RESEARCH ARTICLE

Quality of Life Is Related to Social Support in Elderly Osteoporosis Patients in a Chinese Population

Lina Ma, Yun Li*, Jieyu Wang, Hong Zhu, Wei Yang, Ruojin Cao, Yuying Qian, Ming Feng

Department of Geriatrics, Xuan Wu Hospital, Capital Medical University, Beijing, 100053, China

* liy_xw@sina.com

Abstract

Objective

To explore the association between quality of life and social support in elderly osteoporosis patients in a Chinese population.

Methods

A total of 214 elderly patients who underwent bone mineral density screening were divided into two groups: elderly patients with primary osteoporosis (case group, n = 112) and normal elderly patients (control group, n = 102). Quality of life and social support were compared between the two groups.

Results

Quality of life and social support were significantly different between the case and control groups. The physical function, role-physical, bodily pain, general health, vitality, social-functioning, role-emotional and mental health scores in case group were significantly lower than those in the control group (P < 0.01). The objective support, subjective support, utilization of support, and total scores in case group were significantly lower than those in the control group (P < 0.01). Quality of life and social support were positively correlated in the case group (r = 0.672, P < 0.01).

Conclusion

Quality of life and social support in elderly patients with osteoporosis in China were poorer than in elderly patients without osteoporosis and were positively correlated. Our findings indicate that increased efforts to improve the social support and quality of life in elderly osteoporosis patients are urgently needed in China. Further longitudinal studies should be conducted to provide more clinical evidence to determine causative factors for the observed association between risk factors and outcomes.

Introduction

Estimated future demographic changes in China will result in significant social and economic challenges in the daily lives and care of elderly people, including maintenance of quality of life (QOL). Osteoporosis (OP), which is characterized by low bone mass, bone microstructure damage, bone fragility, and risk of fractures, is one of the most common diseases in the elderly, with annual increases in the prevalence of osteoporotic fractures with the trend of improved population aging[1,2]. The incidence of OP in the elderly population is as high as 56%, and women represent 60–70% of elderly people with OP in China [3–5]. Osteoporotic fracture is associated with high rates of disability and mortality in elderly patients[6,7]. Patients with OP have high disability and mortality rate, and the associated psychological burden and mental pain can affect QOL [8,9]. Despite increasing evidence showing worse QOL in OP patients, little is known regarding interventions improving QOL, particularly in elderly patients. Recently, a study in China has found over two years of zoledronic acid treatment in women with postmenopausal OP can improve bone mineral density, and can help improve QOL[10].

Social support is defined as the amount of affection, companionship, and care from family members, friends, and other individuals[11,12]. Brennan SL investigated the relationship between socioeconomic status and reported perceptions of QOL in a cross-sectional population-based analysis of a representative sample of Australian men, and found that men from lower and upper socioeconomic status groups had lower QOL compared to their counterparts in the mid socioeconomic status group[13]. Low social support and low socioeconomic status significantly increased the odds of depressive symptoms[14]. Better social support is reported to be associated with improved QOL, and individuals with OP who have lower pain and more exercise are considered having better QOL[15]. Social support predicts QOL above and beyond disease activity, demographic factors and social integration in patients with rheumatoid arthritis [16], and measurement of QOL plays an important role in the clinical evaluation of OP and comparison of different therapeutic measures in clinical trials[17,18]. Social support was also found to partially mediate loneliness and depression in elderly people[19], and it has beneficial effects on subjective well-being of older adults among domains of enjoyment, morale, depression and loneliness [20,21], which are closely relative to QOL. Pediatric research has found that family social support could predict healthy lifestyle behaviors for the prevention of OP in a population with 354 girls, aged 8–11 years [22]. A study containing 112 female patients with osteoporosis and 112 normal controls in community in China showed the incidence of depression in OP patients was higher, the QOL was worse, and the score of objective support was lower[23]. Nevertheless, to our knowledge, there is no research on social support and QOL in elderly patients with OP, and our study is the first to concentrate on this. The hypothesis of this research was that social support and QOL in elderly patients with OP in China were worse than normal controls, and were positively correlated.

