



Contents lists available at ScienceDirect

Taiwanese Journal of Obstetrics & Gynecology

journal homepage: www.tjog-online.com

Review Article

Factors affecting sexual function in menopause: A review article

Soheila Nazarpour^a, Masoumeh Simbar^{b, c, *}, Fahimeh Ramezani Tehrani^c^a Department of Midwifery, Faculty of Nursing and Midwifery, Islamic Azad University, Chalus Branch, Chalus, Iran^b Department of Midwifery and Reproductive Health, School of Nursing and Midwifery, Shahid Beheshti University of Medical Sciences, Tehran, Iran^c Reproductive Endocrinology Research Center, Research Institute for Endocrine Sciences, Shahid Beheshti University of Medical Sciences, Tehran, Iran

ARTICLE INFO

Article history:

Accepted 27 November 2015

Keywords:

effective factors
menopause
sexual function
systematic review

ABSTRACT

This study aimed to systematically review the articles on factors affecting sexual function during menopause. Searching articles indexed in Pubmed, Science Direct, Iranmedex, EMBASE, Scopus, and Scientific Information Database databases, a total number of 42 studies published between 2003 and 2013 were selected. Age, estrogen deficiency, type of menopause, chronic medical problems, partner's sex problems, severity of menopause symptoms, dystocia history, and health status were the physical factors influencing sexual function of menopausal women. There were conflicting results regarding the amount of androgens, hormonal therapy, exercise/physical activity, and obstetric history. In the mental–emotional area, all studies confirmed the impact of depression and anxiety. Social factors, including smoking, alcohol consumption, the quality of relationship with husband, partner's loyalty, sexual knowledge, access to health care, a history of divorce or the death of a husband, living apart from a spouse, and a negative understanding of women's health were found to affect sexual function; however, there were conflicting results regarding the effects of education, occupation, socioeconomic status, marital duration, and frequency of sexual intercourse.

Copyright © 2016, Taiwan Association of Obstetrics & Gynecology. Published by Elsevier Taiwan LLC. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Introduction

Menopause is a natural event associated with several physical and psychological changes that cause a complex period in life for women [1]. Various aspects of women may be influenced by menopause; among them sexual function can be affected greatly. Sexuality is an integral part of one's identity and sexual function is a combination of psychosocial aspects such as sexual arousal, sexual desire and sexual fantasies [2]. Therefore, changes in sexuality and sexual function could be included in postmenopausal concerns.

Sexual health is affected by personal factors, intrapersonal relations, social and family traditions, culture, and religion [3]. According to the DSM-IV (Diagnostic and Statistical Manual of Mental Disorders - Fourth Edition), sexual dysfunction is defined as a disturbance in the sexual response cycle or pain associated with sexual intercourse [4]. The prevalence of sexual dysfunction among all women is estimated at between 25% and 63%. The prevalence in

postmenopausal women is even higher with rates between 68% and 86.5% [5].

Several studies have addressed the many factors impacting sexual function in menopausal women. The overall impact of different factors on sexual function including physical, mental–emotional, and social factors has been studied. Physical issues such as the age of the woman and her spouse, hormonal changes, duration of menopause, type of menopause (surgical or medical), organic causes of chronic medical problems, husband's sexual problems, severity of physical menopausal symptoms, physical activity, hormone therapies, obstetric history, and health status are discussed in this paper. Mental–emotional issues, including factors such as depression and anxiety, intensity of menopausal emotional symptoms, feelings about the sexual partner, level of self-confidence and self-esteem, body image, and feelings of sexual attraction are introduced and discussed. Social factors such as the education level and occupation of a woman and her spouse, access to a sexual partner, change in sexual partner, duration of relationship or marriage, frequency of sexual intercourse, quality of relationship with spouse, partner loyalty, socioeconomic status, cultural background, religious beliefs, sexual knowledge, perceived health status, lifestyle, previous sexual activity, social expectations, access to health care, history of previous divorce or death of a

* Corresponding author. Reproductive Endocrinology Research Center, Research Institute for Endocrine Sciences, Vali Asr Street, Opposite Shahid Rajaee Heart Hospital, Tehran 1996835119, Iran.

E-mail address: msimbar@gmail.com (M. Simbar).

spouse, racial and ethnic differences, and substance abuse (tobacco, alcohol, etc.) are reviewed and discussed.

Given the variety of factors and the results of the studies, this article aims to answer the question of what factors influence sexual function in menopausal women.

Materials and methods

This was a narrative review, searching Pubmed, Science Direct, and Iranmedex databases and the Scientific Information Database using keywords including “menopause”, “sexual function”, “sexual dysfunction”, “predictive factors”, “menopausal women”, “sexual difficulty/difficulties”, and “climacteric”. Longitudinal, cross-sectional, and interventional studies published between 2003 and 2013 were considered. In this study, English and Farsi-language articles were reviewed. It is noteworthy that the full manuscripts of all citations that were likely to meet the objective of our study were selected and obtained. In cases of duplicate publication, the most recent and complete versions were selected. Articles with no clear methodology as well as those conducted only on premenopausal women were excluded. However, other studies including menopausal and nonmenopausal women were included in the study with concentration on results of menopausal women. Other studies on menopausal age groups (e.g., 42–52 years) without menopausal status were excluded. Furthermore, studies based on convenience sampling, articles with an answer rate <50%, and studies with an indefinite answer rate or sample size were also excluded. In such studies, lack of menstruation for a 1-year period has been the criterion for menopause. Moreover, the investigation of sexual function and diagnosis of sexual dysfunction was carried out using standard questionnaires such as Female Sexual Function Index, the six-item Female Sexual Function Index, McCoy Female Sexuality Questionnaire, and the 14-item Changes in Sexual Functioning Questionnaire. We found 42 related articles from 153 citations identified from electronic searches.

