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Health-related quality of life in disease-free survivors of breast cancer with the general population

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Background: Although most of the literature about health-related quality of life (HRQoL) focuses on breast cancer patients, few studies compared the HRQoL in disease-free breast cancer survivors with that of the general population.
Materials and methods: We administered the European Organization for Research and Treatment of Cancer Quality of Life Questionnaire Core 30 and Quality of Life Questionnaire Breast Cancer Module, McGill Quality of Life Questionnaire, Beck Depression Inventory, and Brief Fatigue Inventory to 1933 disease-free survivors for over 1 year after being diagnosed with stage 0 to III breast cancer. We performed multivariate-adjusted analyses in all HRQoL comparisons.
Results: The scores for some HRQoL scales were comparable for both disease-free breast cancer survivors and the general female population; however, there was clinically significant difference in cognitive and social functioning, fatigue, insomnia, and financial difficulties between the two groups. Radiotherapy and systemic adjuvant therapy variables did not limit the HRQoL. Demographic characteristics such as age, time since surgery, and comorbidity were associated with some HRQoL scales and fatigue and depression were associated with almost all HRQoL scales.
Conclusions: Disease-free survivors of breast cancer had good HRQoL, which was less affected by the type of treatment than it was by demographic characteristics, time since surgery, comorbidity, fatigue, and depression.
Key words: breast cancer, disease-free survivor, health-related quality of life

introduction

Breast cancer patients are the largest group of female cancer survivors worldwide [1]. As their number has grown, concern has increasingly been directed to treatment-related sequelae and their effects on health-related quality of life (HRQoL) [2]. If we could identify factors that increase cancer survivors' risk for diminished HRQoL, we could develop strategies to overcome those factors and design appropriate intervention programs [3]. Although most of the literature about HRQoL focuses on breast cancer patients [3–5], few studies have concentrated specifically on comparison of the long-term HRQoL in disease-free breast cancer survivors with that of the general population.

The Korean National Cancer Center initiated the Breast Cancer Quality Care Study, which focused on treatment experiences and health outcomes for women diagnosed and treated for cancer in Korea. As part of that study, we compared the HRQoL of disease-free breast cancer survivors with that of the general population and sought to evaluate the impact of demographic and treatment-related characteristics and of health status on survivors' HRQoL.

materials and methods

study design and subject recruitment

We identified women who had undergone primary curative surgery for breast cancer between 1993 and 2002 in five hospital-based breast cancer registries in Korea. The registries contained information about stage, type of surgery, history of cancer therapy, and other clinical characteristics, such as recurrence and date of last follow-up. Women were eligible to participate if they (i) had a past diagnosis of breast cancer (stage 0, I, II, or III), (ii) were on no current cancer therapy other than tamoxifen, (iii) were currently free of the disease, and (iv) had no other history of cancer. Eligible patients were contacted by telephone, and those who agreed to participate were sent the questionnaire with consent forms and a postage-paid return envelope. Subjects who did not return a questionnaire within 1 month received a reminder card and a telephone call. After reviewing the medical information from the registry, we excluded subjects who had

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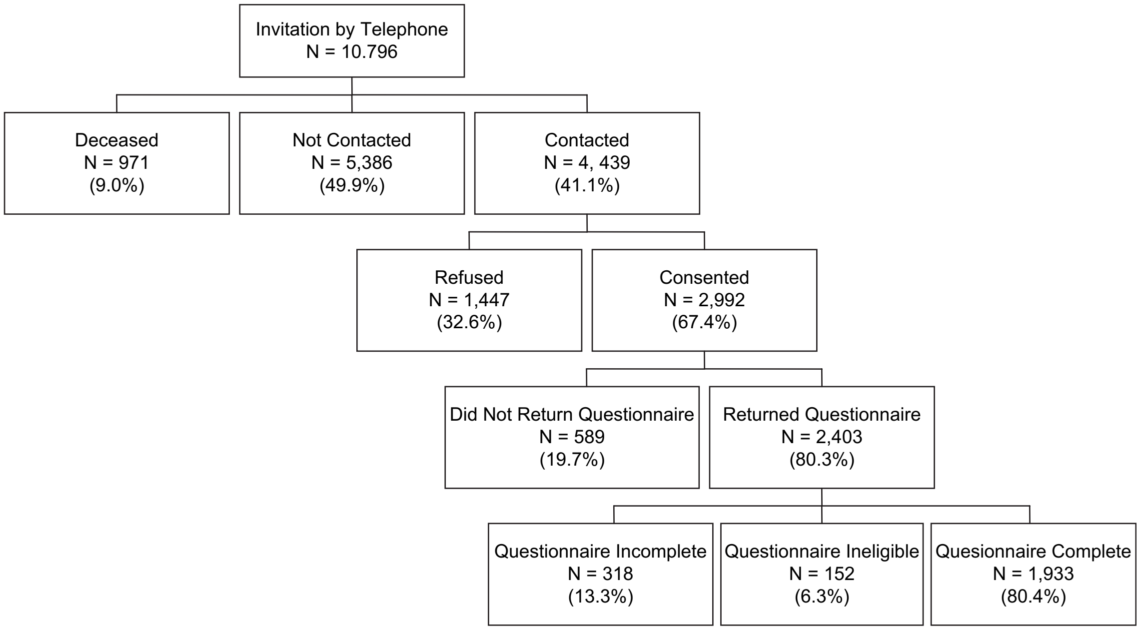


