

Original Research Article

Quality of life of healthy subjects and patients with arthritis and diabetes mellitus in Bayelsa State, Niger Delta region

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Abstract

Purpose: There is paucity of information about quality of life (QOL) studies among patients with arthritis and diabetes mellitus in developing countries. The objective of this study was to evaluate quality of life of patients with arthritis (AR) and diabetes mellitus (DM).

Methods: A total of 507 subjects comprising 364 healthy adult volunteers and 143 hospital patients with arthritis and diabetes mellitus were enrolled into the study. Data were collected using Ferrans and Powers QOL index (QLI). The generic version and disease specific versions were administered to healthy subjects and hospital patients respectively and the data analyzed.

Results: The highest mean overall QOL scores of the healthy subjects (364; 71.79%) which ranged from 24.43(SD=4.08) to 26.62 (SD=2.15) (95% CI 24.94-27.27) is the second most desirable category of QOL rating relative to the reference standard score of zero to 30 for the worst and best case scenarios respectively. This was distantly followed by patients with diabetes mellitus alone (slightly satisfied) with mean OQOL score of 18.92 (SD=2.59; 95% CI 16.03-19.24). Subjects with AR had lower OQOL than diabetic subjects with mean OQOL scores of 15.98 (SD=2.75; 95% CI 13.15-16.77). The least mean OQOL score (moderately dissatisfied) was recorded for patients with AR co-existing with other chronic illnesses with a mean OQOL scores of 8.92 (SD=3.97; 95%CI 7.36 - 13.4). There was statistically significant difference between the OQOL of healthy subjects and patients with arthritis and diabetes mellitus ($p<0.0001$). A strong association also exists between OQOL and age, marital status, employment and gender ($p<0.05$).

Conclusions: Arthritis and diabetes mellitus severely impaired patient QOL. Arthritis has more pronounced effects on QOL either alone or as co-morbid chronic illness. Concerted efforts at stemming the prevalence of these conditions, supportive roles for the elderly and married women as well as cost effective management of these conditions among others must be put in place.

Keywords: Arthritis, diabetes, Quality of life, Niger Delta, Nigeria

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INTRODUCTION

Quality of life consideration is one of the most important patient centered approach which aims at interfacing patient perspective with those of health care providers [1-3]. For patients, it ought to be improved continuously by health care

interventions which are qualitative, evidence-based and conform to acceptable standard of practice [4-6]. QOL has been variously defined [7,8,9,10]. Campbell (1981) described it as a subjective sense of well-being, derived from current experience of life as a whole [7]. The various domains of QOL fall within four broad

classifications which include health & functioning status, socioeconomic, psychological & spiritual and family status [11].

Most chronic illnesses such as rheumatoid arthritis which progressively causes joints destruction with serious pain, inflammation and disability severely affect patients QOL [12, 13]. The presence and severity of complications or comorbidities have also been reported to have greatest impairment on multiple dimensions of health related quality of life (HRQOL) in arthritis and diabetes among other disease conditions [13-15].

QOL indices are very important in this era of mandated improvement in efficiency, cost containment, cost effectiveness and getting the greatest value from increasingly limited resources. Information about patient perspective such as functional status, well-being, and other important health outcomes will be used both by policy analyst, and managers of healthcare organizations [16, 17]. Clinicians will also use such information to evaluate existing as well as new treatments/technologies. Diseases that cannot be cured or of severe disabilities such as arthritis, diabetes, cancer among others would require health related quality of life (HRQOL) improvement strategies in their management [16-18]. In spite all these developments QOL studies are very rare in most developing countries such as of Nigeria. The objectives of this study therefore were to evaluate the impact of diabetes mellitus and arthritis among other co-morbidities on quality of life of patients and to appreciate quality of life perception among healthy subjects.