The procedure consisted of one researcher searching for the articles. Inclusion and exclusion of articles were based on the title and abstract of articles. Then, the full texts of the qualified articles were obtained and were studied, and results were extracted. The results were given to two other researchers for revision and correction.

Results

There is great controversy on sexual function and its influencing factors in the literature. While some studies showed that menopause transition negatively affects sexual function [19,10], others demonstrated opposite effects [6–8]. Some postmenopausal women consider the menopausal period as the best time of their lives in terms of sexuality, because they lack the fear of pregnancy and have been living with their partners for a longer time [6–8].

Menopause was associated with an increase in sexual problems, such as lack of sexual desire [1], decreased frequency of sexual activity, decreased sexual response, orgasmic problems, and a decrease in genital sensitivity [9] related to reduced levels of estradiol [10], while other studies indicated that interpersonal variables may be more significant than hormonal levels. Factors affecting sexual function can be classified as physical, mental–emotional, and social.

Physical factors

Ageing

A longitudinal analysis indicated a significant decline in sexual function associated with aging and menopausal transition. A

review of studies indicated that there is a negative correlation between age and sexual function (see Table 1). Some studies also found a negative relationship between the age of the husband and the wife's sexual function [11–14].

Hormonal profiles

Hormonal changes such as estrogen deprivation and decreased androgens may lead to changes in sexual organs and other body systems influencing sexual function. Researchers have reached a consensus about the effects of estrogen decline on reduced sexual function [5]. Moreover, the effect of androgens on sexual function has been studied. A study has shown lower levels of testosterone to be predictors of sexual dysfunction, especially in women with natural menopause [15]. In another study it was shown that in early menopausal-transition women, free plasma testosterone levels were the sole predictive factor of overall sexual function score. In early postmenopause (defined as the 5 years following the final menstrual period) [16], however, dehydroepiandrosterone sulfate (DHEAS) and estradiol levels were predictors of the overall sexual function score [17].

A study indicated a positive relationship between total and free testosterone levels and DHEAS with sexual function [18]. Conversely, some studies showed no relationship between sexual function and serum androgens [19–21]. A study has shown that androgen level is not predictive of low female sexual function in women aged 18–75 years but low domain score for sexual responsiveness for women aged 45 years or older was associated with lower serum DHEAS level [21].

It has been demonstrated that the use of hormone replacement therapy has a positive effect on the sexual function of menopausal women [11,13,14,22,23]. A study showed that hormone replacement therapy significantly improved sexual function in orgasm, pain relief, and lubrication, but desire and arousal which have the highest importance rating were not improved [23]. However, one study showed that the use of hormone replacement therapy during menopause is the main risk factor associated with sexual dysfunction in sexually active women [24].

Type and duration of menopause

The type of menopause as another factor in sexual dysfunction has been studied. A study showed that sexual dysfunction was significantly more common in women who had surgical menopause compared with those who experienced natural menopause [15]. Another factor is the severity of menopausal symptoms. All studies in this area suggest that sexual function is inversely correlated with the severity of menopausal symptoms [12,13,22,25–28]. One study found no relation between the duration of menstrual cessation and sexual function [25].

Medical histories

Chronic medical problems (including urinary incontinence, pelvic floor disorders, surgery, diabetes, cardiovascular disease, neurological or cardiovascular disorders, obesity, hyperlipidemia, hypertension, osteoarthritis, multiple sclerosis, renal failure, liver failure, pulmonary disease, endometriosis, uterine fibroids, cancer, hyperprolactinemia, and hypothyroidism) were studied and the results showed that these problems have a negative impact on sexual function in postmenopausal women [5,11,25,29]. Among medical complications, obesity is of high concern. In a survey, it was shown that the frequency of women reporting their sexual activity as satisfactory was higher among women with lower body mass index [30]. It was also demonstrated that overall sexual function

Table 1
Studies on factors affecting sexual function in postmenopausal women (physical domain).