Materials and Methods

Participants

Elderly patients (average age, 69.27 ± 9.21 years) with primary OP (n = 112; 81 men, 31 women) and normal elderly patients (average age, 68.26 ± 8.62 years) (n = 102; 74 men, 28 women) were recruited from the Department of Geriatrics, Xuan Wu Hospital, Capital Medical University between August 2008 and September 2012. Exclusion criteria included secondary OP; diabetes; cancer; recent acute infection; severe cardiac, liver, or kidney dysfunction; cerebrovascular disease; severe Parkinson's disease; depression or anxiety; dementia; and trauma or operation in the previous six months.

All of the participants underwent a standardized clinical assessment, which included a medical history, physical examination, completion of the Short Form-36 (SF-36) questionnaire, completion of the Social Support Rating Scale (SSRS), and BMD measurement. Informed consent was obtained from all participants prior to participation. This clinical investigation was approved by the Ethics Committee of Xuanwu Hospital, Capital Medical University, China. Participants provide their written informed consent to participate in this study. The participant consent was recorded in a file and the ethics committee approved this consent procedure.

Data collection

In this prospective study, a comprehensive questionnaire was completed by trained investigators. The following basic demographic and clinical data were retrospectively obtained from the medical charts: sex, age, duration of admission, diagnosis, and medication history.

Venous blood was collected from the patients who were admitted to the hospital early in the morning following an overnight fast. Serum total cholesterol, triglycerides, C-reactive protein, high-density lipoprotein cholesterol, low-density lipoprotein cholesterol, creatinine, and fasting plasma glucose were determined.

The SF-36 scale was used to assess QOL. The scale consists of 36 items within 8 scales that assess the following general health concepts: physical function (PF), role-physical (RP), bodily pain (BP), general health (GH), vitality (VT), social-functioning (SF), role-emotional (RE), and mental health (MH). Each of the 8 scales has a lowest possible score of 36 and a highest possible score of 150. Higher scores indicate better QOL[24]. The total score and each factor score were calculated.

The SSRS was used to evaluate social support. The SSRS contains a total of 10 items within three dimensions: objective support (3 items), subjective support (4 items), and the utilization of support (3 items). Objective social support refers to actual or visible social support, including material direct assistance and social relationship network. Subjective social support refers to the experience or emotional social support, namely the individual feels understood and respected by society. Utilization of support refers to the conscious or unconscious use their social support system to cope with challenges or stress. Higher SRSS scores indicate greater social support[25].

Bone density

All subjects underwent a BMD measurement by a trained technician in a separate room at the hospital using dual energy X-ray absorptiometry (DXA) (GE, Madison, WI, USA) for the lumbar (L1-L4) and femoral neck regions as well as the whole body. DXA is considered the gold standard method for the diagnosis of OP because it is rapid, safe, and accurate[26]. Absolute values of BMD are expressed as T-scores (standard deviation from the normal reference population) and Z-scores (standard deviation from the sex- and age-matched population). OP was diagnosed according to the WHO criteria[27]: osteopenia (bone mass loss) is 1–2.4 standard deviations below the mean BMD of healthy adults of the same sex and race; OP is ≥2.5 standard deviations below the mean BMD of healthy adults of the same sex and race[28]. Spine and hip radiography were conducted to identify a vertebral or hip compression fracture. Quality control for the assessment was carried out in strict accordance with the consensus of the International Society for Clinical Densitometry.

Statistical analysis

Data are expressed as mean ± SEM. Unpaired t-tests were conducted for data that were normally distributed, and rank sum tests were conducted for data that were not distributed

Table 1. Comparison of common factors between the two groups.

Groups	Number	Age (Years old)	Sex (Male,%)	Marital status (Married,%)	TC (mmol/L)	TG (mmol/L)	HDL-C (mmol/L)	LDL-C (mmol/L)	Cr (mmol/L)	FPG (mmol/L)	BMI (kg/m²)
Case group	112	69.27 ±9.21	72.32	98.04	4.7±0.4	1.7±0.2	2.2±0.4	2.5±0.4	75.2 ±16.0	5.6±0.4	22.5 ±4.1
Control group	102	68.26 ±8.62	72.55	98.21	4.6±0.3	1.8±0.2	2.1±0.3	2.4±0.2	74.0 ±17.2	5.8±0.7	23.0 ±3.9

Compared to the control group, all P > 0.05. TC: total cholesterol; TG: triglyceride; HDL-C: high density lipoprotein cholesterol; LDL-C: low density lipoprotein cholesterol; CRP: C-reactive protein; Cr: creatinine; FPG: fasting plasma glucose; BMI: body mass index.

