaginal atrophy.

To the best of our knowledge, we could not find a study that evaluates the effect of oxytocin vaginal gel on sexual function of postmenopausal women. Therefore, this study aimed to bridge this gap in the literature by evaluating the effect of oxytocin vaginal gel on sexual function of postmenopausal women.

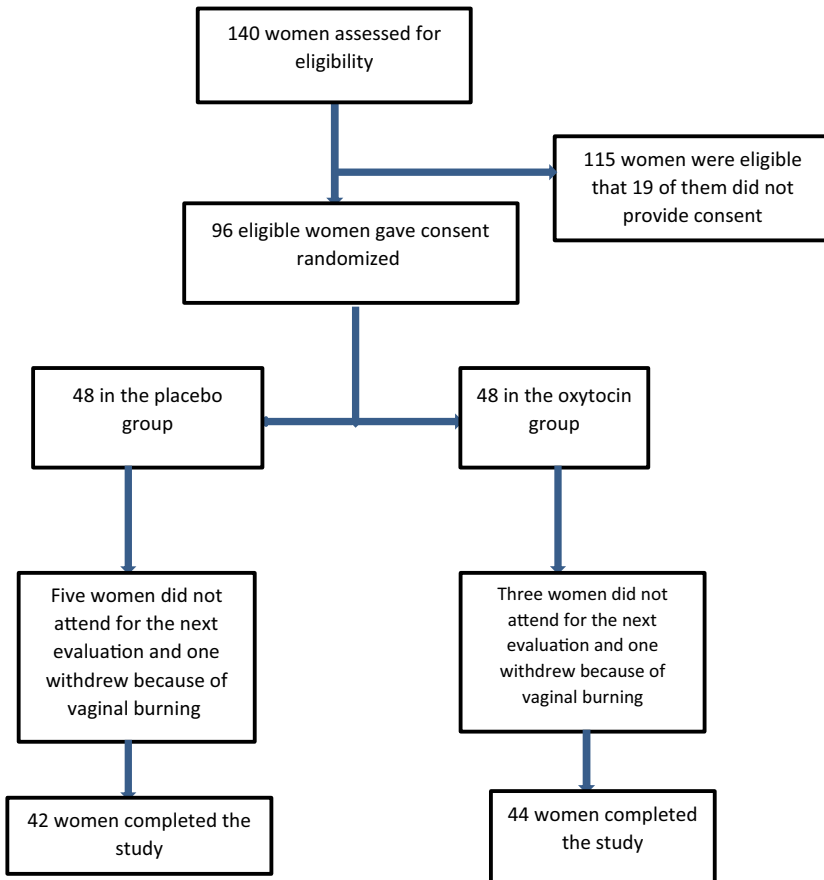
## Methods

This randomized controlled trial was conducted on 96 women to assess the effect of oxytocin vaginal gel on sexual function of postmenopausal women. This study started in April and completed in September 2018. The Ethics Committee of Ahvaz Jundishapur University of Medical Sciences approved the protocol of this study (Ref No: IR.AJUMS.REC.1396.720). Also, the protocol of the study was registered in the Iranian Registry for Clinical Trials (Ref No: IRCT20160602028220N2).

The inclusion criteria were as follows: postmenopausal women who were aged between 40–50, monogamous with sexual relationship, whose last menstruation was more than one year prior to the study, and whose score of sexual function was less than 26 according to Female Sexual Function Index (FSFI). Women using hormone replacement therapy, having any vaginal bleeding or any breast diseases, or using vaginal lubricant, or having any undiagnosed genitalia disorder were excluded from the study.

### Sample size calculation

The Al-Saqi et al.'s study was considered as a reference for sample size calculation when  $\beta = 0.9$ ,  $\alpha = 0.01$ , and considering 20% attrition, the total sample size for each group was calculated to be 48.