METHODS

The setting for the study were College of Health Sciences Campus, Niger Delta University Wilberforce Island, Federal Medical Centre Yenagoa, a tertiary health institution which serves as referral center to other hospitals in the state with patients' turnover of about 5000 monthly and two private hospitals in Yenagoa, all in Bayelsa State, Niger Delta.

The population for the study includes 1757 healthy adult volunteers in Niger Delta University and eligible hospital patients encountered during the study period. Inclusion criteria for the healthy volunteers were readiness to participate by consenting and freedom from chronic illnesses. For hospital patients, eligibility for inclusion was diagnosed cases arthritis and diabetic mellitus either alone or as co-morbid illness. Exclusion criteria include In-patients, non-consenting, and those who were too ill to part-take.

A total of 507 participants were enrolled comprising 364 healthy subjects selected through systematic random sampling and completely enumerated 143 eligible consented hospital patients. The hospital subjects include 47 patients with arthritis alone, 25 patients with diabetic mellitus alone and 71 patients with arthritis and co-morbid chronic illnesses such as diabetic mellitus, asthma, hypertension, and peptic ulcer diseases. Arthritis was diagnosed using patient signs and symptoms such as joint pains, X-ray, and erythrocyte sedimentation rate. For diabetes mellitus diagnosis was by using various tests such as fasting plasma glucose and two hour post prandial test.

The cross sectional descriptive study was carried out in June to November 2014. It involves the use of validated questionnaire which were self-administered to healthy subjects and interviewer administered to hospital patients following ethical approval which was given by Federal Medical Centre, Yenagoa. In addition, Informed consent was obtained from all individual participants included in the study.

The tool used for the study was the Ferrans and Powers quality of life index (QLI) questionnaire which has been widely validated to be very reliable [11, 19-23]. In addition information on demographic characteristics was collected from the patients using a standard format as well. The Ferrans and Powers' QLI was developed based on the operational definition of QOL as "a person's sense of well-being that stems from satisfaction or dissatisfaction with the areas of life that are important to him/her" [11, 19]. Respondents are requested to indicate how satisfied they were with 33 areas of life, as well as how important they consider each one of them to be. Ratings are made on a 1-6 Likert type scale ranging from very dissatisfied/unimportant to very satisfied/very important respectively. The instrument yields overall score and four domain scores: health and functioning (HF; 13 items), social and economic (SE; 8 items), psychological and spiritual (PSY/SP; 7 items), and family (FA; 5 items). Satisfaction responses are weighted by their paired importance ratings by multiplication. Paired multiplicative satisfaction-importance item scores are then used to calculate total and domain scores that range between 0 and 30 (zero is the lowest level score for very dissatisfied subjects while a score of 30 is the highest level of life satisfaction /quality of life representing very satisfied state in addition to highest importance rating in a specific domain. The details of the calculation of the quality of life

(QOL) scores are as published by Ferrans and Powers in 1985 [11, 24].

The generic version of the questionnaire was self-administered to adult healthy subjects while disease specific versions (arthritis and diabetes mellitus) were interviewer administered to hospital patients in the consulting rooms of physicians. The English version of the QLI was used which was appropriately interpreted to illiterate subjects in local dialect which is being spoken fluently by the trained data collectors. Collected data include age group, sex, marital status, occupation, and concurrent illnesses in addition to information on quality of life index questionnaire.

A table of complete interpretative standard for the various categories of satisfaction was developed for the cross-sectional design following published guidelines, since only the two extreme QOL scores of zero and 30 were obvious from literatures which were predominantly longitudinal studies [24]. A QOL score of zero is for very dissatisfied/very unimportant response combination while a QOL score of 30 is for very satisfied/very important response combination for all the 33 questionnaire items [11,24]. Appropriate QOL scores were calculated and recorded for all probable responses on the six-graded likert scale/degree of satisfaction for each paired multiplicative satisfaction-importance item value.

Data were entered into Microsoft Excel 2007 and analysed with GraphPad InStat 3, and/or SPSS version 20. The QOL scores were recorded as mean \pm standard deviation (SD). One way ANOVA and Student's 't' test were used for comparing the data. A p-value less than 0.05 was considered significant.