Figure 1. Recruitment response to mailed invitations and survey questionnaires.

recurrent cancer and were receiving cancer therapy. Then, reviewing the patient-reported questionnaire, we excluded subjects who had recurrent cancer and were receiving cancer therapy other than hormonal therapy at the time of the survey. If clinical and self-reported data were not consistent, we gave precedence to the clinical data.

We compared the HRQoL of breast cancer survivors—obtained with the European Organization for Research and Treatment of Cancer Quality of Life Questionnaire Core 30 (EORTC QLQ-C30), Quality of Life Questionnaire Breast Cancer Module (QLQ-BR23), and the McGill Quality of Life Questionnaire (MQoL) existential and support scales—with that of the general female population. The reference data were derived from a representative sample of the Korean adult population, comprising 500 men and 500 women selected by a nationwide random route technique. A trained interviewer visited each patient's home and explained the purpose of study. As breast cancer affects mainly women, we used only data for women in the general population sample for all comparisons in this study. This group completed the self-reported questionnaire in the presence of an interviewer who was there to explain the purpose of study, but like the survivors, they completed the questionnaire for themselves without the interviewer's assist. The institutional review board of the National Cancer Center reviewed and approved the protocol of our study.

instruments

Patients completed a questionnaire that covered demographic and clinical characteristics and a number of standardized instruments designed to assess HRQoL, existential QoL, fatigue, and depression. The EORTC QLQ-C30 is a 30-item cancer-specific questionnaire for assessing the general HRQoL of cancer patients [6]. The questionnaire incorporates five functioning domains (physical, role, cognitive, emotional, and social), three symptom scales (fatigue, pain, and nausea and vomiting), global health and overall HRQoL scales, and several single items that assess additional symptoms commonly reported by cancer patients (e.g., dyspnea, appetite loss, sleep disturbance, constipation, and diarrhea) and the perceived financial impact of disease and treatment.

The EORTC QLQ-BR23 was designed to assess the impact of common breast cancer treatment modalities (surgery, chemotherapy, radiotherapy, or hormonal treatment) upon women's well-being [7]. The module incorporates 23 questions grouped into the functioning scale (i.e., body image, sexuality, and future perspective) and the symptom scales and single item to assess systemic side-effects, arm symptoms, breast symptoms, and hair loss. For this study we used a combined form of the QLQ-C30 and QLQ-BR23, the Korean version of which has been validated [8]. The existential and support subscales of the MQoL were also administered. The MQoL is a multidimensional HRQoL questionnaire whose validity and reliability have been established in patients with chronic illness [9]. The existential and support subscales focus on the individual's ability to find meaning in existence and achieve goals, and they also cover issues of support. Each of these multiple-item scales was scored from 0 to 10, with a higher score representing better HRQoL. The MQoL was translated into Korean by the forward–backward translation process and was pilot tested with the original author's approval.

The Brief Fatigue Inventory (BFI) was used to evaluate the survivors' experience of fatigue, one of the most common long-term effects of treatment [10, 11]. The Korean version of the BFI consists of a one-page fatigue assessment tool that contains nine items, each measuring the severity of fatigue on a 0 to 10 scale. The first three items assess current level of fatigue and the worst and usual fatigue in the preceding 24 hours. Six items assess the extent to which fatigue has interfered with different aspects of life, such as work or social relations, during the preceding 24 hours. The global score for the BFI is calculated as the mean value of those nine items; a higher score represents more severe fatigue.