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normally. Pearson correlation analysis was conducted to evaluate the correlation between QOL and social support in both the case and control groups. Moderated regression analysis using dummy coding was conducted. Differences were considered statistically significant and very significant at P < 0.05 and P < 0.01, respectively. SPSS version 12.0 for Windows (SPSS Inc., Chicago, IL, USA) was used for all statistical analyses.

Results

Comparison of common factors between the two groups

There were no significant differences between the two groups in age, sex, marital status, the levels of serum total cholesterol, triglycerides, C-reactive protein, high-density lipoprotein cholesterol, low-density lipoprotein cholesterol, creatinine, fasting plasma glucose or body mass index (all P>0.05) (Table 1).

Comparison of quality of life scores between the two groups

The SF-36 showed the following scores in the case and control groups, respectively: PF, 69.2 ± 20.2 vs. 88.7 ± 17.1; RP, 57.2 ± 22.7 vs. 79.1 ± 22.6; BP, 58.4 ± 18.9 vs. 80.1 ± 20.4; GH, 46.9 ± 18.9 vs. 59.3 ± 18.0; VT, 61.3 ± 20.1 vs. 74.3 ± 20.2; SF, 66.0 ± 25.3 vs. 81.1 ± 30.0; RE, 65.1 ± 31.1 vs. 82.0 ± 33.5; MH, 64.0 ± 20.2 vs. 75.4 ± 22.0; and total, 61.1 ± 20.0 vs. 77.5 ± 23.4. The PF, RP, BP, GH, VT, SF, RE, MH and total scores in the OP group were significantly lower than those in the control group (P < 0.01) (Fig 1).

Comparison of Social Support Rating Scale scores between the two groups

The Social Support Rating Scale resulted in the following scores for social support in the case and control groups, respectively: objective support, 6.88 ± 2.07 vs. 8.71 ± 2.66; subjective support, 19.02 ± 3.20 vs. 22.41 ± 4.10; utilization of support, 6.03 ± 1.25 vs. 6.91 ± 1.67; and total, 31.93 ± 7.83 vs. 38.03 ± 8.91. The objective support, subjective support, utilization of support, and total scores in the OP group were significantly lower than those in the control group (P < 0.01) (Fig 2, S1 Table.).

Correlation between quality of life and social support in elderly osteoporosis patients

Social support was positively related to QOL in case group (r = 0.672, P < 0.01), while there was no correlation between social support and QOL in control group (r = 0.116, P = 0.244).
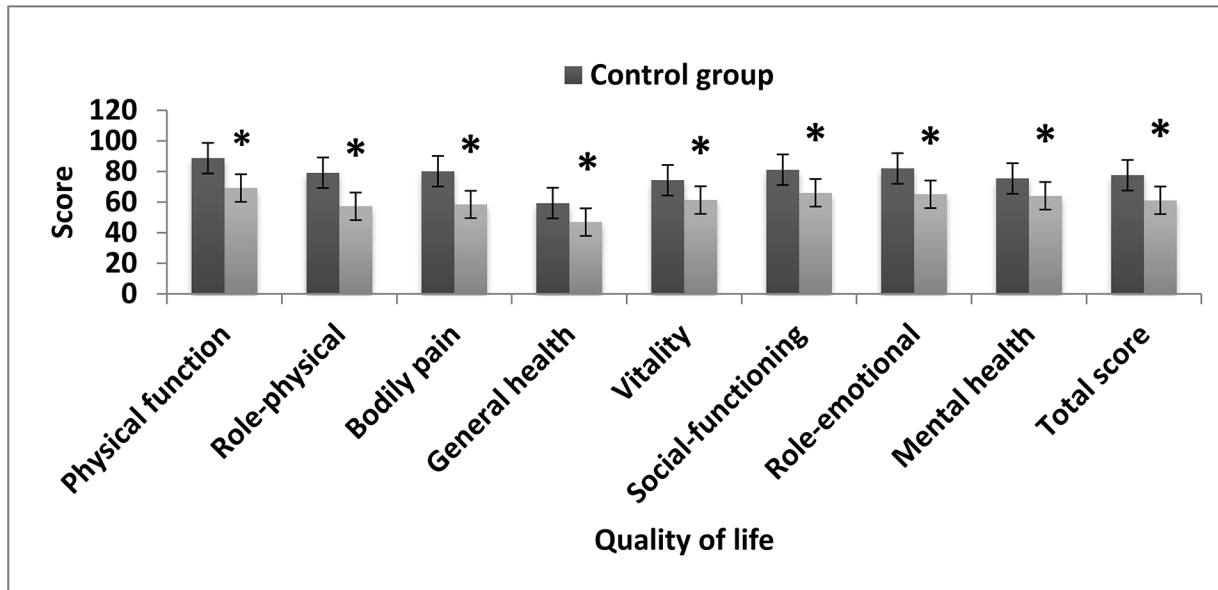
Fig 1. Comparison of SF-36 scores between the case group of elderly patients with osteoporosis (n = 112) and control group (n = 102). Values are reported as mean ± SEM. *Significantly different from the control group (P < 0.01).