RESULTS

The results of generated interpretative standard indicated a total domain QOL scores ranging from 18.00 to 30.00 for those who are at least

slightly satisfied with present life circumstances. A score of 18.00, the lower limit of satisfaction is categorized as slightly satisfied while a score of 30, the upper limit represents the highest level of quality of life satisfaction for all the variables to which highest importance rating is as well attached. Scores of 12.00 to 17.99 are slightly dissatisfied while values below 12.00 are either moderately dissatisfied (6.00-11.99) or very dissatisfied (0-5.99). A QOL score of zero represents the worst case scenario. Details are as shown in Table 1.

A total of 507 respondents were interviewed out of which 364 (71.79%) were healthy and 143 (28.21%) who actually visited hospitals and are suffering from arthritis or diabetes mellitus either alone or as co-morbid illness with other chronic disease(s). Majority of the subjects were females (274; 54.04%) with 233(45.96%) males. A greater proportion was single (309; 61.0%), 183 (36.1%) were married and 15 (2.96%) were divorcee. Three Hundred and Sixty (70.0%) of the subjects were between 20 to 40 years of age, 70(13.8%) were between 41 and 60 years and 77 (29.0%) were above 60 years

Among the entire (hospital and healthy) subjects, males has statistically significantly higher mean overall quality of life (OQOL) score of 23.70 (SD=5.97 relative to the females with a mean OQOL score value of 21.99 \pm 7.26 and a two-tailed P value of 0.004. There was also significantly higher values of QOL scores for the various domains for males (P = 0.008) with family (FA) and psychology/spiritual (PSY/SP) domains having the highest values. The OQOL score was extremely significantly higher (P < 0.0001) for those whose marital status was single (26.09 \pm 2.82) as compared to those who are married (18.09; SD=7.82). The OQOL score of the divorcee was the lowest with a score of (11.79; SD= 3.97) which implied moderately dissatisfied (second to the lowest ranking in the 1-6 Likert scale of Ferrans and Powers quality of life index scale) (Table 2).

Table 1: Probable scores for different degree of satisfaction with Ferrans and Powers Quality of Life Index

Satisfaction scale	Quality of life scores				
	OQOL	H&F	SE	PSY&SP	FA
Very Satisfied	30.00	30.00	30.00	30.00	30.00
Moderately Satisfied	24.00-29.99	24.00-29.99	24.00-29.99	24.00-29.99	24.00-29.99
Slightly Satisfied	18.00-23.99	18.00-23.99	18.00-23.99	18.00-23.99	18.00-23.99
Slightly Dissatisfied	12.00-17.99	12.00-17.99	12.00-17.99	12.00-17.99	12.00-17.99
Moderately Dissatisfied	6.00-11.99	6.00-11.99	6.00-11.99	6.00-11.99	6.00-11.99
Very Dissatisfied	0.00-5.99	0.00-5.99	0.00-5.99	0.00-5.99	0.00-5.99

OQOL= Overall quality of life, H&F= health and functioning, S.E= socioeconomically related QOL, PSY&SP= psychological and spiritual related QOL, FA= family related QOL

Table 2: Quality of life among the various gender groups

Variables	Frequency n=507 N (%)	Disease Occurrence (n=507) All Subjects N (%)	Disease Occurrence (n=143) Hospital Patients N (%)	QUALITY OF LIFE SCORES				
				OQOL	H&F	S.E	PSY/SP	FA
Sex								
Females	274(54.04)	89 (17.55)	89 (62.24)	21.99±7.26	21.25± 8.34	21.1± 6.6	22.2±7.1	22.8±6.5
Males	233 (45.96)	54 (10.65)	54 (37.76)	23.70± 5.97	23.33± 6.84	22.1± 5.8	23.7± 6.2	24.0± 5.4
Marital Status								
Divorce	15 (2.96)	15 (2.96)	15 (3.49)	11.79± 3.97	9.47± 4.99	12.3±4.4	12.7± 4.1	11.4± 4.8
Married	183 36.09	119 (23.47)	118 (83.22)	18.09± 7.82	16.49± 8.77	18.1± 6.9	18.0± 7.5	19.9± 6.8
Single	309 (60.95)	9(1.78)	9 (6.29)	26.09± 2.82	26.22 ± 2.91	24.1± 4.2	26.3± 3.0	26.0± 3.1