Depression was assessed using the Beck Depression Inventory (BDI). The BDI, which was originally designed to measure the depth or intensity of depression in psychiatric patients, evaluates 21 symptoms of depression. Each symptom is rated on a four-point intensity scale. The scores are added, yielding a total ranging from 0 to 63; a higher score represents more severe depression [12]. The Korean version of the BDI has been validated.

In addition to the above measures, the full survey instrument also included items concerning treatment experience, work problems, and regret and satisfaction about treatment decisions. We will publish the results of those aspects of the study in the future. Feasibility and comprehensibility of the survey instrument were pretested with 15 breast cancer survivors.

Table 1. Demographic and clinical characteristics of participants

Characteristics	BCS (N = 634)		Mastectomy (N = 1299)		P
	No. of patients	%	No. of patients	%	
Age, years					<0.01
Mean (SD)	46.6 (9.4)		47.8 (9.2)		
Marital status (N = 1891)					NS
Married	527	85.1	1078	85.8	
Education (N = 1889)					<0.001
≥High school graduate	471	76.5	865	68.0	
Religion (N = 1887)					NS
Christian	226	36.6	468	36.9	
Buddhist	179	29.0	373	29.4	
Catholic	110	17.8	225	17.7	
Nonreligious	90	14.6	192	15.1	
Others	13	2.1	11	0.9	
Employment status (N = 1781)					<0.01
Unemployed	377	64.7	862	72.0	
Menopausal status (N = 1886)					<0.001
Postmenopausal	460	74.7	1042	82.1	
Time since surgery, months					<0.001
Median (range)	44 (15–135)		53 (16–143)		
Comorbidity					<0.01
≤1	557	87.9	1068	82.2	
≥2	77	12.1	231	17.8	
Experience of treatments					
Chemotherapy (yes)	342	57.3	799	64.9	<0.01
Radiotherapy (yes)	504	82.4	229	18.4	<0.001
Hormone therapy (yes)	266	48.0	575	48.1	NS

BCS, breast-conserving surgery; SD, standard deviation; NS, not significant.

statistical methods

We scored the QLQ-C30 and QLQ-BR23 items according to the EORTC scoring manual [13]. We linearly transformed the QLQ-C30 and QLQ-BR23 data to yield scores from 0 to 100; a higher score represented a better level of functioning or a higher level of symptoms. We handled incomplete questionnaires according to the developers' recommendations. We did not use BFI, BDI, or MQoL scales with missing values.

We used descriptive statistics for clinical, socioeconomic, and therapeutic variables and *t*- and chi-square tests. We compared breast cancer survivors with the general population controls on the basis of multivariate (age, marital status, education, religion, and employment status)-adjusted HRQoL means and the proportion of 'problematic groups' in each HRQoL scale. We defined a problematic group as one with a global HRQoL or functioning scale score of 33 or less and a symptom scale score of 66 or more on the QLQ-C30 or QLQ-BR23 [14]. Since these groups differed by demographic characteristics (age, marital status, education, religion, employment status, menopause, time since surgery, and comorbidity), we also compared multivariate-adjusted means of HRQoL between treatment subgroups. We used analysis of covariance with a generalized linear model to determine significant differences between groups. We used multiple regression analysis to examine the impact of demographic and clinical characteristics on HRQoL. Because of multiple comparisons, we considered a P value less than 0.01 to be statistically significant in univariate and multivariate analysis, and we defined a 'clinically significant' difference in HRQoL as a 10-point difference in mean score [13, 14]. We used the multiple R^2 coefficients to estimate the percentage of variability of the dependent variable accounted for by all covariates in the regression model. All statistical tests were two sided.

results

subjects and recruitment results

We identified 10 796 potentially eligible breast cancer survivors from the participating registries. Of them, 971 (9.0%) died. We made multiple attempts to contact the others by postcard or telephone but were not able to reach 5386 (49.9%) of them; the most frequent reason for contact failure was a change of address or telephone number. Of the 4439 women who were contacted, 32.6% refused to participate. The reasons given most frequently were that the survey was inconvenient, that it took too long to complete, or that the patient felt too ill. Of the 2992 women who consented to participate, 2403 (80.3%) returned the questionnaire. Of them, we excluded 152 women who had recurrent cancer or were receiving cancer therapy at the time. After we reviewed the questionnaires for completeness, 1933 women remained in the study (Figure 1).

