

Comparison of Neuropsychological Functions, Depression and Anxiety in postmenopausal and premenopausal Women in Isfahan

Bit Hashemi ^a , Karim Asgari ^b

^a *Master Student of Psychology, Islamic Azad University, Branch khourasghan, Isfahan, Iran*

^b *Associate Professor of Psychology, University of Isfahan, Iran*

Abstract

The significance of menopause is due to its association with changes in physical and psychological nerve. Some women pass these changes easily and without any particular crisis, but some others must grapple at this time with a lot of problems. The purpose of this study was to compare the neuropsychological performance, anxiety and depression in postmenopausal and non menopausal women. The participants of this study were , 200 women (100 premenopausal women about 45 to 65 years old and 100 postmenopausal women 20 to 40 years old) who were selected by non-random available sampling in accessible health centers Motahari and Sajjad Amin hospital and Asgariyeh. The research methodology was descriptive (causal-comparative). The research instrument used neuropsychological functions, or brain systems, the questionnaire of 101 questions with 0.89 reliability to evaluate functions of five important brain systems (prefrontal cortex, cingulate gyrus, limbic system, basal ganglia and temporal lobe) and Beck depression questionnaire by reliability 0.93 and Beck anxiety by reliability 0.92 to assess depression and anxiety were for the participants . To analyze the data, descriptive and inferential statistics (univariate and multivariate analysis of variance) was used. The results showed that among premenopausal and postmenopausal women ,function of neuropsychological (prefrontal cortex, cingulate gyrus, limbic system, basal ganglia and cortex Temporal) and anxiety were significantly different ($P < 0.001$) But the from point of depression there is no significant difference ($P > 0.001$). The results showed that functions of neuropsychological after menopause influences because of decreased protective effects of estrogen and postmenopausal women experience more anxiety during this period in comparison to premenopausal women .

Keywords: Neuropsychological, Anxiety, Depression, Postmenopausal women, Premenopausal women

Introduction:

The average age of menopause in the world have been reported 51 years old and due to the increase in life expectancy in many countries, more than one-third of women spend in menopause, during the lifetime (Rajaeefard et al, 2010). With the onset of menopause in women, ovarian hormones including estrogen (estradiol & Estrone) progesterone, andrestandion and testosterone dramatically reduce.And this function results in various physical, psychological and urine, reproductive, cardiovascular disease, osteoporosis and weakness of cognitive faculties (Freeman, 2004).Recent studies has opened a way to understand the fact that estrogen influences other factors beside his famous effects in the field of reproduction has another important function and it is tropic or nutritional impact on the brain neurons. Estrogen affects through the hippocampus and the effect on synapse formation, cell plasticity, neuronal excitability on cognitive function of individuals (Greene et al, 2010) and it can easily pass the blood brain barrier. It impacts on different parts of the brain functions through two nuclear receptor called sit plasmatic nuclear estrogens called ER- alpha ($ER\alpha$) and ER- beta ($ER\beta$). $ER\alpha$ plays an important role in regulating the behavior and Reproductive Endocrinology and their functions. $ER\beta$ appears to play an important role in nerve protection behaviors, such as learning and memory, anxiety and mood (Horst, 2010).Thus we conclude that estrogen affects the nerve function in women psychologically .In Arthur Weber psychology neuropsychology or neuropsychology is defined as follows: on branch of physiological psychology on communication within the expected neural processes and behaviors (Pournaghash Tehrani, 2014). Five important part of the brain that is involved in the creation of purposeful behavior (MC Donald, 1999) include prefrontal cortex, cingulated gyres, deep limbic system, basal ganglia and temporal lobe (Amen, 2005). Apart from the effects of nerve - cognitive estrogen, studies have shown that decreasing estrogen, especially in postmenopausal women leads to mood Fluctuations especially depression and anxiety (Barbara et al, 2008).Depression is a disorder that patient has symptoms such as low mood with reducing energy and passion, feeling guilty, difficulty in concentrating, loss of appetite and thoughts about death and suicide (Kaplan & Saduk, 2009). About one-fifth to one-third of women regardless of age and menopausal status complain about depressed mood. In fact, more than 70 percent of women in premenopausal cry from the simplest things .they become irritable and restless and more than 60 percent of them suffer from anxiety and depression and memory loss (Lipovac et al, 2010).If a person had a history of mental illness or problems in the stress of the climacteric period (early menopause) , she may also be more prone to mental disorders, lack of memory in the early stages of dementia , trigger a depressive effect of estrogen because the patient reacts to lose her cognitive functions (Speroff & Fritz, 2012). Variable mood and anxiety by hormonal changes and other factors may cause medical symptoms such as migraine headaches, stomach problems, insomnia and depression (Eslapik & Lorena, 2008), anxiety identifies with symptoms such as restlessness, fear, anxiety, irritability, fatigue, insomnia and signs such as headache, chest pain, palpitations, shortness of breath, cold sweats, clear skin. Symptoms of anxiety and irritability in many women increases in the ages near to menopause (Pestei & Allameh, 2007).most of the women afraid of definitions they heard about this period and this may make them prone to disorders like nervousness, bad mood, irritability, depression and reducing the social compatibles (Ryan et al, 2011), especially in societies where the beauty and attractiveness of women is very important and is a value (Nkuei, 2006.) Therefore, the "menopause" can lead to challenges in life and as a result it causes the disease and disability and it affects bad effect on the quality of life in the person and it will be the start point for a series of complications that can endanger the health of families and communities, thus addressing to this issue is critical (Asgari et al, 2011).