OQOL= Overall quality of life, H&F= health and functioning, S.E= socioeconomically related QOL, PSY/SP= psychological and spiritual related QOL, FA= family related QOL

Table 3: Comparative quality of life scores among the various categories of subjects

	Quality of life scores				
	Illness free subjects (n=364)	All the hospital patients (n=143)	Arthritis (n=47)	Diabetes Mellitus (n=25)	Arthritis + co-morbid illness (n=71)
OQOL	26.43±2.34	13.58±5.39	15.98±2.75	18.92±2.59	8.92±3.97
H&F	26.62±2.15	11.13±5.39	12.80±3.58	15.83±2.23	7.01±4.27
S E	24.43±4.08	14.32±4.90	14.98±4.85	17.71±3.86	12.36±4.37
PSY/SP	26.59±2.53	13.59±4.74	14.48±3.97	16.95±3.32	10.84±3.62
FA	26.44±2.69	15.66±5.09	16.56±4.31	18.78±3.16	12.93±4.92
95% CI	24.937 - 27.267	11.612 - 15.700	13.151 - 16.769	16.032 - 19.244	7.364 - 13.46

One way ANOVA= P < 0.0001

OQOL= Overall quality of life, H&F= health and functioning, S.E= socioeconomically related QOL, PSY/SP= psychological and spiritual related QOL, FA= family related QOL, CI= Confidence Interval, Co-Morbid illness (at least one): Diabetes Mellitus, Asthma, Cancer, and Hypertension

There was statistically significant difference between the OQOL of healthy subjects and patients with arthritis and diabetes mellitus ($p < 0.0001$). The highest mean QOL scores of the healthy subjects (364; 71.79%) which ranged from 24.43(SD=4.08) for socioeconomic to 26.62 (SD=2.15) for health and functioning domains and belong to the category of moderately satisfied is the second most desirable QOL ranking in the 1-6 likert scale of Ferrans and Powers quality of life index scale. The patients with arthritis and other co-morbid illnesses such as asthma, diabetes mellitus, peptic ulcer among others had the least desirable QOL among the respondents with a mean overall QOL scores of 8.92 (SD=3.97); moderately dissatisfied category. In between these two extreme are diabetes mellitus patients who belong to slightly satisfied category with a mean overall QOL score of 18.92 (SD=2.59) and the patients with only arthritis who are also slightly dissatisfied (mean overall QOL score; 15.98 (SD=2.75). Details are as shown in Table 3.

The highest mean OQOL score (26.25; SD=2.39) was recorded for the youngest age category (21-25 years) and the age group of 71-75 year had the lowest mean score of (10.93; SD= 6.37) ($P < 0.0001$). There was a general and gradual fall in the mean OQOL scores as the subjects becomes aged. Even though few individuals had maximum OQOL scores of 30 which implied they are very satisfied with their present QOL and attached highest importance to all the quality of life indicators, none of the age group had mean OQOL score up to 30. The age group of 20-45 which constituted 379 (74.85%) of the subjects were moderately satisfied with a mean OQOL scores ranging from 24.02 (SD=5.20) to 26.25 (SD=2.39) which means they are the most satisfied with respect to their present subjective sense of well-being among the respondents. This was followed by age group of 46-50 year who constituted 12 (2.37%) and are slightly satisfied with an OQOL score of 22.15 (SD= 3.39). The age group of 51-60 year and >76 years, 51 (10.01%) are slightly dissatisfied with their QOL with OQOL scores ranging from 14.62 (SD=4.94) to 15.12 (SD=5.45). The remaining 65 (12.82%)