Whereas participants were more likely than nonparticipants to have received breast-conserving surgery (BCS) ($P < 0.001$), there were no other major differences between the groups with respect to age or type of treatment received (chemotherapy, radiation therapy, or hormone therapy). The median follow-up was 50 months from the time of the surgery (range, 16–143 months).

Table 1 presents the baseline sociodemographic characteristics of the participants in the mastectomy group and the BCS group at the time of the survey.

Table 2. LS mean values[a] of EORTC QLQ-C30, QLQ-BR23, MQoL, BFI, and BDI scales in breast cancer survivors by adjuvant teatment

Variable	Surgery, chemotherapy, and hormone therapy (N = 593)		Surgery and hormone therapy (N = 223)		Surgery and chemotherapy (N = 488)		Surgery alone (N = 400)	
	LS mean	SE	LS mean	SE	LS mean	SE	LS mean	SE
EORTC QLQ-C30								
Global health status/QoL	66.46	1.01	69.22	1.63	64.57	1.08	67.06	1.23
Physical functioning	77.18	0.71	79.80	1.16	77.42	0.76	79.54	0.87
Role functioning	74.31	1.04	78.56	1.69	74.31	1.12	76.84	1.28
Emotional functioning	71.80	1.01	74.84	1.64	72.59	1.09	76.00	1.25
Cognitive functioning	71.24	0.95	75.03	1.56	73.11	1.03	73.68	1.17
Social functioning[b]	77.53	1.10	83.3	1.78	78.75	1.18	82.59	1.35
Fatigue	37.56	1.01	35.66	1.65	36.56	1.10	34.70	1.25
Nausea and vomiting	9.55	0.70	8.36	1.14	9.14	0.76	6.42	0.38
Pain	20.00	0.95	17.06	1.55	21.60	1.03	19.22	1.17
Dyspnea	18.63	1.08	15.60	1.75	18.01	1.16	16.72	1.33
Insomnia[b]	27.4	1.33	23.67	2.15	23.42	1.43	20.44	1.63
Appetite loss	10.32	0.93	7.78	1.51	12.12	1.00	8.41	1.14
Constipation	23.13	1.25	19.08	2.02	19.98	1.35	20.20	1.53
Diarrhea	8.67	0.82	10.54	1.32	9.38	0.88	8.52	1.00
Financial difficulties[b]	25.17	1.28	16.9	2.09	25.62	1.38	20.03	1.58
EORTC QLQ-BR23								
Body image	47.17	1.43	52.61	2.32	50.00	1.55	51.25	1.75
Sexual functioning	23.17	1.07	24.13	1.74	22.12	1.17	24.06	1.34
Sexual enjoyment	40.22	2.01	42.04	3.24	41.37	2.14	40.44	2.50
Future perspective	42.45	1.40	47.38	2.28	44.60	1.52	47.92	1.73
Systemic therapy side-effect	27.77	0.80	25.57	1.29	26.31	0.86	25.10	0.97
Breast symptoms	19.14	0.82	16.81	1.33	19.13	0.88	16.80	1.01
Arm symptoms	29.13	1.10	26.07	1.79	29.06	1.19	27.35	1.35
Upset by hair loss	41.28	2.15	34.16	3.72	41.05	2.38	38.12	2.96
MQoL								
Existential subscale	7.21	0.09	7.34	0.14	6.98	0.10	7.24	0.11
Support subscale	7.49	0.09	7.44	0.15	7.16	0.10	7.51	0.11
BFI total score	33.59	0.89	32.69	1.46	34.31	0.97	33.52	1.10
BDI total score	14.20	0.38	13.81	0.62	14.48	0.41	13.60	0.47

EORTC QLQ-C30, European Organization for Research and Treatment of Cancer Quality of Life Questionnaire Core 30; BR23, breast cancer module; MQoL, McGill Quality of Life Questionnaire; BFI, Brief Fatigue Inventory; BDI, Beck Depression Inventory; QoL, quality of life; LS, least squares; BCS, breast-conserving surgery; SE, standard error. *P* values are from analysis of covariance with a generalized linear model.

[a] Adjusted for age, marital status, education, religion, employment status, menopausal status, time since surgery, and comorbidity.

[b] $P < 0.01$.