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Moderated regression analysis using dummy coding showed that there was no difference between the case and control group correlation (B = 0.245, t = 0.794, P = 0.428).

Discussion

The hypothesis of this research was that social support and QOL in elderly patients with OP in China were worse than normal controls, and social support and QOL in case group were
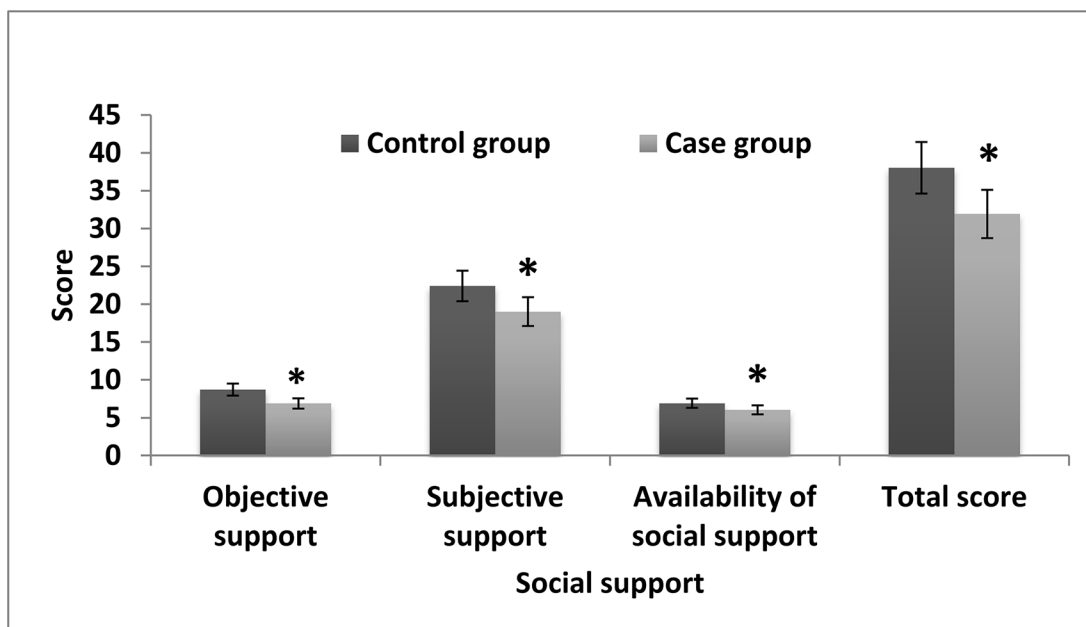

Fig 2. Comparison of Social Support Rating Scale scores between the case group of elderly patients with osteoporosis (n = 112) and control group (n = 102). Values are reported as mean ± SEM. *Significantly different from the control group (P < 0.01)

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positively correlated. Our results showed a significant statistical difference in QOL and social support scores between the two groups, and this significant difference was observed in all dimensions of QOL and social support. Our study showed that QOL was significantly poorer in patients with OP than in the control group. In addition, patients with OP likely required higher levels of social support than they were reporting in the current study, and social support was positively related with QOL in the elderly patients with OP. This indicates that maybe we can provide adequate social support to improve the quality of life in elderly osteoporosis patients. To our knowledge, our study is the first to concentrate on social support and QOL in elderly patients with OP. Our results conform to the results of the study conducted by Pitsilka DA in patients with rheumatoid arthritis[16], but another study in China has found that objective support in patients with OP was lower than that of a control group, while there were no difference in other dimensions of social support between case group and control group[19], the discrepancy may be lie in the difference of study population, our study population contains both male and female elderly OP patients aged >60 years, while Wang's study population contains female patients with postmenopausal OP aged >45 years.