Table 4: Quality of life among the different age groups

Age group (year)	Frequency N (%) (n=507)	Disease Occurrence (n=507)	Disease Occurrence (n=143) Hospital Patients N (%)	QUALITY OF LIFE SCORES				
				OOQL	Health & Functioning	Socio-economic	Psychological/Spiritual	Family
20-25	109 (21.50)	4(0.79)	4 (2.79)	26.25± 2.39	26.56± 2.14	24.05±3.79	26.43± 2.51	26.01± 2.12
26-30	197(38.85)	5(0.99)	5 (3.49)	26.18± 2.49	26.40± 2.52	24.04± 4.21	26.45±2.62	26.27± 2.65
31-35	29(5.72)	4(0.79)	4 (2.79)	25.54± 3.14	25.23± 4.21	25.09± 5.06	25.10± 3.92	26.51± 3.02
36-40	25(4.93)	6(1.18)	6 (4.19)	*24.02± 5.20	*22.64± 6.58	*22.77± 5.98	*23.25± 5.78	*24.56± 5.47
41-45	19(3.75)	8(1.58)	8 (5.59)	24.26± 5.77	*20.93± 9.24	22.24± 7.25	22.63± 8.61	24.94± 4.98
46-50	12(2.37)	6(1.18)	6 (4.19)	*22.15± 3.39	*20.61± 6.29	*21.25± 7.46	*21.15± 8.49	*24.45± 4.69
51-55	16(3.16)	16(3.16)	16 (11.19)	*15.12± 5.45	*12.49± 4.61	*15.38± 4.63	*14.48± 2.99	*15.01± 4.66
56-60	23(4.54)	23(4.54)	23 (16.08)	*14.62± 4.94	*12.81± 4.60	*14.62± 4.12	*14.44± 5.02	*15.57± 3.74
61-65	27(5.32)	27(5.33)	27 (18.89)	*11.18± 4.16	*8.67± 4.87	*13.98± 4.37	*11.88± 4.33	*13.44± 4.18
66-70	24(4.73)	24(4.73)	24 (16.78)	*11.18± 4.61	*8.76± 5.07	*12.89± 3.14	*11.94± 3.98	*14.26± 5.69
71-75	14(2.76)	14(2.76)	14 (9.79)	*10.93± 6.37	*8.56± 5.71	*12.65± 5.85	*12.43± 5.04	*14.59± 4.74
> 76	12(2.37)	12(2.37)	12 (8.39)	*13.44± 5.77	*12.29± 5.07	*13.15± 6.89	*14.37± 5.23	*14.62± 4.80

OOQL= Overall quality of life*Statistically significantly lower than age range 26 – 30 at $p=0.05$

Table 5: Quality of life scores among healthy subjects & hospital patients

	MED LAB N=91	MEDICINE N=54	NURSING N=97	PHARMACY N=109	ALL HOSPITAL PATIENTS N=143
OOQL	26.56±2.50	25.12±2.84	26.67±2.13	26.36±1.94	*13.58±5.39
H&F	26.30 ±2.26	25.69±2.63	26.45±1.99	27.02±1.91	*11.13±5.39
SE	26.29 ±4.49	22.87±4.11	24.68±3.99	24.62±3.63	*14.32±4.90
PSY/SP	24.29± 2.50	25.72±3.44	26.64±2.33	26.49±2.31	*13.59±4.74
FA	26.20±2.09	25.32±3.71	27.43±1.76	25.77±2.94	*15.66±5.09
95% CI	24.779 - 7.077	23.471 - 26.417	25.110 - 27.638	24.915 - 27.189	11.612 - 15.700

OOQL= Overall quality of life, H&F= health and functioning, SE= socioeconomically related QOL, PSY&SP= psychological and spiritual related QOL, FA= family related QOL, MED LAB- Medical Laboratory Science, CI= Confidence Interval. ANOVA= $P < 0.0001$ *QOL scores statistically significantly different from others.

belong to the age group of 61-75 years have the worst QOL among the subjects (moderately dissatisfied) with OOQL scores of 10.93 (SD=6.37) to 11.18 (SD= 4.16) (Table 4).