The proportion of missing data for each of the instruments was as follows: QLQ-C30, 2.3%; QLQ-BR23, 5.1%; MQoL, 4.0%; BFI, 2.3%; and BDI, 2.9%.

HRQoL according to types of treatment

Although women who received no systemic chemotherapy had statistically significantly better social functioning, less insomnia, and fewer financial difficulties, measured by the QLQ-C30, they did not show clinically significant difference (Table 2). The QLQ-BR23, MQoL, BFI, and BDI showed no differences among groups by adjuvant treatment. We also compared survivors with or without radiotherapy by type of surgery (Table 3). Among the BCS group, the QLQ-C30, QLQ-BR23, MQoL, BFI, and BDI did not show any difference between patients who underwent radiotherapy and those who did not. Among mastectomy patients, only social functioning and financial difficulties, measured by the QLQ-C30, were significantly better in women who received no radiotherapy, but these also did not show clinically significant difference.

predictors of HRQoL in multivariate analysis

In multivariate analysis, chemotherapy, radiotherapy, and hormone therapy had little impact on HRQoL, but mastectomy compared with BCS was associated with lower social functioning and poorer body image (Table 4). The type of surgery had an impact on body image. Women who had undergone mastectomy reported a clinically significant poorer body image than women who had BCS (least-squares mean, 43.9 versus 63.2). It had no clinically significant impact, however, on social functioning (least-squares mean

Table 3. LS mean values[a] of EORTC QLQ-C30, QLQ-BR23, MQoL, BFI, and BDI scales in breast cancer survivors with or without radiotherapy by type of surgery

Variable	BCS (N = 612)				Mastectomy (N = 1245)			
	Without radiotherapy (N = 108)		With radiotherapy (N = 504)		Without radiotherapy (N = 1016)		With radiotherapy (N = 229)	
	LS mean	SE	LS mean	SE	LS mean	SE	LS mean	SE
EORTC QLQ-C30								
Global health status/QoL	62.70	2.63	67.88	1.15	66.28	0.74	64.48	1.62
Physical functioning	76.48	1.79	79.21	0.79	78.00	0.52	76.21	1.13
Role functioning	72.56	2.68	77.48	1.17	75.34	0.76	73.37	1.66
Emotional functioning	72.36	2.63	74.36	1.15	73.23	0.75	72.79	1.64
Cognitive functioning	74.63	2.40	72.72	1.04	73.60	0.69	72.01	1.51
Social functioning[b]	81.62	2.49	81.99	1.09	80.65	0.82	73.54	1.78
Fatigue	40.85	2.77	36.03	1.20	35.93	0.73	36.97	1.59
Nausea and vomiting	7.74	1.56	7.61	0.68	8.37	0.54	9.68	1.18
Pain	19.64	2.34	18.56	1.02	19.94	0.72	20.35	1.57
Dyspnea	19.88	2.54	15.60	1.11	17.15	0.80	20.90	1.76
Insomnia	23.27	3.61	26.48	1.57	22.98	0.95	24.02	2.08
Appetite loss	11.32	2.32	9.38	1.02	9.63	0.68	12.95	1.48
Constipation	20.78	3.29	21.0	1.44	21.00	0.89	18.73	1.95
Diarrhea	7.80	2.03	9.15	0.89	8.92	0.59	7.89	1.28
Financial difficulties[c]	23.35	3.04	20.15	1.33	22.90	0.97	29.91	2.10
EORTC QLQ-BR23								
Body image	63.72	3.40	63.69	1.48	42.88	1.02	48.43	2.23
Sexual functioning	22.85	2.77	24.41	1.18	22.85	0.79	21.04	1.73
Sexual enjoyment	50.33	5.51	43.26	2.16	39.34	1.43	38.35	3.43
Future perspective	46.26	3.64	45.83	1.58	44.82	1.04	45.49	2.26
Systemic therapy side-effect	27.08	2.02	26.09	0.88	26.30	0.58	25.79	1.27
Breast symptoms	17.18	2.07	17.98	0.91	18.16	0.60	21.12	1.32
Arm symptoms	26.23	2.73	27.01	1.19	28.00	0.82	33.01	1.78
Upset by hair loss	41.08	6.57	41.68	2.58	37.65	1.59	38.24	3.31
MQoL								
Existential subscale	6.88	0.22	7.22	0.09	7.15	0.067	7.11	0.14
Support subscale	7.16	0.24	7.38	0.10	7.41	0.07	7.33	0.15
BFI total score	35.71	2.30	33.64	1.01	33.33	0.65	33.75	1.42
BDI total score	14.53	0.90	13.58	0.40	14.27	0.29	14.38	0.63