**Figure 1.** Flow diagram of recruitment and retention of participants in the study.

### **Drug preparation**

The vaginal oxytocin gel was prepared in Ahvaz Jundishapur Pharmacy School. At first sodium carboxymethyl cellulose (2%) was added to the 20% propinyl glycol and the mixture was stirred. Then methyl paraben was mixed with boiled water and stirred until it was cool. Afterward, 2 gr oxytocin powder that was mixed with water residue (39%) was added and stirred until the oxytocin gel was formed. The same process was done to make placebo, except the oxytocin powder was not added. Oxytocin gel and placebo were placed in similar tubes and encoded by pharmacist and the researcher and the participants were not aware of the content of the tubes.

Eligible women were invited called to attend the health center, and they were assessed regarding PH of vagina and maturation index. The PH of vagina was determined using gauge paper (Macherey Nagel, Germany) that was placed on the vaginal wall and the number was recorded in the check list. A smear from posterior fornix was obtained, fixed and sent to a laboratory for measuring vaginal maturation index.

Women with low sexual function were considered for the study and randomized into the oxytocin gel or placebo groups using block randomization (block size of 4 and ratio of 1:1) to receive 400 IU oxytocin gel (equal to the one fourth of each applicator) or placebo each night for eight weeks.

The following questionnaires were used to collect data: a demographic questionnaire, a check list for recording vaginal PH, maturation index, and Female Sexual Index (FSFI) for measuring sexual function.

**Table 1.** Socio-demographic characteristics of participants in the oxytocin and placebo groups.

Variables	Oxytocin n = 44	Placebo n = 42	P value
	Mean $\pm$ SD		
Age (y)	54.18 $\pm$ 3.31	54.1 $\pm$ 3.68	0.98
Age of menopause (y)	50 $\pm$ 2.16	50.38 $\pm$ 2.59	0.51
Body mass index (kg/m <sup>2</sup> )	28.5 $\pm$ 1.54	28.8 $\pm$ 1.49	0.26
Coitus per month	2.75 $\pm$ 1.34	2.38 $\pm$ 0.88	0.27
	N(%)		
<b>Education</b>			
Primary	20(45.5)	14(33.3)	0.46
Secondary	13(29.5)	17(40.5)	
Diploma and higher	11(25)	11(26.2)	
<b>Economic situation</b>			
Weak	17(38.5)	16(38.1)	0.92
Moderate	21(47.7)	19(45.2)	
Good	6(13.6)	7(16.7)	
<b>Job</b>			
Housewife	2(4.5)	1(2.4)	0.58
Employee	42(95.5)	41(97.6)	

FSFI contains 19 questions to measure sexual function in six domains including sexual desire (two questions), arousal and lubrication (four questions each), orgasm, satisfaction and pain (three questions each). The score of each domain was multiplied in a certain factor; 0.6 for desire, 0.3 for arousal and lubrication and 0.4 for other domains of sexual function (Rosen et al., 2000). The validity and reliability of this questionnaire was approved by Fakhri et al. (2012), in Iran.

Both the demographic and FSFI questionnaire were completed by the participants at the beginning of the study and eight weeks later. One of the researchers (IZ) was available to resolve any ambiguity. The PH of vagina and vaginal maturation index were measured at the baseline and after eight weeks.

### Statistical analyses

All data were entered into SPSS version 22. The Shapiro-Wilk test was used for checking the normal distribution of data. Independent t-test and chi-square tests were used for continuous and categorical data respectively. The  $p < 0.05$  was considered significant.

### Results

Of all 98 women recruited for this study, four from the placebo and five from the oxytocin groups withdrew the study. The flow diagram of recruitment and retention of the participants and drop-out reasons are presented in Figure 1. The socio-demographic characteristics of participants are presented in Table 1. The mean age of women was 54.18 and 54.1 in the oxytocin and placebo groups, respectively. The mean age of menopause was around 50. Most women in both groups had primary education and were in the moderate level of economic class.