The overall mean QOL scores of the healthy subjects 364 (71.79%) range from 25.12 (SD=2.84) to 26.67(SD=2.13) which all belong to the category of moderately satisfied (second to the highest ranking) in the 1-6 likert scale of Ferrans and Powers quality of life index scale. The various domains ranking also fall into that category except one value of mean QOL score of 22.87 (SD=4.11) (slightly satisfied) for psychosocial/spiritual related aspect of QOL for one of the faculties. The mean QOL scores of the hospital patients which ranged from 11.13 (SD=5.39) for H&F to 15.66 (SD=5.09) for FA (moderately dissatisfied to slightly dissatisfied categories) were statistically significantly lowered than those of the healthy subjects with a p-value of 0.0001 (Table 5).

DISCUSSION

The subjects with arthritis and diabetes mellitus have very low quality of life scores relative to the healthy subjects. Subjects suffering from arthritis

have poorer quality of life than those of diabetes mellitus particularly with co-morbid chronic illnesses. Among subjects with chronic illnesses those who are elderly, divorcee and female gender groups were also found to be less satisfied with their quality of life as compared to their respective counter parts. These observations are similar to previous reports [12-16, 20, 22, 23].

The strengths of the study include the use of a well validated quality of life instrument with overlapping generic and disease specific versions on a separate continuum scale of satisfaction and perceived importance to the QOL variables, inclusion of demographic information, and enrollment of healthy subjects alongside those who have single as well as multiple chronic illnesses for appropriate comparison. Some of the weaknesses are fewer hospital patients relative to healthy subjects, relatively small sample size and the use of some students as healthy subjects which may lead to subjective socio economic status.

The observed extremely significant differences in the QOL scores of healthy subjects who are moderately satisfied as compared to the grossly dissatisfied hospital patients confirmed the debilitating nature of arthritis among other chronic diseases and why measures to reduce its incidence and prevalence need to be put in place. The severe impact of arthritis on patient QOL has been widely reported [25-27] which is related to inability of patients to cope with daily activities. This underscores the need for proper and effective management of patients with arthritis especially in resource limited settings of most developing countries. Arthritis patients have poorer QOL relative to diabetes patients, probably because of inflammation, pain, joint damage, fatigue, disability and depression associated with the joint disease [25-27]. People with diabetes mellitus were as well reported to have poorer QOL particularly from complications [15,28] relative to healthy subjects. The worst QOL recorded in subjects with multiple comorbidities in this study is also consistent with worsening physiological conditions in such patients and in agreement with published reports [27,29].

The progressive decline in recorded QOL scores from apparently healthy subjects to patients with diabetes mellitus which became worst with arthritis co-existing with other chronic illnesses observed further strengthens the validity, reliability and sensitivity of the Ferrans and Powers quality of life index scale as widely reported [11,19-23] and its applicability in Nigerian settings. However, translation to local dialect and its re-validation may be desirable in some situations. It equally supports the realistic nature of the emerging desire for health related quality of life assessment to be incorporated into patient care especially to monitor health care interventions for incurable chronic diseases.

Higher prevalence of arthritis and diabetes mellitus among female subjects may be partly responsible for significantly lower QOL scores among them. In addition, poorer QOL of married hospital subjects compared to those who are single and worsens in divorcees who lack remarkable matrimonial companionships underscore the need for improved emotional support for female patients. This is similar to previous report [30]. However, marital status has been shown to be a positive predictor of QOL among heart failure patients relative to elderly ones who were living alone [31].