EORTC QLQ-C30, European Organization for Research and Treatment of Cancer Quality of Life Questionnaire Core 30; BR23, breast cancer module; MQoL, McGill Quality of Life Questionnaire; BFI, Brief Fatigue Inventory; BDI, Beck Depression Inventory; BCS, breast-conserving surgery; QoL, quality of life; LS, least squares; SE, standard error. *P* values are from analysis of covariance with a generalized linear model and are for the comparison between women who received radiotherapy and those who received no radiotherapy by type of surgery.

[a] Adjusted for age, marital status, education, religion, employment status, menopausal status, time since surgery, and comorbidity.

[b] $P < 0.001$.

[c] $P < 0.01$.

79.0 versus 81.3) (data not shown). With increasing age, breast cancer survivors reported better social and emotional functioning and future perspectives but poorer physical and sexual functioning and diminished sexual enjoyment. Multivariate analysis also revealed that comorbidity had a negative effect on global HRQoL; on physical, role, and cognitive functioning; and on future perspectives, but all these factors improved with time. Menopausal status was related to sexual functioning, sexual enjoyment, and existential well-being (MQoL). Those who practiced a religion had higher scores on the existential and support subscales than those who did not. Interestingly, depression and fatigue emerged as the strongest predictors of almost all HRQoL studies in multivariate analyses.

comparison of HRQoL between breast cancer survivors and the general population

Figures 2 and 3 present the HRQoL data for the breast cancer survivors and general population groups. Breast cancer survivors and general population subjects showed the similar multivariate-adjusted mean scores for global HRQoL, nausea/vomiting, dyspnea, appetite loss, and diarrhea on the QLQ-C30, all scales of the QLQ-BR23, and the MQoL existential and support scales. In contrast, breast cancer survivors showed poorer QLQ-C30 scores for all functioning scales and the remaining symptoms. We found clinically significant differences among breast cancer survivors with respect to QLQ-C30 scales of cognitive functioning, social functioning, financial difficulties, fatigue, and insomnia.

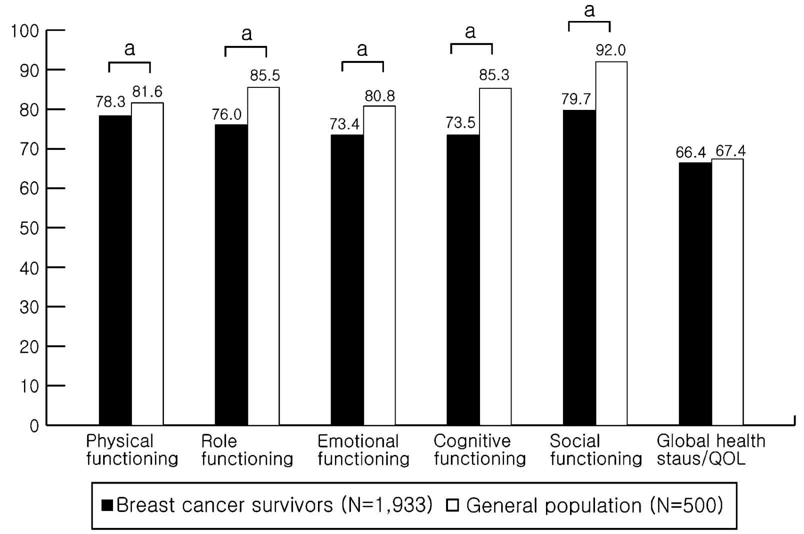
Table 4. Beta coefficients for EORTC QLQ-30, QLQ-BR23, and MQoL using multiple regression including demographic and clinical variables