With advances in the study of QOL, greater attention has been given to the QOL of patients with OP instead of just focusing on decreasing the rate of osteoporotic fractures. QOL can provide a comprehensive basis for reasonable allocation of health resources for treatment or intervention and decisions regarding screening in patients with chronic illnesses [29]. Decreased QOL in elderly patients with OP not only related to decreased labor capacity and psychological factors but also related to cardiovascular diseases[19,30,31]. Osteoporotic fracture is a major cause of morbidity and is negatively associated with QOL [32–34]. Patients with OP also have poorer social support, which refers to the help and support of both spiritual and material needs from family, relatives, friends, colleagues, and other individuals and organizations, as well as the individual's degree of social support utilization[12]. Li H has found that friend support rather than family support could enhance the positive effect of social support [35]. Social networks are important for the perception of support[36]. Social support is the interdependent relationship between individuals or between the individual and group; this relationship can show the ability to cope with short-term challenges, stress, and social relationship deprivation[37]. Intergeneration social support, self-esteem, and loneliness have been significantly correlated with subjective wellbeing[38]. Social support could moderate the association between stress and depression and was found to have effects on depressive and anxiety symptoms[39,40]. High social support also has a protective effect among individuals with low impulsivity[41].

Our study demonstrates social support and QOL were worse in elderly patients with OP in China and they were positively correlated. There are various reasons for this. Firstly, the living situation of the elderly in China is different from that of western countries [42]. Most of the elderly in China are retired at home; some have questioned if the loss of social sense, rising prices, and change in roles have caused a decline in the standard of living[43]. Secondly, familial respect and care, spiritual support, and material support are particularly important for the elderly in China, which can consciously encourage the elderly to increase availability of and initiate social support[44]. The elderly might increase their utilization of social support if they are encouraged to spend more time with family and friends, actively participate in collective activities, and actively talk to family members or friends when encountering troubles or are confused with something[45]. Moreover, increased socialization is advantageous for emotional health. Previous studies have found patients with low levels of stress receive more total and subjective social support than patients with high levels of stress, which reflects the buffer that social support has on mental stress and the protective effect on mental health[46,47]. Therefore, the social support system may contribute to disease rehabilitation and improvement of QOL [48].

Social support has been shown to be equivalent to many classic risk factors for prognosis of some diseases; therefore, it can be used both as a tool for risk stratification and potential target for interventions to improve outcomes[49,50]. Previous study has found health education interventions can improve the physiological, psychological, and social function aspects of QOL [51]. We have found QOL and social support in elderly patients with OP were significantly lower than those in normal elderly individuals, and social support was positively related to QOL in the elderly OP group, while there was no correlation between social support and QOL in control group, which indicates that increased efforts to improve the social support and quality of life in elderly OP patients are urgently needed in China. Therefore, we should strengthen the social support network for elderly OP patients, by conducting health education, organizing patient clubs, and improving community awareness, with the aim of improving QOL and realizing a healthy aging society[52,53]. Further longitudinal studies also should be conducted to provide more clinical evidence for the relationship of social support and QOL in elderly OP patients.

Conclusion

The results of the present study show that QOL and social support in elderly patients with OP were poorer and positively correlated in elderly OP patients in China. These findings indicate that increased efforts to improve the social support and quality of life in elderly OP patients are urgently needed in China.

Limitations

Participation in this study was restricted to patients living in Beijing. Hence, our results may not be representative of the overall Chinese population. Moreover, the cross-sectional study design cannot determine causative factors for the observed association between risk factors and outcomes; therefore, follow-up studies should be conducted in the future.

Supporting Information

S1 Table. The Social Support Rating Scale scores between the case group of elderly patients with osteoporosis (n = 112) and control group (n = 102) (PDF).
(PDF)

Acknowledgments

Author Contributions

Conceived and designed the experiments: LM YL JW. Performed the experiments: WY HZ. Analyzed the data: RC. Contributed reagents/materials/analysis tools: YQ MF. Wrote the paper: LM.