Factors affecting sexual function	Researchers	Results
Age and age of partner	Jonusiene et al [22] Pérez-López et al [26] Lianjun et al [29] Chedraui et al [13] Ishak et al [11] Verit et al [34] Chedraui et al [14] Chedraui et al [12] Charandaby et al [25] Beigi et al [36] Blümel et al [24]	Sexual function was better in younger women Sexual function inversely correlated with female age Age was independent risk factor for low sexual function of women Sexual function displayed an inverse relation with partner age Women at high risk of FSD were significantly associated with age and husband's age Low sexual function was positively correlated with age Female age and partner's age significantly increased the risk for FSD Sexual function intensity correlated with female age and partner age Sexual function in the age group 55–59 y was significantly lower There was statistically significant relationship between age and FSD Age (> 48 y) was one of the main risk factors associated with FSD
Menopausal status	Alarslan et al [15]	FSD was significantly more common in surgically than in naturally menopausal women
Chronic medical problems	Lianjun et al [29] Ishak et al [11] Charandaby et al [25]	Chronic medical disease was a risk factor for low sexual function of women Medical problems were associated with increased risk of having FSD Sexual function of patients with chronic disease was significantly lower
Urinary incontinence	Charandaby et al [25] Blümel et al [24]	Sexual function of persons with urinary incontinence was significantly lower Bladder problems was one of the main risk factors associated with FSD
Partner sexual function and sexual problems.	Pérez-López et al [26] Mezones-Holguin et al [27] Lianjun et al [29] Chedraui et al [14] Chedraui et al [12] Blümel et al [24]	Female sexual function inversely correlated with partner issues (including erectile dysfunction) Sexual function was inversely correlated to partner sexual function Presence of sexual dysfunction in partner was a risk factor for low sexual function of women The presence of erectile dysfunction and premature ejaculation increased the risk for FSD Lower sexual function was related to sexual dysfunction of partner Partner sexual dysfunction was one of the main risk factors associated with FSD
The severity of the symptoms of menopause	Jonusiene et al [22] Pérez-López et al [26] Mezones-Holguin et al [27] Llaneza et al [28] Chedraui et al [13] Chedraui et al [12] Charandaby et al [25]	Menopausal symptoms were one of the main risk factors for development of FSD Lower sexual function was related to menopausal symptoms Sexual function was inversely correlated to female MRS psychological scorings Score of sexual function inversely correlated with the severity of menopausal symptoms Inverse correlations were found between sexual function and severity of menopause Sexual function inversely correlated with hot flush intensity Sexual function in individuals with vasomotor symptoms was significantly lower
Duration of menstrual stopping	Charandaby et al [25]	Duration of menstrual stopping had no significant correlation with any aspect of sexual function
Exercise and physical activity of individual and partner	Llaneza et al [28] Park et al [30] Gerber et al [20] Mirzaiinj Mabadi et al [32] Dąbrowska et al [31] Lara et al [33]	Sexual function were positively correlated to regular exercising in the partner Sexual satisfaction was higher among women doing physical activity Exercise is the only variable significantly associated with sexual satisfaction No significant relationship was seen between vasomotor symptoms, sexual function and exercise An association is seen between high levels of general physical activity and better sexual functioning The Intervention (PEP: physical exercise protocol) did not improve sexual function
HT	Jonusiene et al [22] Chedraui et al [13] Ishak et al [11] Chedraui et al [14] Blümel et al [24] González et al [23]	Sexual function was better in HT users compared with non-users Sexual function displayed a significant positive correlation with HT Those who practiced contraception were less likely to have FSD Menopausal HT use decreased the risk for FSD HT use was one of the main risk factors associated with FSD HRT significantly improves sexual function in the orgasm, lubrication and pain domains
Body mass index	Park et al [30]	The frequency of women reported their sexual activity as satisfactory was higher
Waist circumference	Chedraui et al [12]	Sexual function intensity correlated with waist circumference
Obstetric history (gravidity, parity and abortion)	Chedraui et al [13] Verit et al [34] Botros et al [35] Chedraui et al [12]	Sexual function displayed an inverse relation with female parity Low sexual function was positively correlated with gravidity, parity and abortion rates Nulliparous women reported superior sexual satisfaction scores compared with parous women Female parity was significantly related to better sexual function.
Dystocia	Lianjun et al [29]	Dystocia was a risk factor for low sexual function of women
Health status	Lianjun et al [29]	Poor health status of partner was a risk factor for low sexual function of women
Hormone levels (testosterone and DHEAS)	Moghassemi et al [19] Gerber et al [20] Alarslan et al [15] Nappi et al [17] Turna et al [18] Davis et al [21]	There was no difference between the two groups (with and without dysfunction) in hormone level There was a lack of association between free T and sexual satisfaction both at year 1 and year 5. Lower testosterone level was predictive of sexual dysfunction Plasma FT level was the only factor to predict sexual function at early menopausal transition. During early postmenopause, levels of DHEAS and E2 were predictor factors Decreased total testosterone, free testosterone and DHEAS levels positively correlated with sexual function Low domain score for sexual responsiveness for women aged 45 years or older was associated with lower serum DHEAS level

DHEAS = dehydroepiandrosterone sulfate; FSD = female sexual dysfunction; FT = Free Testosterone; HT = hormone therapy; MRS = Menopause Rating Scale.

scores were inversely related to waist circumference, an indicator of obesity [12]. Among other medical problems, bladder problem and urinary incontinence are important. Some studies identified these problems as having a negative impact on sexual function in women [24,25].

Characteristics of partners

Sexual dysfunction of partners is considered an influential factor and has an adverse effect on menopausal women's sexual function

[12,14,24,26,27,29]. The poor health status of a sexual partner was also demonstrated to be an independent risk factor for low sexual function in women [29].

Physical activity and exercise

Physical activity and exercise were suggested by some studies to have a positive relationship with the level of sexual function [30,31]. A study showed exercise to be significantly related to sexual satisfaction [20]. Another study revealed that overall sexual

function scores were positively correlated with a sexual partner's regular exercise [28]. On the other hand, in a descriptive study, no significant association was found between sexual function and exercise [32]. In addition, a physical activity intervention protocol also showed that physical activity does not affect sexual function [33].

Reproductive histories

Another factor is the obstetric history of postmenopausal women. A study on women aged 40–59 years in Ecuador revealed that an inverse relationship exists between overall sexual function score and the number of deliveries [13]. A study conducted by the same researcher on healthy women aged 40–59 in Ecuador, however, revealed that there was a significant relationship between female parity and better sexual function [12]. Also, a study showed that low sexual function is related to gravida, parity, and the number of abortions [34]. A study in the United States found that nulliparous women had higher sexual satisfaction scores compared with multiparous women [35]. Another study demonstrated that dystocia was an independent risk factor for low sexual function [29]. Table 1 shows the results of researches conducted on the effects of physical–biological factors on sexual function in postmenopausal women.