The PH of vagina and maturation index of oxytocin group vs. placebo group are listed in Table 2. As evident from this table, after intervention, the number of superficial and intermediate cells increased (38.7  $\pm$  7.18 vs. 3.69  $\pm$  2.76,  $p = 0.0001$ ) and (27.56  $\pm$  5.77 vs. 19.07  $\pm$  8.56), while the number of para basal cells decreased (33.95  $\pm$  9.17 vs. 77.23  $\pm$  8.97) significantly in the oxytocin group compared to the placebo group. Also, the PH of vagina decreased significantly in the oxytocin group compared to the placebo group after intervention (4.51  $\pm$  0.51 vs. 6.07  $\pm$  0.73).

Table 3 shows the sexual function of participants before and after intervention in two groups of oxytocin and placebo. As this table shows, the sexual desire, arousal, lubrication, orgasm, and

**Table 2.** The maturation index and vaginal PH before and after intervention in two groups of oxytocin and placebo.

Variables		Oxytocin	Placebo	CI (95%)	P value between groups
		N = 44	N = 42		
Superficial cells	Before	0.59 ± 1.38	0.35 ± 0.79	-0.72, 0.25	0.34
	After	38.7 ± 7.18	3.69 ± 2.76	-37.3, -32.6	0.0001
<i>P value within group</i>		0.0001	0.0001		
Intermediate cells	Before	14.54 ± 8.53	16.6 ± 8.59	-1.60, 5.74	0.26
	After	27.56 ± 5.77	19.07 ± 8.56	-11.6, -5.34	0.0001
<i>P value within group</i>		0.0001	0.0001		
Para basal cells	Before	84.8 ± 9.18	83.02 ± 8.57	-5.6, 2.02	0.35
	After	33.95 ± 9.17	77.23 ± 8.97	39.3, 47.17	0.0001
<i>P value within group</i>		0.0001	0.0001		
Vaginal maturation index	Before	7.76 ± 4.68	8.58 ± 4.35	-1.12, 2.76	0.4
	After	52.48 ± 7.54	13.25 ± 5.06	-41.9, -36.46	0.0001
<i>P value within group</i>		0.0001	0.0001		
Vaginal PH	Before	6.01 ± 0.75	6.19 ± 0.79	-0.04, 0.57	0.28
	After	4.51 ± 0.51	6.07 ± 0.73	1.67, 2.19	0.0001
<i>P value within group</i>		0.0001	0.13		

**Table 3.** Sexual function of participants before and after intervention in two groups of oxytocin and placebo.

Variables	Oxytocin		Placebo		CI (95%)	P value after intervention
	N = 44		N = 42			
	Before	After	Before	After		
	Mean ± SD					
Sexual desire	2.4 ± 0.7	3.04 ± 0.6*	2.39 ± 0.72	2.43 ± 0.66	0.33, 0.88	<0.0001
Arousal	2.77 ± 0.65	3.39 ± 0.55*	2.78 ± 0.65	2.85 ± 0.6**	0.29, 0.79	<0.0001
Lubrication	2.8 ± 0.85	4.53 ± 0.64*	3.02 ± 0.58	3.48 ± 0.6**	1.07, 1.31	<0.0001
Orgasm	2.78 ± 0.58	3.63 ± 0.53*	3.07 ± 0.7	3.13 ± 0.72**	0.23, 0.77	<0.0001
Sexual satisfaction	3.27 ± 0.67	4.04 ± 0.65*	3.3 ± 0.78	3.42 ± 0.9**	0.27, 0.95	<0.0001
Pain	3.3 ± 1.15	5.53 ± 0.75*	3.07 ± 0.77	3.62 ± 0.72**	1.59, 2.23	<0.0001
Total score of sexual function	17.35 ± 3.4	24.19 ± 2.56*	17.66 ± 2.78	19 ± 2.84**	4.03, 6.35	<0.0001

\*p value <0.0001 before and after intervention in the oxytocin group.