The progressively depreciating QOL as the arthritis patients are aging is partly in conformity with expected reality of gradual reduction in

normal functioning status as one become older. More so, predisposition to some diseases such as arthritis which resulted partly from reducing joint lubrication increases with age. This is buttressed by the observation of higher rate of disease occurrence among the subjects in this study who are 50 years of age and above. Several studies have demonstrated age as a predictor of QOL [30-33]. Sedentary life style, retiring, none functioning, low income status of most elderly that largely become second time dependents also contribute to their poorer QOL. Since they often found it difficult to cope with their life activities which have been altered by diseases, they need help coping with the ways their lives are altered by disease [33].

The study should be generalized with caution due to low proportion of hospital patients. Suggestions for further research include comparing available treatment modalities and their respective QOL improvements which can serve as basis for enhance patient management and cost effectiveness evaluation as well as better utilization of limited resources.

CONCLUSION

Arthritis and diabetes mellitus severely impaired patient quality of life. All the domains of QOL including health & functioning, socioeconomics, psychological & spiritual as well as family related aspects were significantly impacted. Arthritis was noted to have more pronounced effects on QOL than diabetes mellitus while co-morbid chronic illnesses with arthritis had the greatest impacts. Concerted efforts at stemming the astronomical prevalence rates of chronic diseases such as arthritis and diabetes, supportive roles for elderly people and married women and cost effective management of these conditions among others must be put in place.

DECLARATIONS

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Conflict of Interest

No conflict of interest associated with this work.

Contribution of Authors

The authors declare that this work was done by the authors named in this article and all liabilities