Mental and emotional factors

Depression and anxiety

Depression and anxiety are demonstrated to have a negative impact on sexual function in postmenopausal women [17,22,26–29,36]. Results show that depression is an independent risk factor for low sexual function [29] and depression and anxiety are among the main risk factors for developing sexual dysfunction disorders [22]. Table 2 shows the relationship between sexual function in menopausal women and depression and anxiety.

Table 2
Psychosocial factors affecting sexual function in menopausal women.

Factors affecting sexual function	Researchers	Results
Smoking	Park et al [30]	Sexual satisfaction was higher among non-smoking women
Alcohol consumption	Pérez-López et al [26] Lianjun et al [29]	Female sexual function inversely correlated with partner issues (including alcohol abuse) Alcohol use was a risk factor for low sexual function of women
Quality of relationship with spouse	Lianjun et al [29] Beigi et al [36]	Better sexual relationship with the partner was a protective factor for low sexual function of women. There was significant relationship between quality of relationship with spouse and FSD
Partner faithfulness	Chedraui et al [14] Blümel et al [24]	Partner faithfulness decreased the risk for FSD Partner faithfulness was protective factor for FSD
History of divorce or death of the previous spouse	Charandaby et al [25]	Sexual function in individuals with a history of divorce or death of the previous spouse was significantly lower
Living apart from the partner	Lianjun et al [29]	Living apart from the partner was a risk factor for low sexual function of women
Sexual awareness	Beigi et al [36]	There was a significant relationship between sexual awareness and SD
Negative perception of female health status	Blümel et al [24]	Negative perception of female health status was one of the main risk factors associated with FSD
Marriage period	Ishak et al [11] Verit et al [34] Blurian & Ganjlu [45]	Women at high risk of FSD were associated with duration of marriage Low sexual function was positively correlated with marriage period With increasing duration of marriage, sexual problems were lower
Frequency of sexual intercourse	Ishak et al [11] Chedraui et al [12]	Women at high risk of FSD were associated with frequency of sexual intercourse Sexual function positively correlated with coital frequency
Access to private healthcare	Blümel et al [24]	Access to private healthcare was protective factor for FSD
Depression and anxiety	Jonusiene et al [22] Pérez-López et al [26] Mezones-Holguin et al [27] Llaneza et al [28] Lianjun et al [29] Beigi et al [36] Nappi et al [17]	Depression and anxiety were the main risk factors for FSD Lower sexual function was related to mood symptoms (anxiety and depression) Sexual function was inversely associated with depression Sexual function was inversely correlated to total scores of depression. Depression was a risk factor for low sexual function of women There was significant relationship between depression and FSD During late perimenopause and early postmenopause periods, the depression score and anxiety score, respectively, were predictors of sexual function

FSD = female sexual dysfunction.

Social factors

Interpersonal relationships, socioeconomic status, cultural background, religious beliefs, general health, and access to a sexual partner affect how women feel about their sexuality during menopause [9].

Unfortunately, due to a lack of education, many women may not realize that changes in sexual function may be associated with changes in hormone levels. Some women think that sexual function does not change for years after menopause, and they attribute their entire sexual complaint to their sexual partners [1]. Backgrounds and interpersonal issues may be responsible for some changes experienced during menopause, but are not responsible for all changes [37].

Social expectations

Social expectations also have a negative impact on sexual desire. Many cultures still believe that older women are sexually inactive. Although this attitude is changing, cross-sectional studies show that there is a negative change in sexuality during menopause and postmenopausal women show a lower sexual desire [9]. For example, menopausal women in Nigeria [38] and Kuwait [39] avoid sexual activity. At this stage men remarry and many new families are formed [38,39]. While in some other countries, older women are less controlled, sexual desires are more favorable, and they seem more attractive to young men [40].

Sexual relationship factors

It has been demonstrated that sexual desire is associated with earlier sexual activity [41]. Another study also showed that a previous level of sexual function is a major predictor of current sexual function [42].

Frequency of sexual activity is a significant influencing factor for sexual activity as aging occurs. Feelings of desire and the enjoyment of sexual activity are also affected by access to a partner [43]. Also,

the absence of a sexual partner may affect sexual response in menopause women, leading to vaginal problems and reduced sexual desire [9]. Moreover, the history of divorce or death of a previous spouse [25] and living apart from one's spouse [29] were determined to be risk factors for sexual dysfunction. A study revealed that the risk of female sexual dysfunction was significantly related to the frequency of sexual intercourse [11]. However, another study showed that sexual function is positively related to sexual intercourse frequency [12].

There is evidence that some aspects of sexual function may be reduced by increasing the duration of a relationship. A research showed that sexual desire and interest decreased with length of relationship for women in their late teens to early 30s and sexual desire decreased with length of relationship for women in their early 50s to mid-60s [44]. A research showed that there is a relationship between female sexual dysfunction and duration of marriage [11]. However, another study showed that with increasing duration of marriage, sexual problems were lower [45].

The quality of the relationship with a spouse is among the social factors that can affect sexual function in menopausal women [29,36]. A study revealed that having a better relationship with a partner protected against sexual dysfunction in women [29]. In another study, six areas of sexual function in 3167 women aged 42–52 were studied using the “Study of Women's Health Across the Nation” (SWAN). The results of the SWAN highlighted the importance of relationship factors on sexual function and menopause. Among these factors, feelings toward the sexual partner and/or the start of a new relationship were considered of paramount importance [46]. Some studies determined that a partner's fidelity reduces the risk of sexual dysfunction in women [14,24].