References

1. Abrahamsen B, Osmond C, Cooper C. Life expectancy in patients treated for osteoporosis: Observational cohort study using national danish prescription data. J Bone Miner Res. 2015; doi: 10.1002/jbmr.2478

2. Ford MA, Bass M, Zhao Y, Bai JB, Zhao Y. Osteoporosis knowledge, self-efficacy, and beliefs among college students in the USA and China. J Osteoporos. 2011; 2011: 729219. doi: 10.4061/2011/729219 PMID: 21603144

3. Lau EM, Chung HL, Ha PC, Tang H, Lam D. Bone mineral density, anthropometric indices, and the prevalence of osteoporosis in Northern (Beijing) Chinese and Southern (Hong Kong) Chinese women-the largest comparative study to date. J Clin Densitom. 2015; doi: 10.1016/j.jocd.2014.11.001

4. Lee CN, Lam SC, Tsang AY, Ng BT, Leung JC, Chong AC. Preliminary investigation on prevalence of osteoporosis and osteopenia: Should we tune our focus on healthy adults? Jpn J Nurs Sci. 2014; doi: 10.1111/jjns.12063

5. Wu Q, Tao G, Liu X, Mou S. Dual energy X-ray bone density measurement and the prevalence of osteoporosis among 1333 people in urban area of Beijing. Chin J Osteoporosis.1995; 1; 76–80

6. Hongo M, Miyakoshi N, Shimada Y, Sinaki M. Association of spinal curve deformity and back extensor strength in elderly women with osteoporosis in Japan and the United States. Osteoporos Int. 2012; 23:1029–1034. doi: 10.1007/s00198-011-1624-z PMID: 21455761

7. Snellman G, Byberg L, Lemming EW, Melhus H, Gedeborg R, Mallmin H, et al. Long-term dietary vitamin D intake and risk of fracture and osteoporosis: a longitudinal cohort study of Swedish middle-aged and elderly women. J Clin Endocrinol Metab. 2014; 99:781–790. doi: 10.1210/jc.2013-1738 PMID: 24423281

8. Ebesunun MO, Umahoin KO, Alonge TO, Adebusoye LA. Plasma homocysteine, B vitamins and bone mineral density in osteoporosis: a possible risk for bone fracture. Afr J Med Med Sci. 2014; 43:41–47. PMID: 25335377

9. Wilson S, Sharp C A, Davie MW. Health-related quality of life in patients with osteoporosis in the absence of vertebral fracture: a systematic review. Osteoporos Int. 2012; 23:2749–2768. doi: 10.1007/s00198-012-2050-6 PMID: 22814944

10. Huang S, Lin H, Zhu X, Chen X, Fan L, Liu C. Zoledronic acid increases bone mineral density and improves health-related quality of life over two years of treatment in Chinese women with postmenopausal osteoporosis. Endokrynol Pol. 2014; 65(2):96–104 doi: 10.5603/EP.2014.0014 PMID: 24802732

11. Hodge AM, English DR, Giles GG, Flicker L. Social connectedness and predictors of successful ageing. Maturitas. 2013; 75;361–366. doi: 10.1016/j.maturitas.2013.05.002 PMID: 23746413

12. Sok SR, Yun EK. A comparison of physical health status, self-esteem, family support and health-promoting behaviours between aged living alone and living with family in Korea. J Clin Nurs. 2011; 20;1606–1612. doi: 10.1111/j.1365-2702.2010.03551.x PMID: 21366741

13. Brennan SL, Williams LJ, Berk M, Pasco JA. Socioeconomic status and quality of life in population-based Australian men: data from the Geelong Osteoporosis Study. Aust N Z J Public Health. 2013; 37 (3):226–32 doi: 10.1111/1753-6405.12063 PMID: 23731104

14. Ng CW, Tan WS, Gunapal PP, Wong LY, Heng BH. Association of Socioeconomic Status (SES) and Social Support with Depressive Symptoms among the Elderly in Singapore. Ann Acad Med Singapore. 2014; 43(12):576–87. PMID: 25588916

15. Huang CY, Liao LC, Tong KM, Lai HL, Chen WK, Chen CI, et al. Mediating effects on health-related quality of life in adults with osteoporosis: a structural equation modeling. Osteoporos Int. 2015; 26 (3):875–83. doi: 10.1007/s00198-014-2963-3 PMID: 25477231

16. Pitsilka DA, Kafetsios K, Niakas D. Social support and quality of life in patients with rheumatoid arthritis in Greece. Clin Exp Rheumatol. 2015; 33:27–33. PMID: 25437270

17. Cesarec G, Martinec S, Basić I, Jakopić D. Effect of exercises on quality of life in women with osteoporosis and osteopenia. Coll Antropol. 2014; 38:247–254. PMID: 24851625

18. Zhou Z, Wang C, Yang H, Wang X, Zheng C, Wang J. Health-related quality of life and preferred health-seeking institutions among rural elderly individuals with and without chronic conditions: a population-based study in Guangdong Province, China. Biomed Res Int. 2014; 2014:192376. doi: 10.1155/2014/192376 PMID: 24949425

19. Liu L, Gou Z, Zuo J. Social support mediates loneliness and depression in elderly people. J Health Psychol. 2014 Jun 11. pii: 1359105314536941.