\*\*p value <0.005 before and after intervention in the placebo group in the arousal, sexual satisfaction and orgasm domains and less than 0.0001 for the lubrication and pain and total score of sexual function.

sexual satisfaction improved and pain reduced significantly in the oxytocin group compared to the placebo group after eight weeks of intervention. Also, the total score of sexual function increased significantly in the oxytocin group compared to the placebo (24.19 ± 2.56 vs. 19 ± 2.84, p < 0.0001).

## Discussion

This study was designed to evaluate the effect of oxytocin vaginal gel on sexual function of postmenopausal Iranian women. The results of this study showed that vaginal atrophy improved significantly in the oxytocin group compared to the placebo, and signs and symptoms such as PH of vagina, and maturation index of vagina improved after eight weeks of intervention. There are other studies that showed oxytocin vaginal gel could improve the vaginal atrophy. Jonasson et al. (2011) found that oxytocin vaginal gel for seven days could improve the subjective symptoms of vaginal atrophy in postmenopausal women. Al-Saqi et al. (2015) also compared the effect of oxytocin vaginal gel 400 IU with 100 IU and found that both doses of oxytocin could significantly improve the vaginal atrophy in postmenopausal women after seven weeks of intervention. Torky et al. (2018) also found that oxytocin vaginal gel could significantly reduce the signs and symptoms of vaginal atrophy in postmenopausal women after one month of intervention. The results of the three mentioned studies are in line with our study in terms of improving vaginal atrophy.

The results of the present study showed that all domains of sexual function improved in the oxytocin vaginal gel group compared to the placebo. Other studies showed that complementary therapies such as isoflavones, calcium or vitamin D could significantly improve the quality of life and sexual function in postmenopausal women (Vitale et al., 2018). Also Basaria et al. (2009) in their study found that using high dose isoflavones (20 gr of soy protein) could significantly improve the components of quality of life such as vasomotor, psychosexual, physical and sexual. We could not find any study that evaluated the effect of oxytocin vaginal gel on sexual function. Oxytocin is a hormone that has many functions. For example, it is necessary for bonding between the mother and infant and also for sexual relationships. However, depending on the circumstances, one function may overtake the other. For instance in postpartum women, response to the cry or smiling of the infant increases with oxytocin test, while in nulliparous women, sexual response is dominant to oxytocin administration (Gregory et al., 2015).

The effect of intranasal neuropeptide oxytocin (24 IU) on human sexual behavior was assessed by Behnia et al., on 29 healthy couples, and authors could not find an effect of intranasal oxytocin on sexual desire, arousal, orgasm and refractory aspects of sexual behavior in couples, but it could increase the intimacy of orgasm, and contentment after sexual intercourse (Behnia et al., 2014). Similar to Behnia et al., Muin et al., in their study found that long term administration of intranasal oxytocin (32 IU) for eight weeks in postmenopausal women could not improve the sexual function, but could decrease the sexual distress and increase the sexual quality of life (Muin et al., 2015). Results of Behnia et al., and Muin et al., have some differences with our study. In both studies, authors could not find an effect of intranasal oxytocin on sexual functions' domains such as arousal, sexual desire, and orgasm. This may be due to the fact that both studies used intranasal oxytocin and even Muin et al., administered oxytocin before each sexual intercourse.

### **Strengths and limitations of study**

The present study is the first in its type to evaluate the effect of oxytocin vaginal gel on sexual function of postmenopausal women. We followed women intensively for eight weeks. The signs and symptoms of vaginal atrophy were also evaluated. One of the limitations of this study is that the oxytocin or placebo vaginal gel was watery and precise drug administration was not possible and there might have been mistake in giving the exact dose. Due to the financial problems, we were unable to prepare disposable vaginal applicator to be filled with the correct dose of medication, but other studies used disposable applicators (Torky et al., Al-Saqi et al., and Jonasson et al.). We only followed women for eight weeks, so the long term effects of oxytocin should be evaluated in further studies.

### **Conclusion**

The results of this study showed that administration of oxytocin vaginal gel could significantly improve the vaginal atrophy as well as sexual function in postmenopausal women. Using vaginal oxytocin gel for sexual dysfunction in postmenopausal women who are not interested in hormone therapy is recommended.