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REFERENCES

- Klarman HE, Francis JO'S, Rosenthal GD. Cost effectiveness analysis applied to the treatment of chronic renal disease. *Med care* 1968; 6(1):48–54. doi:10.1097/00005650-196801000-00005.
- Fanshel Sol, Bush JW. A health-status index and its application to health services outcomes (PDF). *Operations Res* 1970; 18(6): 1021–66.
- Torrance GW, Thomas WH, Sackett DL. A utility maximization model for evaluation of health care programs. *Hlth Serv Res* 1972; 7(2):118–133
- Zhang X1, Norris SL, Chowdhury FM, Gregg EW, Zhang P. The effects of interventions on health-related quality of life among persons with diabetes: a systematic review. *Med Care* 2007; 45(9), 820-34.
- Reichmann H, Martínez-Martin P, Stocchi F. Effect of therapeutic interventions on health-related quality of life in Parkinson's disease. *Euro Neurol Rev* 2014; 9(1):19–26.
- Hepler CD, Strand LN. Opportunities and responsibilities in pharmaceutical care. *Am J Pharm Educ* 1990; 47: 533-543.
- Campbell A. The sense of well-being in America: recent patterns and trends. New York McGraw-Hill 1981.
- Goodinson and Singleton. Quality of Life: a critical review of current concepts, measures, and their clinical implications. *Int J Nurs Stud* 1989; 6(4):327-341.
- World Health Organization. Basic documents: World Health Organization, Geneva, Switzerland: World Health Organization 1948.
- World Health Organization Quality of Life Assessment (WHOQOL). (1998). Development and psychometric properties. *Soc Sci Med* 198; 46:1569-1585.
- Ferrans C, Powers M. Quality of Life Index: Development and psychometric properties. *Adv Nurs Sci* 1985; 8: 15-24.
- Chorus AMJ, Miedema HS, Boonen A, van der Linden S. Quality of life and work in patients with rheumatoid arthritis and ankylosing spondylitis of working age. *Ann Rheum Dis* 2003; 62:1178-1184.
- Bansback NJ, Anis AH, Marra CA. Patient reported outcomes for rheumatoid arthritis: Where are we and Where are we going? *J Rheumatol* 2008; 35(8):1482-1483.
- Maddigan S, Feeny D, Johnson J. Health related quality of life deficit associated with diabetes and comorbidities in a Canadian National Population Health Survey. *Qual Life Res* 2005; 14:1311–20.
- de-Visser C, Bibo H, Groenier K, et al. The influence of cardiovascular disease on quality of life in type 2 diabetics. *Qual Life Res* 2002; 11:249–61.
- Centers for Disease Control and Prevention. Health-Related Quality of Life (HRQOL). Centers for Disease Control and Prevention, Atlanta, Georgia 2000.[cited 2015 June 20]. Available from <http://www.cdc.gov/hrqol/index.html>.
- Ashcroft RE. Quality of Life as the Basis of Health Care Resource Allocation: A Philosopher's perspective on QALYs. *AMA J Ethics* 2005; 7(2):18.
- Ashcroft RE, Hope RA, Parker M. Theoretical perspectives on evidence-based patient choice. In: Edwards A, Elwyn G, eds. *Evidence-Based Patient Choice*. Oxford, England: Oxford University Press: 2001;53-65
- Ferrans, C., & Powers, M. Psychometric assessment of the Quality of Life Index. *Research in Nursing and Health* 1992; 15, 29-38.
- Bliley AV, Ferrans C. Quality of life after angioplasty. *Heart & Lung* 1993; 22(3):193-199.
- Rustoen T, Wiklund I, Hanestad B, Burckhardt C. Validity and reliability of the Norwegian version of the Ferrans and Powers Quality of Life Index. *Scand J Caring Sci* 1999; 13(2):96-101.
- Rustøen T, Wahl A, Burchardt C. Changes in the importance of quality of life domains after cancer diagnosis. *Scandinavian Journal of Caring Sciences* 2000; 14, 224-231.
- Salonen, P; Tarkka, M; Kellokumpu-Lehtinen, P; Åstedt-Kurki, P; Luukkaala, T; Kaunonen, M. Telephone Intervention and quality of life in patients with breast cancer. *Cancer Nurs* 2009; 32(3):177-190.
- Ferrans C, Powers M. Ferrans and Powers Quality of Life Index Questionnaire and Scoring 1985. [cited 2014 June 2]. Available from: <http://www.uic.edu/orgs/qli/index.html>.
- Jakobsson U1, Hallberg IR. Pain and quality of life among older people with rheumatoid arthritis and/or osteoarthritis: a literature review. *Clin Nurs* 2002; 11(4):430-43.
- Pollard L, Choy EH, Scott DL. The consequences of rheumatoid arthritis: Quality of life measures in the individual patient. *Clin Exp Rheumatol* 2005; 23(Suppl. 39):S43-S52.
- Qin J, Theis KA, Barbour KE, Helmick CG, Baker NA, Brady TJ. Impact of Arthritis and Multiple Chronic Conditions on Selected Life Domains—United States, 2013. *MMWR Morb Mortal Wkly Rep* 2015; 64, 578-82.
- Wändell PE. Quality of life of patients with diabetes mellitus. An overview of research in primary health care in the Nordic countries. *Scand J Prim Health Care* 2005; 23(2):68-74.
- Westaway MS. The impact of chronic diseases on the health and well-being of South Africans in early and later old age. *Achieves of Gerontology and geriatrics* 2010; 50(2):213–221.
- Han K, Park E, Kim J, Kim SJ, Park S. Is marital status associated with quality of life? *Health and Quality of Life Outcomes* 2014; 12:109.
- Luttik ML1, Jaarsma T, Veeger N, van Veldhuisen DJ. Marital status, quality of life, and clinical outcome in patients with heart failure. *Heart Lung* 2006; 35(1),3-8.
- Centers for Disease Control and Prevention (CDC). Public health and aging: projected prevalence of self-reported arthritis or chronic joint symptoms among persons aged ≥65 years—United States, 2005–2030. *MMWR Morb Mortal Wkly Rep* 2003;52:489-91.
- Chisholm MA, Spivey CA, Nus AV. Influence of economic and demographic factors on quality of life in renal transplant recipients. *Clin Transplant* 2007; 19, 285–293.