20. DuPertuis LL, Aldwin CM, Bosse R. Does the source of support matter for different health outcomes? Findings from the normative aging study. J Aging Health. 2001; 13;494–510. PMID: 11917886

21. Yeung G, Fung H. Social support and life satisfaction among Hong Kong Chinese older adults: Family first? Eur J Ageing. 2007; 4;219–227.

22. Ievers-Landis CE, Burant C, Drotar D, Morgan L, Trapl ES, Kwoh CK. Social support, knowledge, and self-efficacy as correlates of osteoporosis preventive behaviors among preadolescent females. J Pediatr Psychol. 2003; 28;335–345. PMID: 12808010

23. Wang CX, Yang FX, Zhu XH, Yu GJ. Investigation on mental state, quality of life and social support of female patients with osteoporosis. Chinese J Rehab. 2008; 23:250–252.

24. Ware JE Jr, Sherbourne CD. The MOS 36-item short-form health survey (SF-36). I. Conceptual framework and item selection. Med Care. 1992; 30:473–483. PMID: 1593914

25. Xu J, Wei Y. Social support as a moderator of the relationship between anxiety and depression: an empirical study with adult survivors of Wenchuan earthquake. PLoS One. 2013; 8:e79045. doi: 10.1371/journal.pone.0079045 PMID: 24250754

26. Cameron JR, Sorenson J. Measurement of bone mineral in vivo: an improved method. Science. 1963; 142:230–232. PMID: 14057368

27. WHO. Guidelines for preclinical evaluation and clinical trials in osteoporosis. Geneva: WHO; 1998.

28. Assessment of fracture risk and its application to screening for postmenopausal osteoporosis. Report of a WHO Study Group. World Health Organ Tech Rep Ser. 1994; 843:1–129. PMID: 7941614

29. Ma YH, He SC, Teng GJ. Quality of life assessment in patients with osteoporosis. J Intervent Radiol. 2007; 16:497–501.

30. Tadic I, Vujasinovic Stupar N, Tasic L, Stevanovic D, Dimic A, Stamenkovic B, et al. Validation of the osteoporosis quality of life questionnaire QUALEFFO-41 for the Serbian population. Health Qual Life Outcomes. 2012; 10:74. doi: 10.1186/1477-7525-10-74 PMID: 22709379

31. Tremollieres F, Ribot C. Bone mineral density and prediction of non-osteoporotic disease. Maturitas, 2010; 65:348–351. doi: 10.1016/j.maturitas.2009.12.023 PMID: 20079983

32. Greendale GA, Barrett-Connor E, Ingles S, Haile R. Late physical and functional effects of osteoporotic fracture in women: the Rancho Bernardo Study. J Am Geriatr Soc. 1995; 43:955–961. PMID: 7657934

33. Adachi JD, Ioannidis G, Pickard L, Berger C, Prior JC, Joseph L, et al. The association between osteoporotic fractures and health-related quality of life as measured by the Health Utilities Index in the Canadian Multicentre Osteoporosis Study (CaMos). Osteoporos Int. 2003; 14:895–904. PMID: 12920507

34. Vujasinović-Stupar N, Radunović G, Smailji M. Quality of life assessment in osteoporotic patients with and without vertebral fractures. Med Pregl. 2005; 58:453–458. PMID: 16526246

35. Li H, Ji Y, Chen T. The roles of different sources of social support on emotional well-being among Chinese elderly. PLoS One. 2014; 9:e90051. doi: 10.1371/journal.pone.0090051 PMID: 24594546

36. Yamashita CH, Amendola F, Gaspar JC, Alvarenga MR, Oliveira MA. Association between social support and the profiles of family caregivers of patients with disability and dependence. Rev Esc Enferm USP. 2013; 47;1359–1366. doi: 10.1590/S0080-623420130000600016 PMID: 24626362

37. Santini ZI, Koyanagi A, Tyrovolas S, Mason C, Haro JM. The association between social relationships and depression: A systematic review. J Affect Disord. 2014; 175;53–65. doi: 10.1016/j.jad.2014.12.049 PMID: 25594512

38. Tian Q. Intergeneration social support affects the subjective well-being of the elderly: mediator roles of self-esteem and loneliness. J Health Psychol. 2014 Sep 9. pii: 1359105314547245.