### **Acknowledgements**

This study is a part of master's thesis of IZ. We would like to thank all women who participated in this study.

### **Data availability statement**

The data set of this study will be available by the corresponding author upon request.

## Disclosure statement

There is no conflict of interest among authors of this study.

## References

- Algoe, S. B., Kurtz, L. E., & Grewen, K. (2017). Oxytocin and social bonds: The role of oxytocin in perceptions of romantic partners' bonding behavior. *Psychological Science*, *28*, 1763–1772. doi:10.1177/0956797617716922
- Anacker, A. M. J., Beery, & A. K. (2013). Life in groups: The roles of oxytocin in mammalian sociality. *Frontiers in Behavioral Neuroscience*, *7*, 185. doi:10.3389/fnbeh.2013.00185
- Al-Saqi, S. H., Uvnäs-Moberg, K., & Jonasson, A. F. (2015). Intravaginally applied oxytocin improves post-menopausal vaginal atrophy. *Post Reproductive Health*, *21*, 88–97. doi:10.1177/2053369115577328
- Basaria, S., Wisniewski, A., Dupree, K., Bruno, T., Song, M. Y., Yao, F., Ojumu, A., John, M., & Dobs, A. S. (2009). Effect of high-dose isoflavones on cognition, quality of life, androgens, and lipoprotein in post-menopausal women. *Journal of Endocrinological Investigation*, *32*, 150–155. doi:10.1007/BF03345705
- Behnia, B., Heinrichs, M., Bergmann, W., Jung, S., Germann, J., Schedlowski, M., Hartmann, U., & Kruger, T. H. (2014). Differential effects of intranasal oxytocin on sexual experiences and partner interactions in couples. *Hormones and Behavior*, *65*, 308–318. doi:10.1016/j.yhbeh.2014.01.009
- Cagnacci, A., Carbone, M. M., & Palma, F. (2016). Prevalence and association between objective signs and subjective symptoms of vaginal atrophy: The AGATA study. *Menopause*, *23*, 1139–1145. doi:10.1097/GME.0000000000000675
- Caruso, S., Cianci, S., Giovanni, S., Matarazzo, M. G., Amore, F. F., & Cianci, A. (2017). Effects of ultralow topical estradiol dose on vaginal health and quality of life in postmenopausal women who underwent surgical treatment for pelvic organ prolapse. *Menopause*, *24*, 900–907. doi:10.1097/GME.0000000000000851
- Dalal, P. K., & Agarwal, M. (2015). Postmenopausal syndrome. *Indian Journal of Psychiatry*, *57*(Suppl 2), S222–S232. doi:10.4103/0019-5545.161483
- Fakhri, A., Pakpour, A. H., Burri, A., Morshedi, H., & Zeidi, I. M. (2012). The female sexual function index: Translation and validation of an Iranian version. *The Journal of Sexual Medicine*, *9*, 514–523. doi:10.1111/j.1743-6109.2011.02553.x
- Gregory, R., Cheng, H., Rupp, H. A., Sengelaub, D. R., & Heiman, J. R. (2015). Oxytocin increases VTA activation to infant and sexual stimuli in nulliparous and postpartum women. *Hormones and Behavior*, *69*, 82–88. doi:10.1016/j.yhbeh.2014.12.009
- Harvard Women's Health Watch. (2019). *Managing postmenopausal vaginal atrophy*. Retrieved June 19, 2019, from <https://www.health.harvard.edu/womens-health/managing-postmenopausal-vaginal-atrophy>.
- Jonasson, A.F., Edwall, L., & Uvnäs-Moberg, K. (2011). Topical oxytocin reverses vaginal atrophy in postmenopausal women: a double-blind randomized pilot study. *Menopause International*, *17*, 120–125. doi:10.1258/mi.2011.011030
- Lee, A., Kim, T. H., Lee, H. H., Kim, Y. S., Enkhbold, T., Lee, B., Park, Y. J., & Song, K. (2018). Therapeutic approaches to atrophic vaginitis in postmenopausal women: A systematic review with a network meta-analysis of randomized controlled trials. *Journal of Menopausal Medicine*, *24*, 1–10. doi:10.6118/jmm.2018.24.1.1
- Masliza, W., Daud, W., Yazid Bajuri, M., Shuhaila, A., Hatta, S., & Rohaizat Hassan, M. (2014). Sexual dysfunction among postmenopausal women. *La Clinica Terapeutica*, *165*, 83–89. doi:10.7471/CT.2014.1681
- Moberg, K. U., & Prime, D. K. (2013). Oxytocin effects in mothers and infants during breastfeeding. *Infant*, *9*, 202–206.
- Muin, D.A., Wolzt, M., Marculescu, R., Sheikh Rezaei, S., Salama, M., Fuchs, C., Luger, A., Bragagna, E., Litschauer, B., & Bayerle-Eder, M. (2015). Effect of long-term intranasal oxytocin on sexual dysfunction in premenopausal and postmenopausal women: a randomized trial. *Fertility and Sterility*, *104*, 715–723. doi:10.1016/j.fertnstert.2015.06.010
- Naumova, I., & Castelo-Branco, C. (2018). Current treatment options for postmenopausal vaginal atrophy. *International Journal of Women's Health*, *10*, 387–395. doi:10.2147/IJWH.S158913
- Nazarpour, S., Simbar, M., Ramezani Tehrani, F., & Alavi Majid, H. (2018). Quality of life and sexual function in postmenopausal women. *Journal of Women & Aging*, *30*, 299–309. doi:10.1080/08952841.2017
- Phipps, A., Ichikawa, L., Bowles, E. J. A., Camey, P. A., Kerlikowske, K., Miglioretti, D. L., & Buist, D. S. M. (2010). Defining menopausal status in epidemiologic studies: A comparison of multiple approaches and their effects on breast cancer rates. *Maturitas*, *67*, 60–66. doi:10.1016/j.maturitas.2010.04.015
- Rosen, C. Brown, J., Heiman, S., & Leib, R. (2000). The Female Sexual Function Index (FSFI): A multidimensional self-report instrument for the assessment of female sexual function. *Journal of Sex & Marital Therapy*, *26*, 191–208.
- Simon, J. A. (2011). Identifying and treating sexual dysfunction in postmenopausal women: the role of estrogen. *Journal of Women's Health*, *20*, 1453–1465. doi:10.1089/jwh.2010.2151