Ethnicity and race

Another factor is ethnic and racial differences. SWAN in women of all ages reported notable differences in the sexual arena regarding ethnic and racial differences. Controlling a large number of variables, a higher frequency of sexual intercourse was reported by black women than by white women. Hispanic women had lower physical pleasure and arousal; Chinese and Japanese women reported more pain and less desire and arousal than white women; although the only significant difference was for arousal [46].

Socioeconomic factors

Some studies indicated a significant relationship between socioeconomic status and family status, place of residence and sexual dysfunction [36,47]. A research showed a significant negative correlation between sexual dysfunction and family income [34]. A review study showed that the number of women who had satisfactory sexual activity was higher among women with middle socioeconomic status [30], but an Iranian study revealed the sexual function of those with adequate incomes is significantly low [25].

In the field of education, a number of studies showed a positive relationship between the education level of an individual and/or her partner and sexual function [12,13,24,26,28–30]. Other studies, however, have suggested a negative relationship between education and sexual function [14,34,36,47]; however no significant difference has been found between women's level of education and sexual function in any dimensions [24].

A study showed a statistically significant relationship between women's jobs and female sexual dysfunction. No relation, however, was noted between spouse's jobs and sexual dysfunction in menopause [47]. Some studies showed no significant relationship between job and sexual dysfunction [24,36].

Drug abuse and habits

Drug abuse and drug habits have also been studied. A research showed nonsmoking women experienced satisfactory sexual activity more than smokers [30]. A study found alcohol to be an independent risk factor for low sexual function among women [29]. Another study showed that female sexual function is negatively associated with a husband's alcohol abuse [26].

Knowledge and attitude

A study showed a relationship between sexual awareness and sexual dysfunction [36]. According to another study, a negative perception of women towards health status was also found to be a risk factor for sexual dysfunction [24].

Geographical conditions

A study marked a high altitude location as a factor affecting sexual function [12].

Access to health care

According to a study, access to private health care is a protective factor for sexual dysfunction [24].

Tables 2 and 3 show the results of research conducted on social and demographic (respectively) factors affecting sexual function in postmenopausal women.

Discussion

Results on the prevalence of sexual dysfunction showed significant differences which may be due to choice of ethnic, religious, cultural, and attitudinal factors as well as different methodologies and tools [3,48]. Moreover, the kind of study, sample selection methods, ethnic beliefs regarding sexual issues, and methods of study had a significant impact on estimating the prevalence of these disorders [3]. Results also showed that effective factors on sexual function among menopausal women are also very different and sometimes even contradictory based on location, type of research, time, and participants of the study. Physically, the biological processes involved in the initiation of sexual activity and sexual response indicated in most cases that the estrogen and testosterone hormones are key points affecting sexual function [5]. There is a consensus that some hormonal factors affect sexual function in menopausal women, such as estrogen withdrawal, which represents the loss of sexual function. Hormone replacement therapy showed a protective effect on sexual function [11,12,14,22,23], except in one study [24]. However, the method of prescribing the hormone, time of onset and type of study could be effective in this regard.

Furthermore, lower sexual drive, arousal and vaginal lubrication are all associated with reduced androgen levels [49]. The medical effects of androgens in women in order to solve sexual problems are still controversial. Despite some reports of the beneficial effects of androgen treatment on sexual dysfunction and other symptoms of androgen-deficiency syndrome, as well as its proof of being healthy in short-term uses (6 months), its long-term effects are as yet unknown [50].

Some studies have shown that serum testosterone levels are significantly related to sexual function in menopausal women [15,17,18,51], but contradictions have been observed regarding the effects of androgen deficiency [15,17,18,20,52]. The reason for this discrepancy may be differences in the measurement of hormone

Table 3

Studies on demographic factors affecting sexual function in postmenopausal women.

Factors affecting sexual function	Researchers	Results
Education and spouse's education	Pérez-López et al [26]	Female sexual function positively correlated with female and partner education.
	Llaneza et al [28]	Sexual function were positively correlated to female and partner education
	Lianjun et al [29]	Low education level was independent risk factor for low sexual function of women
	Chedraui et al [13]	Sexual function displayed a significant positive correlation with female educational level
	Verit et al [34]	There was negative correlations between low sexual function and education
	Chedraui et al [14]	Educational level significantly increased the risk for FSD
	Park et al [30]	Sexual satisfaction was higher among women with higher educational status
	Chedraui et al [12]	Sexual function positively correlated with female and partner educational level
	Charandaby et al [25]	Education had no significant correlation with any aspect of sexual function
	Beigi et al [36]	There was significant relationship between education and spouse's education with FSD
	Fahami et al [47]	There was significant relationship between education and husband's education with FSD
	Blümel et al [24]	Higher educational level (women) was negatively related to FSD
	Charandaby et al [25]	Female job had no significant correlation with any aspect of sexual function.
	Beigi et al [36]	There was significant relationship between job and FSD
Job	Fahami et al [47]	There was significant relationship between type of job and FSD
Income (socioeconomic status)	Verit et al [34]	There was significant negative correlations between low sexual function and family income
	Park et al [30]	Sexual satisfaction was higher among women with middle socioeconomic status
	Charandaby et al [25]	Sexual function in individuals with insufficient household income was significantly lower
	Beigi et al [36]	There was significant relationship between economic status and FSD
	Fahami et al [47]	There was significant relationship between economic situation of the family and FSD
Residence Status	Beigi et al [36]	There was significant relationship between residence status and FSD
	Fahami et al [47]	There was significant relationship between residence status (appropriate or inappropriate) and FSD
Altitude	Chedraui et al [12]	Lower sexual function were related to high altitude

FSD = female sexual dysfunction.

levels in the blood, different kits used as measuring tools, or type and number of study participants [53].