Research methodology

The present study was causal – comparative research and the Sampling included all postmenopausal women 45-65 years and non menopausal 20-40 years in Isfahan. they selected non-random available sampling method. from in this study among 384 accepted centers (aged 20 to 65) in Amin and Asgariyeh hospital and in Sjad and motahary health centers ,only 214 person were eligible and they were willing to cooperate and to participate in the research. Among them 8 person eligible to withdraw from the study and 6 women also because they didnt answer completely to the questionnaire, they were excluded from the process. For two groups of population, the criterias to enter this study as follows: postmenopausal women: the age range of 45 to 65 years.menopause has been occurred In the form of physiological. They passed the cessation of menstruation at least one year and utmost 15 years.they werent under any medication and hormones.they were in perfect physical health, mental or mood. To participate in the research process,they must be satisfied. Non-menopausal women: The age range was 20 to 45 years.Also the menstrual cycle was regular and physiological.they werent under any medication and hormones. They were completely in healthy physical, mental and emotional state .criterias that exclude pre and post menopausal women: women 45 to 65 years with a background of hormone therapy during the last 6 months and a had background of hysterectomy (removal of the uterus). They had non-Iranian nationality. They had physical illness (thyroid or adrenal, cancer and liver tumors) and were psychit. For the treatment of psychological and physical problems ,they were under psychological treatments. They had no sign of menopause wasn't as a result of lack of menstrual cycle and other physical and psychological problems occurred and they werentnot consent to participate in the research process.

Research tools

In this study,it was used three questionnare : Beck Depression, Beck Anxiety and neuropsychological function or brain systems. Beck questionnare : Beck Depression Inventory has 21 questions which is based on 21 aspects or symptoms such as mood, pessimism, sense of failure, dissatisfaction, guilt, expectation of punishment, self-dislike, self-accusation suicidal thoughts, crying, irritability, social isolation, indecision, perceived physical change, hard work, fatigue, insomnia, changes in appetite, weight loss, decreased sexual interest and mental preoccupation. The answer to each question consists of four options ranging from 0 to 3 and is also summarized. There is Normal 15-0, minor depression (31-15), moderate depression (47-31), deep depression (63-47) Thus, total scores can range from zero to 63. Beck, Steer and Brown (1996) reported internal consistency of the instrument as 0.73 to 0.92 with mean of 0.86 and the Cronbach alpha for the patient and non- patients were reported 0.86 and 0.81. Cronbach's alpha was 0.78 in Iran and the two- week test –retest reliability was 0.73 (Fathi Ashtiani, 2013).In Iran Dobson and Mohammad Khani (2008) report validity 0.91 to this study. Also in studies by (Ghassemzadeh et al, 2005) alpha coefficient of this questionnaire was 0.87 and its retest coefficient $r = 0.74$ and they reported its correlation with Beck depression questionnaire first edition (0.93). Some instruments that is designed to measure anxiety is Beck anxiety inventory. Beck anxiety questionnare conducted by Aaron T Beck and his colleagues in 1988. This questionnaire consists of 21-item that have list the symptoms of anxiety and it is similar more to the check list and in contrast there is four options to choose from. Each phrase reflects one of symptoms of anxiety that usually people who are anxious psychologically or they are in anxious state, they experience (Beck and Steer, 1990). In the multiple choice Beck questionnaire ,each question in a range of a four part is scored from 0 to 3. Total score put in range from 0 to 63 that high