- Torky, H. A., Taha, A., Marie, H., El-Desouky, E., Raslan, O., Moussa, A. A., Ahmad, A. M., Abo-Louz, A., Zaki, S., Fares, T., & Eesa, A. (2018). Role of topical oxytocin in improving vaginal atrophy in postmenopausal women: a randomized, controlled trial. *Climacteric*, *21*, 174–178. doi:[10.1080/13697137.2017](https://doi.org/10.1080/13697137.2017)
- Vitale, S. G., Caruso, S., Rapisarda, A. M. C., Cianci, S., & Cianci, A. (2018). Isoflavones, calcium, vitamin D and inulin improve quality of life, sexual function, body composition and metabolic parameters in menopausal women: result from a prospective, randomized, placebo-controlled, parallel-group study. *Przegląd Menopauzalny*, *17*, 32–38. doi:[10.5114/pm.2018.73791](https://doi.org/10.5114/pm.2018.73791)
- Yazdanpanahi, Z., Nikkholgh, M., Akbarzadeh, M., & Pourahmad, S. (2018). Stress, anxiety, depression, and sexual dysfunction among postmenopausal women in Shiraz, Iran, 2015. *Journal of Family & Community Medicine*, *25*, 82–87. doi:[10.4103/jfcm.JFCM\\_117\\_17](https://doi.org/10.4103/jfcm.JFCM_117_17)