Variables	Global health status/QoL	Physical functioning	Role functioning	Emotional functioning	Cognitive functioning	Social functioning	Body image	Sexual functioning	Sexual enjoyment	Future perspective	Existential subscale	Support subscale
Age, years	–	-0.18^{a}	–	0.25^{a}	–	0.32^{a}	–	-0.38^{b}	-0.60^{a}	0.46^{b}	–	–
Married	–	–	–	–	–	–	–	9.38^{b}	–	–	–	–
≥High school	2.78^{a}	3.36^{b}	–	4.01^{a}	–	4.68^{a}	–	–	–	–	–	–
Religious	–	–	–	–	–	-6.32^{b}	–	–	–	–	0.39^{a}	0.47^{a}
Employed	–	2.85^{a}	4.44^{b}	–	–	–	–	–	–	–	–	–
Postmenopausal	–	–	–	–	–	–	–	-8.19^{b}	-9.65^{a}	–	0.34^{a}	–
Time since surgery, year	–	0.48^{a}	0.70^{a}	0.79^{b}	–	0.62^{a}	–	–	–	1.46^{b}	–	–
Comorbidity	-4.09^{a}	-2.61^{a}	-4.17^{a}	–	-3.76^{a}	–	–	–	–	-5.47^{a}	–	–
Mastectomy	–	–	–	–	_	-4.98^{a}	-16.3^{b}	–	–	–	–	–
Chemotherapy	–	–	–	–	–	–	–	–	–	–	–	–
Radiotherapy	–	–	–	–	–	–	–	–	–	–	–	–
Antihormonal therapy	–	–	–	–	–	–	–	–	–	–	–	–
BFI total score	-0.54^{b}	-0.32^{b}	-0.48^{b}	-0.28^{b}	-0.30^{b}	-0.27^{b}	-0.19^{b}	–	–	-0.17^{a}	-0.01^{b}	-0.01^{b}
BDI total score	-0.67^{b}	-0.33^{b}	-0.55^{b}	-1.22^{b}	-0.68^{b}	-0.81^{b}	-1.32^{b}	-0.37^{b}	-0.52^{a}	-1.27^{b}	-0.13^{b}	-0.12^{b}
Adjusted R^2	0.47	0.33	0.35	0.44	0.27	0.25	0.29	0.11	0.19	0.21	0.42	0.29
No. of patients	1349	1335	1344	1343	1346	1331	1343	1242	465	1341	1336	1321

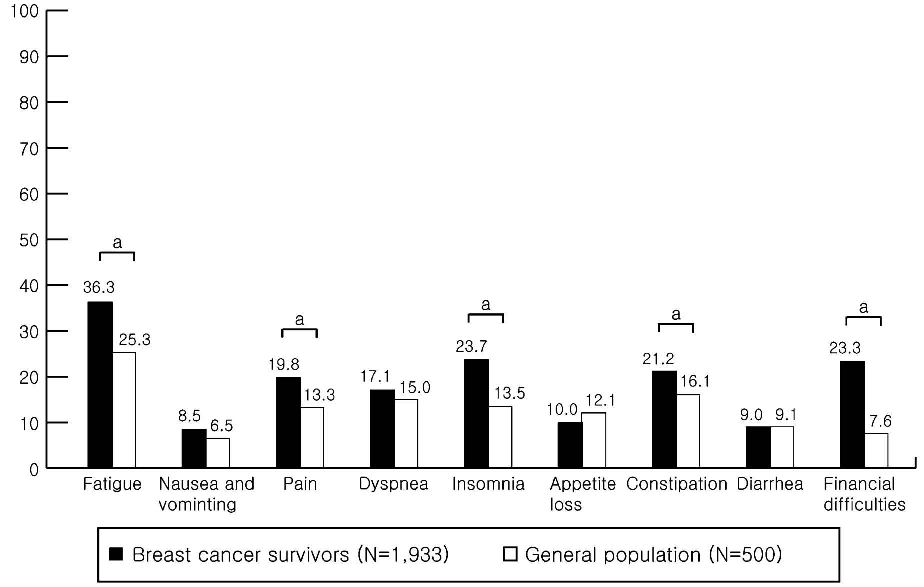
EORTC QLQ-C30, European Organization for Research and Treatment of Cancer Quality of Life Questionnaire Core 30; BR23, breast cancer module; MQoL, McGill Quality of Life Questionnaire; QoL, quality of life. *P* values are from analysis of covariance with a generalized linear model.

[a] $P < 0.01$.

[b] $P < 0.001$.