scores indicate severe anxiety, score of 0 to 21 very low anxiety, 22 to 35 points moderate anxiety and scores more than the 36 indicates high anxiety and it needs follow-up and treatment. To calculate the internal consistency, calculation from Cronbach's alpha 0.92 and reliability coefficient $r = 0.6$ reported that indicates high internal consistency. Kaviani and Mousavi in Iran (2008) they performed questionnaire on 1513 people of different ages and sex in 261 anxious patients. Their results showed that Beck Anxiety questionnaire has validity $r = 0.72$ and reliability $r = 0.83$ and Cronbach's alpha is 0.92 it indicates test is favorable. The questionnaire of neuropsychological test performance or brain systems: this questionnaire conducted by American psychiatrist, doctor Iman in late 2009, it is made based on laboratory results and ongoing research on behavioral disorder with physiological origin and using SPECT scan and contains 101 questions based on a Likert scale, that it assesses on certain division several questions, the neuropsychological functions of the frontal, temporal, basal ganglia, limbic system and the cingulate cortex and Consequently, it determines subcategories behavioral disorders in each category. Participant explains her status about each question on 5 degrees scale of very high expression to never and the score achieved by the person indicates her potential damage in that part of the brain. Because of the novelty of this questionnaire, it isn't still Standardization in Iran but also its validity and reliability has been investigated in several research. Five neurologist evaluated the questionnaire's harmony with the considered objectives and they reported that it has high validity. Also the internal consistency (Cronbach's alpha) has been calculated on a sample of 30 people and the equivalent of 0.89 achieved (Hatly, 2014). In the present study, Cronbach's alpha calculated as 0.96 respectively. Also Cronbach's alpha coefficient in each of the test subscales (prefrontal cortex, cingulate gyrus, basal ganglia, limbic system and temporal lobe), respectively achieved 0.84, 0.87, 0.91, 0.88 and 0.84.

The Analysis of Data

Data analyzed through (ANOVA) univariate variance analysis and (MANOVA) multivariate variance by using SPSS-20 statistical software. $P < 0.001$ considered as significance level.

Research Findings

In below table, it shows characteristics of the two groups regarding demographic data.

Table 1: demographic information menopausal and perimenopausal women

Premenopausa	Postmenopausal	Variable
(%)	(%)	
		Age group
0.37	0	20-30
0.45	0	31-40
0.12	0.33	41-50
0	0.23	51-60
0	0.42	61-70
		Education
0.11	0.28	Guidance school
0.45	0.47	Diploma

0.8	0.3	Associate
0.28	0.22	Bachelor
0.8	0	MA
0.21	0	JOB
0	0.44	employee
0.79	0.56	Retired
		House wife

Table 2: Mean and standard deviation of variables with sample groups

deviation standard		The mean		number	Subscales	Variable
premenopausal women	Postmenopausal women	premenopausal women	Postmenopausal women			
8.76	8.13	15.55	22.80	200	Prefrontal unresponsive	Neuropsychological functions
4.94	5.69	8.26	11.27	200	Prefrontal impulsive	
8.49	15.9	65.15	22.58	200	Cingulate gyrus	
9.93	93.8	18.18	25.09	200	limbic system	
11.76	54.11	15.99	22.82	200	Basal ganglia	
5.93	75.6	7.29	11.71	200	Temporal lobe	Depression
7.99	7.36	14.49	16.42	200		
8.20	25.10	14.18	18.76	200		
						Anxiety

According to Table 2, the average of all subscales of postmenopausal women is higher than the average non-menopausal women, that it shows the difference between the two groups.

Table 3: Results of multivariate analysis of variance

Significance level	Error DF	Hypoth. D	F	Value	
0.001	195	4	39.525	0.44	Pillais
0.001	195	4	39.525	0.55	Wilks
0.001	195	4	39.525	0.81	Hotellings
0.001	195	4	39.525	0.81	Roys

In Table 3 by significant of MANOVA test, this result achieves that at least one of the variables must be significant. Therefore it discussed to univariate tests to determine which of the variables is significant.