Researchers agree on the reverse effects of aging on sexual function [12,14,24,25,34,36], and some studies have even found a husband's age to be an effective factor [11–14]. This effect may be due to hormonal changes caused by aging and its consequences on sexual function.

Research indicates a consensus on the impact of chronic medical problems [11–13,24,29,30], spousal sexual problems [12,14,24,26–28], and severity of menopausal symptoms [13,22,24–28,54] on sexual function in menopausal women. It seems that physical complaints may affect sexuality.

There is no consensus on the impact of physical activity [20,28,30–33,55,56], possibly due to the type of defined exercise. Regular exercise was emphasized in some studies, while in some others it was not included. The number and type of samples in these studies were also different.

Results showed a difference of opinion on the impact of obstetric history on sexual function in postmenopausal women [12,13,34,35]. Dystocia, however, is considered to be a factor in reduced sexual function [29]. Comprehensive studies, however, should be conducted regarding dystocia in order to accurately judge it.

All studies demonstrated the impact of depression and anxiety in the area of mental–emotional factors on sexual function [17,22,26–29,36]. With the passage of time, the components of sexual function may possibly change during menopause because of changes in sensory perception, the draining and transfer of central and peripheral nerves, and the peripheral blood flow and muscle tension created in response to the lack of estrogen [40]. Changes in mood, sleep and cognitive functioning are common. These changes may lead to decreased self-esteem, a poorer self-image, and less sexual desire and response [37]. Some women feel less sexually attractive [9] or less satisfied with their bodies [57]. In fact, self-image can change because the body tends to gain weight with age due to slowed metabolism [1]. Some women lose their positive self-image and self-esteem, which leads to a sense of mild to moderate depression [58]. In women who have a previous history

of depression, are sedentary, and rarely exercise or have negative beliefs about menopause, depression increased [1].

Contradicting results were obtained regarding effects of the participants' and their spouses' education levels [12–14,24–26,28–30,34,36,47], occupation [25,36,47], and socioeconomic status (income, place of abode) [25,30,34,36,47] on sexual function which may be due to different methodologies, countries, data analysis tools, participants examined, or the participants' cultures.

Studies showed that smoking and consuming alcohol have negative impacts on women's sexual function [26,29,30]. It has been shown that nicotine can inhibit physical sexual arousal in men and women and that large doses of alcohol can reduce a woman's ability to become sexually aroused and have an orgasm [59].

High-quality relationship with the spouse [29,36], partner fidelity [14,24], sexual awareness [36], and access to private health care [24] were among factors having a positive impact on sexual function. Moreover, a history of previous divorce or death of a spouse [24], living apart from a spouse [29] and having a negative understanding of women's health [24] were found to reduce sexual function. The effect of marital duration [11,45] and frequency of sexual intercourse [11,13], however, showed different results, suggesting that these factors can be influenced by the lack of correct responses given by the studies' participants. In some communities, participants would not answer the questions correctly because of cultural and religious attitudes which consider sexual intercourse in postmenopausal women as a taboo. Lack of access to the full text of some articles and using only English and Persian literature review are the limitations of this study.

This review study illustrates that several factors affect sexual functioning of menopausal women. Therefore, the improvement of sexual functioning as a health dimension in these women requires more and better knowledge and implementation of appropriate interventions. However, health specialists and other individuals in charge need to have a comprehensive approach in dealing with sexual problems in menopausal women. Sexual aging must be a part of health care and medical education and physicians must be advised to ask the aged patients about their sexual concerns.

Conflicts of interest

The authors have no conflicts of interest relevant to this article.