39. Wang X, Cai L, Qian J, Peng J. Social support moderates stress effects on depression. Int J Ment Health Syst. 2014; 8;41 doi: 10.1186/1752-4458-8-41 PMID: 25422673

40. Lau Y, Wong DF, Wang Y, Kwong DH, Wang Y. The roles of social support in helping chinese women with antenatal depressive and anxiety symptoms cope with perceived stress. Arch Psychiatr Nurs. 2014; 28:305–313. doi: 10.1016/j.apnu.2014.05.009 PMID: 25439971

41. Zhang J, Lin L. The moderating effect of social support on the relationship between impulsivity and suicide in rural China. Community Ment Health J. 2014 Dec 25. [Epub ahead of print]

42. Zhou Y, Zhou L, Fu C, Wang Y, Liu Q, Wu H, et al. Socio-economic factors related with the subjective well-being of the rural elderly people living independently in China. Int J Equity Health. 2015; 14;5. doi: 10.1186/s12939-015-0136-4 PMID: 25595196

43. Sun W, Aodeng S, Tanimoto Y, Watanabe M, Han J, Wang B,et al. Quality of life (QOL) of the community-dwelling elderly and associated factors: A population-based study in urban areas of China. Arch Gerontol Geriatr. 2015; 60;311–316. doi: 10.1016/j.archger.2014.12.002 PMID: 25547994

44. Cong Z, Silverstein M. Parents' depressive symptoms and support from sons and daughters in Rural China. Int J Soc Welf. 2011; 20:s4–s17. PMID: 21984870

45. Wu Z, Penning MJ, Zeng W, Li S, Chappell NL. Relocation and social support among older adults in rural China. J Gerontol B Psychol Sci Soc Sci. 2015 Jan 23. pii: gbu187.

46. Guo WB, Yao SQ, Lu YH, Zhu XZ, Wu DX. Life events and social support in patients with major depression. Chinese Mental Health Journal. 2003; 17;693–695.

47. Sutton BS, Ottomanelli L, Njoh E, Barnett SD, Goetz LL. The impact of social support at home on health-related quality of life among veterans with spinal cord injury participating in a supported employment program. Qual Life Res. 2015 Jan 11. [Epub ahead of print]

48. Besser SJ, Anderson JE, Weinman J. How do osteoporosis patients perceive their illness and treatment? Implications for clinical practice. Arch Osteoporos. 2012; 7;115–124. doi: 10.1007/s11657-012-0089-9 PMID: 23225289

49. Mookadam F, Arthur HM. Social support and its relationship to morbidity and mortality after acute myocardial infarction: systematic overview. Arch Intern Med. 2004; 164;1514–1518. PMID: 15277281

50. Bucholz EM, Strait KM, Dreyer RP, Geda M, Spatz ES, Bueno H, et al. Effect of low perceived social support on health outcomes in young patients with acute myocardial infarction: results from the VIRGO (Variation in Recovery: Role of Gender on Outcomes of Young AMI Patients) study. J Am Heart Assoc. 2014; 3;e001252. doi: 10.1161/JAHA.114.001252 PMID: 25271209

51. Wang GB, Guan LZ, Wang HP, et al. Evaluation of life quality intervention of elderly population highly risky of osteoporosis in community. Chinese General Practice. 2008; 11;1229–1231.

52. Schröder G, Knauerhase A, Kundt G, Schober HC. Effects of physical therapy on quality of life in osteoporosis patients- a randomized clinical trial. Health Qual Life Outcomes. 2012; 10;101. doi: 10.1186/1477-7525-10-101 PMID: 22920839

53. Kessenich CR, Guyatt GH, Patton CL, Griffith LE, Hamlin A, Rosen CJ. Support group intervention for women with osteoporosis. Rehabil Nurs. 2012; 25;88–92.