Ability test	Size effect	Significance level	F	Mean square	df	Total squares	Dependent variable	Resource change
1	0.16	0.001	40.127	62481.125	1	162481.125	Neuropsychological functions	Group

0.42	0.01	0.077	3.151	186.245	1	186. 245	Depression
0.93	0.05	0.001	12.158	1048.820	1	1048. 820	Anxiety
				1557.076	198	070. 308301	Neuropsychological functions Error
				59.098	198	11701. 350	Depression
				86.268	198	17081	Anxiety
					200	2314977	Neuropsychological functions Total
					200	59659	Depression
					200	72382	Anxiety

Table 4: Results of univariate analysis of variance

In Table 4, there is a significant difference in the variable neuropsychological functions and anxiety between the two groups. But in depression variable there is not different significant. At the significant level of 0.001 this difference for psychological functions was 0.16 percent, anxiety 0.05 percent and depression 0.01 percent.

Table 5: Analysis of variance to investigate the performance of the neuropsychological

Teat Ability	Size effect	Significance level	F	Mean square	df	Total squares	variable
1	0.15	0.001	36.763	125.2628	1	2628.125	Prefrontal unresponsive
0.97	0.07	0.001	15.952	453.005	1	453.005	Prefrontal impulsive
1	0.13	0.001	30.783	2401.245	1	2401.245	Cingulate gyrus
0.99	0.11	0.001	26.763	2387.405	1	2387.405	limbic system
0.98	0.08	0.001	17.17	2332.445	1	2332.445	Basal ganglia
0.99	0.10	0.001	24.167	976.820	1	976.820	Temporal lobe

According to Table 5, it was reported a significance differences between the two groups of menopausal and perimenopausal women at significant level 0.001, respectively for the functioning of the prefrontal lobe (unresponsive) equals to 0.15 percent, prefrontal lobe function (impulsive) 0.07 % , cingulate gyrus 0.13 %, limbic system 0.11%, basal ganglia to 0.08 % and for the temporal lobe 0.10 %. This means that based on the research findings, the difference between the two groups, the prefrontal lobe functions (inattentive and impulsive), cingulate gyrus, limbic system, basal ganglia and temporal lobe has been significant.

Conclusion:

In the years after menopause, some women experience changes in certain cognitive functions, psychological, physical and sexual that these changes include decreasing sex drive, decreasing sexual response, lack of libido, anxiety, depression, boredom, reduce the span attention, distraction, lack of

continuity concerns, confronting behavior, controversy-seeking, flushing that each of these components occurs as a result of change in the mechanism and function of the brain five coherent system. In order to explain performance difference in neuropsychological functions , we can mention variable biological changes that happen in menopause .Because the human body designed that there is the internal system and two-way interaction between these mechanisms to ensure ultimate and correct performance. Marco et al (2005) studied on the estrogen hormones and brain function and they showed that structure, function and metabolism of brain is different in postmenopausal and pre-menopausal women . Estrogen affects on the posterior side of prefrontal cortex that monitors the executive functions and capabilities such as timing, judgment, impulses control, planning, organizing and the critical thinking and by reducing estrogen, performance of this part of the brain i.e. impulse control affected. So that Genazzani et al (2006) during their studies showed that estrogen influences on the central nervous system through the mechanism of genomic (adjusted synthesis, metabolism of neurotransmitters) and mechanisms of non-genomic (synaptic function and morphology) and prolonged deprivation of estrogen in the regulation of mood in post-menopausal women that it was indicated by studies of Kugaya et al (2003) on serotonin receptors in the cortex prefrontal in women undergo estrogen therapy that binding receptor (5-HT_{2A}) to estrogen had increased significantly in the prefrontal cortex and right anterior cingulate gyrus and cortex lower and middle frontal, after estrogen therapy. Therefore symptoms such as stress, depression and mood that assigned as functions of cingulate gyrus reduced , it matches. Estrogen regulates amount of free tryptophan that reaches the brain and as we know tryptophan is a precursor of serotonin. estrogen causes Tryptophan separate from its points to the plasma albumin and drop in the blood, therefore more free tryptophan will be available to the brain to change into serotonin. Estrogen also increases the serotonin switch-off. Because major cause of depression is reducing the amount of serotonin ,it seems logical that we can say estrogen deficiency after menopause can cause mood change (Mehravian, 2000).Research Walf et al (2009), Kahn et al (2001), Miller (2004), Doma et al (2005) showed that during menopause because of reduced estrogen, the risk of depression increases, which is inconsistent with the conclusions of this study that usually in this period mood downturn is obvious. while the same reasons that explain differences in pre and post menopausal women is mood ,it can also explain the lack of difference between the two groups. Because by increasing women's awareness and considering their biological needs at the present time ,it is possible that even though postmenopausal biologically is the end of fertility and it brings physical changes it is a period of transition age and by demonstrating it as a natural event for all ,it has decreased the possible damages due to ignorance. Also social change in order to consider the needs of middle-age and it reduces the crises of family and social issues that influencing factors on psychological damage like depression, have been charged for health and growth in this period life .but the attention to important biological changes such as loss of estrogen and decreased levels of serotonin and thus depression, support treatment like hormone therapy in order to compensate shortages caused by the secretion of this hormone is an effective step to increase secretion of these hormones and to reduce complications caused the loss neuropsychological performance in estrogen. In other hand, most women experience high anxiety during this period and it may be genetic factors, biochemical factors, including lactate, 5-HT and norepinephrine (Ying Li et al, 2008). Estrogen competitively inhibits the deactivative norepinephrine, therefore it exerts a stimulating effect similar to antidepressant medications. moreover estrogen reduces monoamine oxidase activity . As a result it can increase catecholamines level in the brain. Evidence suggests that estrogen increases levels of norepinephrine neurotransmitter in the neural