References

- [1] Bachmann GA. The changes before “the change”: strategies for the transition to the menopause. *Postgrad Med* 1994;95:113–5. 119–21,124.
- [2] Segen JC. Sexual function. Segen's Medical Dictionary. Farlex, Inc.; 2012. Available at: <http://encyclopedia.thefreedictionary.com/sexual+function> [Accessed 18 Mar 2014].
- [3] Ramezani Tehrani F, Farahmand M, Mehrabi Y, Malek Afzali H, Abedini M. Sexual dysfunction and its risk factors: population-based study among women living in urban areas in four provinces. *Journal of Payesh* 2012;11: 869–75 [Article in Persian, English abstract].
- [4] American Psychiatric Association. Diagnostic and statistical manual of mental disorders. In: 4th ed. Washington, DC: American Psychiatric Association; 2002. Available from: <http://ds.m.psychiatryonline.org/doi/pdf/10.1176/appi.books.9780890420249.dsm-iv-tr>.
- [5] Ambler DR, Bieber EJ, Diamond MP. Sexual function in elderly women: a review of current literature. *Rev Obstet Gynecol* 2012;5:16–27.
- [6] Youngkin EQ, Davis MS. The climacteric, menopause, and the process of aging women's health—a primary care clinical guide. 2nd ed. Virginia: Appleton & Lange, Stamford, Connecticut; 1998. p. 402–23.
- [7] Dennerstein L, Dudley E, Burger H. Are changes in sexual functioning during midlife due to aging or menopause? *Fertil Steril* 2001;76:456–60.
- [8] Sadock JB, Sadock AV. Comprehensive textbook of psychiatry. 7th ed. New York: Lippincott-Williams & Wilkins; 2007. p. 1582.
- [9] Bachmann GA. Influence of menopause on sexuality. *Int J Fertil Menopausal Stud* 1995;40:16–22.
- [10] Berman JR, Goldstein I. Female sexual dysfunction. *Urol Clin North Am* 2001;28:405–16.
- [11] Ishak IH, Low WY, Othman S. Prevalence, risk factors, and predictors of female sexual dysfunction in a primary care setting: a survey finding. *J Sex Med* 2010;7:3080–7.
- [12] Chedraui P, Pérez-López FR, Sánchez H, Aguirre W, Martínez N, Miranda O, et al. Assessment of sexual function of mid-aged Ecuadorian women with the 6-item Female Sexual Function Index. *Maturitas* 2012;71:407–12.
- [13] Chedraui P, Pérez-López FR, Mezones-Holguín E, San Miguel G, Avila C. Assessing predictors of sexual function in mid-aged sexually active women. *Maturitas* 2011;68:387–90.
- [14] Chedraui P, Pérez-López, San Miguel G, Avila C. Assessment of sexuality among middle-aged women using the Female Sexual Function Index. *Climacteric* 2009;12:213–21.
- [15] Alarslan D, Sarandol A, Cengiz C, Develioglu OH. Androgens and sexual dysfunction in naturally and surgically menopausal women. *J Obstet Gynaecol Res* 2011;37:1027–34.
- [16] Soules MR, Sherman S, Parrott E, Rebar R, Santoro N, Utian W, et al. Executive summary: stages of reproductive aging workshop (STRAW). Park City, Utah, July, 2001. *Menopause* 2001;8:402–7.
- [17] Nappi RE, Albani F, Santamaria V, Tonani S, Magri F, Martini E, et al. Hormonal and psycho-relational aspects of sexual function during menopausal transition and at early menopause. *Maturitas* 2010;67:78–83.
- [18] Turna B, Apaydin E, Semerci B, Altay B, Cikili N, Nazli O. Women with low libido: correlation of decreased androgen levels with female sexual function index. *Int J Impot Res* 2005;17:148–53.
- [19] Moghasssemi S, Ziaei S, Haidari Z. Female sexual dysfunction in Iranian postmenopausal women: prevalence and correlation with hormonal profile. *J Sex Med* 2011;8:3154–9.
- [20] Gerber JR, Johnson JV, Bunn JY, O'Brien SL. A longitudinal study of the effects of free testosterone and other psychosocial variables on sexual function during the natural traverse of menopause. *Fertil Steril* 2005;83:643–8.
- [21] Davis SR, Davison SL, Donath S, Bell RJ. Circulating androgen levels and self-reported sexual function in women. *JAMA* 2005;294:91–6.
- [22] Jonusiene G, Zilaitiene B, Adomaitiene V, Aniliene R, Bancroft J. Sexual function, mood and menopause symptoms in Lithuanian postmenopausal women. *Climacteric* 2013;16:185–93.
- [23] González M, Viáfara G, Caba F, Molina E. Sexual function, menopause and hormone replacement therapy (HRT). *Maturitas* 2004;48:411–20.
- [24] Blümel JE, Chedraui P, Baron G, Belzares E, Bencosme A, Calle A, et al. Sexual dysfunction in middle-aged women: a multicenter Latin American study using the Female Sexual Function Index. *Menopause* 2009;16:1139–48.
- [25] Charandaby SM, Rezai N, Hakimi S, Montazeri A, Sh Khatami, Karimi P. Sexual function in postmenopausal women and its predictive factors: a community based study in Ilam 2011. *Iranian Journal of Obstetrics Gynecology and Infertility* 2012;15:1–9 [Article in Persian, English abstract].
- [26] Pérez-López FR, Fernández-Alonso AM, Trbalón-Pastor M, Vara C, Chedraui P. Menopause Risk Assessment (MARIA) Research Group. Assessment of sexual function and related factors in mid-aged sexually active Spanish women with the six-item Female Sex Function Index. *Menopause* 2012;19:1224–30.
- [27] Mezones-Holguín E, Córdova-Marcelo W, Lau-Chu-Fon F, Aguilar-Silva C, Morales-Cabrera J, Bolaños-Díaz R, et al. Association between sexual function and depression in sexually active, mid-aged, Peruvian women. *Climacteric* 2011;14:654–60.
- [28] Llanaez P, Fernández-Iñarrea JM, Arnott B, García-Portilla MP, Chedraui P, Pérez-López FR. Sexual function assessment in postmenopausal women with the 14-item changes in sexual functioning questionnaire. *J Sex Med* 2011;8: 2144–51.
- [29] Lianjun P, Aixia Z, Zhong W, Feng P, Li B, Xiaona Y. Risk factors for low sexual function among urban Chinese women: a hospital-based investigation. *J Sex Med* 2011;8:2299–304.
- [30] Park YJ, Kim HS, Chang SO, Kang HC, Chun SH. Sexuality and related factors of postmenopausal Korean women. *Taehan Kanho Hakhoe Chi (J. Korean Acad Nurs)* 2003;33:457–63.
- [31] Dąbrowska J, Drosdzol A, Skrzypulec V, Plinta R. Physical activity and sexuality in perimenopausal women. *Eur J Contracept Reprod Health Care* 2010;15: 423–32.
- [32] Mirzaiinjabadi K, Anderson D, Barnes M. The relationship between exercise, Body Mass Index and menopausal symptoms in midlife Australian women. *Int J Nurs Pract* 2006;12:28–34.
- [33] Lara LA, Montenegro ML, Franco MM, Abreu DC, Rosa e Silva AC, Ferreira CH. Is the sexual satisfaction of postmenopausal women enhanced by physical exercise and pelvic floor muscle training? *J Sex Med* 2012;9:218–23.
- [34] Verit FF, Verit A, Billurcu N. Low sexual function and its associated risk factors in pre- and postmenopausal women without clinically significant depression. *Maturitas* 2009;64:38–42.
- [35] Botros SM, Abramov Y, Miller JJ, Sand PK, Gandhi S, Nickolov A, et al. Effect of parity on sexual function: an identical twin study. *Obstet Gynecol* 2006;107: 765–70.
- [36] Beigi M, Fahami F, Hassan-Zahraei R, Arman S. Sexual dysfunction in menopause. *Journal of Isfahan Medical School* 2008;26:294–300 [Article in Persian, English abstract].
- [37] Bachmann GA, Leiblum SR. The impact of hormones on menopausal sexuality: a literature review. *Menopause* 2004;11:120–30.
- [38] Bajulaiye O, Sarrel PM. A survey of perimenopausal symptoms in Nigeria. In: Netelovitz M, Van Keep PA, editors. The climacteric in perspective. Proceedings of the Fourth International Congress on the Menopause, held at Lake Buena Vista, Florida, October 28 to November 2, 1984. Boston, MA: MTP Press Limited, p.161–175.
- [39] Omu AE, Al-Qattan N. Effects of hormone replacement therapy on sexuality in postmenopausal women in a mideast country. *J Obstet Gynaecol Res* 1997;23: 157–64.
- [40] Sarrel PM. Sexuality in the middle years. *Obstet Gynecol Clin North Am* 1987;14:49–62.
- [41] Koster A, Garde K. Sexual desire and menopausal development. A prospective study of Danish women born in 1936. *Maturitas* 1993;16:49–60.
- [42] Dennerstein L, Lebert P. Modelling mid-aged women's sexual functioning: a prospective, population-based study. *J Sex Marital Ther* 2004;30:173–83.
- [43] Hayes R, Dennerstein L. The impact of aging on sexual function and sexual dysfunction in women: a review of population-based studies. *J Sex Med* 2005;2:317–30.
- [44] Fugl-Meyer AR, Fugl-Meyer K. Sexual disabilities, problems and satisfaction in 18–74-year-old Swedes. *Scand J Sexol* 1999;2:79–105.
- [45] Blurian Z, Ganju J. Sexual dysfunction and some related factors in women referred to health centers of Sabzevar. *J Fertil Infertili* 2007;163–70. Available from: <http://eprints.medsab.ac.ir/1044/> [Article in Persian, English abstract].
- [46] Avis NE, Zhao X, Johannes CB, Ory M, Brockwell S, Greendale GA. Correlates of sexual function among multi-ethnic middle-aged women: results from the Study of Women's Health Across the Nation (SWAN). *Menopause* 2005;12: 385–98.
- [47] Fahami F, Beygi M, Hasanazhrai R, Arman S. The relationship between socioeconomic status and sexual dysfunction in postmenopausal women. *J Nurs Midwifery Res* 2007;27. Available from: <http://nmmail.mui.ac.ir/oldsit/journal/main.php?filename=article.php&nomagazine=27&noart=2&footer=footer1.php> [Article in Persian, English abstract].
- [48] Hakimi S, Simbar M, Ramezani Tehrani F. Perceived concern of menopausal women: a phenomenological study among Azeri population of Iran. *Iran Red Crescent Med J* 2014;16:e11771.
- [49] Schwenkhaugen A. Hormonal changes in menopause and implications on sexual health. *J Sex Med* 2007;4:220–6.
- [50] Shifren JL. Sexual dysfunction in women: management. UpToDate online 2009. Available at: <http://www.uptodate.com>. [Accessed 10 Apr 2013].
- [51] Nappi RE, Albani F, Santamaria V, Tonani S, Martini E, Terreno E, et al. Menopause and sexual desire: the role of testosterone. *Menopause Int* 2010;16:162–8.
- [52] Nazarpour S, Simbar M, Ramezani Tehrani F, Tohidi M, Alavi Majd H. Study on the correlation between serum androgens and sexual function in post-menopausal women. *IJEM* 2015;17:13–22 [Article in Persian, English abstract].
- [53] Basson R, Brotto LA, Petkau AJ, Labrie F. Role of androgens in women's sexual dysfunction. *Menopause* 2010;17:962–71.
- [54] Nazarpour S, Simbar M, Ramezani Tehrani F, Tohidi M, Alavi Majd H. Effects of the severity of menopausal symptoms on sexual function in postmenopausal women. *JQUMS* 2015;19:54–63 [Article in Persian, English abstract].
- [55] Nazarpour S, Simbar M, Ramezani Tehrani F, Tohidi M, Alavi Majd H. Exercise and sexual dysfunction among postmenopausal women in Iran. *Sci J School Public Health Inst Public Health Res* 2015;13:17–32 [In Persian, English abstract].

- [56] Nazarpour S, Simbar M, Ramezani Tehrani F, Tohidi M, Alavi Majd H. Sexual function and exercise in post-menopausal women residing in Chalous and Nowshahr; North of Iran. *Iranian Red Crescent Med J* 2016;18:e30120.
- [57] Pearce MJ, Hawton K. Psychological and sexual aspects of the menopause and HRT. *Baillieres Clin Obstet Gynaecol* 1996;10:385–99.
- [58] Archer DF. Guiding your patients through the transitional years, menopause, and beyond. *Contemp Ob Gyn* 2000. Suppl:1–18.
- [59] SIECCAN (The Sex Information and Education Council of Canada). How can smoking and drinking affect your sex life? 2010. Available at: http://sexualityandu.ca/uploads/files/CTR_SmokingandDrinking.pdf. [Accessed 4 Nov 2015].