synapse and it affects on its releasing and reabsorption (Walf et al, 2009). Also the absence of functional receptor ER beta in the absence or presence of E2 (estradiol) in female mice leads to increase anxiety and to reduce 5-HT and dopamine in several parts of the brain and it has been shown that the receptor ER Haybta as a nuclear receptors of estrogen ,involve in functions such as anxiety and mood control (Imwalle et al, 2005). Some women are at more risk for new onset anxiety symptoms and this may exacerbate by hormonal changes and Vasomotor symptoms. these talented women may be related to a group of women in the period before menopause who have underlying mental health problems. Also It is likely that hormonal changes create a situation around menopause in which it reduces person's ability to deal with life undesirable events. psychological symptoms may cause by physical changes during menopause period. However it is unlikely that we can attribute all psychological symptoms to this factor. According to the results of this study it is suggested that this research should be done in highly specialized, through advanced imaging devices such as positron emission. Also systematic studies about the health of middle-age in the country and also psychological support and continuous information and education must be conducted to reduce menopause symptoms of menopause by centers or private clinics or health centers.

References:

- Amen, DG (2005).Making a good brain great. New York . Harmony Book
- Asgari F, Basiri Moghadam K, Basiri Moghadam M,Torabi SH,Gholmfarkani S,Moharari M,Mirakhorloo SH (2011).Age of natrural menopause and the incidence of its early complication in menopause transition stages in women from Gonabad city.Ofoghe Danesh, Journal of Gonabad University of Medical Sciences, 18(1).
- Barbara B,Sherwin J, Henry F (2008). Brain aging modulates the neuroprotective effects of estrogen on selective aspects of cognition in women: A critical review. *Frontiers in Neuroendocrinology*, 29:88–113. Available online at www.sciencedirect.com
- Beck AT And Steer RA (1990).The Beck anxiety inventory manual. San AntonioTx. Psychological Corporation.
- Beck AT, Steer RA,Brown G (1996). Beck depression inventory manual. 2nd edn. San Antino Tx. Psychological Corporation
- Douma SL, Husband C, Donnell RN, Barwin BN, Frcog Facog Fscog,Woodend AK (2005). Estrogen-related mood disorders reproductive life cycle factors. *Advances in Nursing Science*,28(4):364–375.
- Dobson K, Mohammad Khani P(2008).Psychometric characteristics of beck depression inventory 2. In a large sample of patients with major depressive disorder. *Rehabilitation in mental disorders* ,8(39).
- Eslapik R and Lorna G (2008). Everything about menopause. Translation F Boghairi.Tehran / Golbarg publication.
- Fathi Ashtiani A(2013). Psychological tests (personality assessment and mental health). Tehran: Beast.
- Freeman EW (2004).Hormones and menopausal status as predictors of depression in women in transitionto menopause. *Arch Gen Psychiatry*,61(1):62-70.
- Greene M, Maher K, Holmes CS (2010).Neuropsychological functioning of endocrin disorders:Gonadotropic hormones and corticosteroids. *Handbookof Medical Neuropsychology*,249-265.
- Ghassemzadeh H, Mojtabei R, Karamghadiri N, Ebrahimkhani N (2005).Psychometric properties of a persion language version of the beck depression inventory. 2nd ed,BDI-II. *Journal of Depression and Anxiety*, 21(4):185-92.

- Genazzani AR, Pluchino N, Luisi S, Luisi M (2006). Estrogen, cognition and female ageing. *Hum Reprod Update*, 13(2):175-187.
- Horst GJ T (2010). Estrogen in the limbic system. *Vitamins & Hormones*, 82: 319–338.
- Genazzani AR, Pluchino N, Luisi S, Luisi M (2006). Estrogen, cognition and female ageing. *Hum Reprod Update*, 13(2):175-187.
- Hatly Isfahani B (2014). The Relationship between circadian rhythm and brain systems in patients with bipolar disorder, MSc Thesis, Faculty of Humanities, University of Isfahan.
- Imwalle D, Bradley G, Rissman J, Emilie F (2005). Lack of functional estrogen receptor β influences anxiety behavior and serotonin content in female mice. *Physiology & Behavior*, 84(1):157–163.
- Kugaya A, Epperson CN, Zoghbi S, Van Dyck CH, Hou, Fujita M, Staley JK, et al (2003). Increase in prefrontal cortex serotonin_{2A} receptors following estrogen treatment in postmenopausal women. *AM J psychiatry*, 160 (8):1522-1524.
- Kahn AD, Moline ML, Ross RW, Altshuler MAL, Cohen LS (2001). Depression during the transition to menopause: a guide for patients and families. Available from www.americanmenopause.org/mission.htm
- Kaplan H and Sadock B (2009). Kaplan and Sadock's synopsis of psychiatry: behavioral sciences/clinical psychiatry. Translation N Poorafkary. Tehran / shareab publication.
- Kaviani H and Mousavi A (2008). Psychometric properties of the Beck anxiety inventory in age and sex classes in Iran. *Tehran University of Medical Sciences*, 66(2).
- Lipovac M, Chedraui P, Gruenhut CH, Gocan A, Stammer M, Imhof M (2010). Improvement of post menopausal depression and anxiety symptoms after treatment with isoflavones derived from red clover extract. *Maturitas*, 65(3): 258-261.
- Markou A, Duka TM, Prelevic G (2005). Estrogens and brain function. *Hormones*, 4(1):9-17.
- McDonald S, Togher L, Code C (1999). Communication disorders following traumatic brain injury. Psychology Press Ltd Publisher S, 112-118.
- Miller A (2004). Demographic characteristics, menopausal status and depression in midlife women. *Woman Health Issues*, 14(6):227–234.
- Mehrabian F (2000). A new approach to menopause. Medical Sciences Isfahan Publication.
- Nkouei, N (2006). Consulting in menopause. Isfahan University of Medical Sciences.
- Pestei K, Alameh M (2007). Clinical guidelines and programs to provide health care services to women 45-60 years of menopause. Qazvin, Pooneh publications.
- Pournaghash Tehrani, S (2014). The task of neuropsychology. Tehran, Tehran University Press.
- Rajaeefard A, Mohammad Begay A, Mohammad Salehi N (2010). Estimating the average age of menopause in women, kumesh, 1.
- Ryan J, Stanczyk FZ, Dennerstein L, Mackd WJ, Clarke MS, Szoek C, Kildeaf D, Hendersong VW (2011). Hormone levels and cognitive function in postmenopausal midlife women. *Neurobiology of Aging* 33(3): 617-622.
- Speroff L and Fritz MA (2012). Clinical gynecological endocrinology and infertility. Translation B Ghazi Gahani and R Ghotbi. Tehran / golban publication.
- Walf AA, Paris JJ, Frye CA (2009). Chronic estradiol replacement to aged female rats reduces anxiety-like and depression-like behavior and enhances cognitive performance. *Psychoneuroendocrinology*, 34(6):909-916.
- Ying Li, Yu Qi, MAL Sun Z, Yang X (2008). Prevalence of depression and anxiety symptoms and their influence factors during menopausal transition and postmenopause in Beijing city. *Maturitas*, 61:238–242.