	Physical functioning	Role functioning	Emotional functioning	Cognitive functioning	Social functioning	Global health staus/QOL
Problematic BP (%)	3.9 [b]	10.4 [b]	9.9 [b]	9.0 [b]	11.3 [b]	21.5
Problematic GP (%)	2.8	4.0	4.8	2.8	2.2	11.6

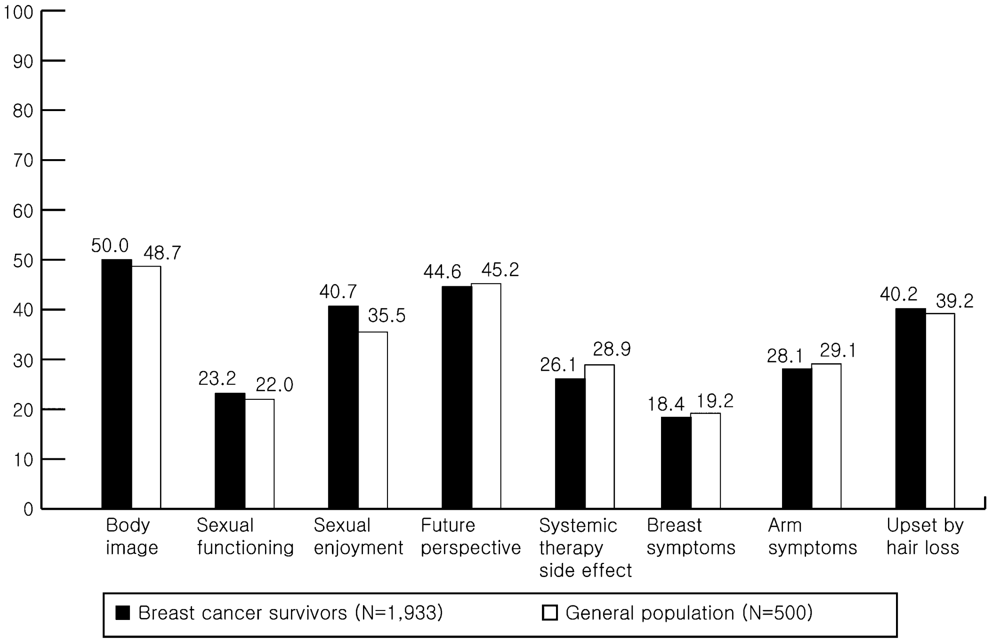


	Fatigue	Nausea and vominting	Pain	Dyspnea	Insomnia	Appetite loss	Constipation	Diarrhea	Financial difficulties
Problematic BP (%)	14.9 [b]	1.9	6.7	9.0	16.6 [b]	4.9	13.1 [b]	3.3	16.0 [b]
Problematic GP (%)	7.2	1.8	4.0	6.4	6.6	6.2	8.8	4.6	2.8

Figure 2. Least-squares mean scores (adjusted for age, marital status, education, religion, employment status, menopausal status, and comorbidity) of EORTC QLQ-C30 and problematic proportion among the breast cancer survivors population (BP) and general population (GP). EORTC QLQ-C30, European Organization for Research and Treatment of Cancer Quality of Life Questionnaire Core 30; QoL, Quality of life. Problematic in global QoL and functioning indicates the score is 33 or less and problematic in symptoms indicates the score is above 66 on a scale of 0–100.

[a] $P < 0.001$ from analysis of covariance with a generalized linear model and are for the comparison between breast cancer survivors and general population.

[b] $P < 0.001$ from chi squares for the comparison between breast cancer survivors and general population and are two sided.



	Body image	Sexual functioning	Sexual enjoyment	Future perspective	Systemic therapy side effect	Breast symptoms	Arm symptoms	Upset by hair loss
Problematic BP (%)	37.8	87.0	89.5	51.5	4.4	3.0	10.9	19.6
Problematic GP (%)	38.8	87.4	90.6	52.0	5.8	3.8	11.2	20.4

Figure 3. Least-squares mean scores (adjusted for age, marital status, education, religion, employment status, menopausal status, and comorbidity) of EORTC QLQ-BR23 and problematic proportion among the breast cancer survivors population (BP) and general population (GP). EORTC QLQ-BR23, breast cancer module of European Organization for Research and Treatment of Cancer Quality of Life Questionnaire. Problematic in functioning indicates a score of 33 or less, and problematic in symptoms indicates a score above 66 on a scale of 0–100.

Breast cancer survivors had a higher proportion of problematic groups than the general population in the physical, role, emotional, social, and cognitive functioning scales of QLQ-C30. Of the symptom scales, breast cancer survivors had a higher proportion of problematic groups with respect to fatigue, insomnia, constipation, and financial problems. The two groups did not differ significantly in their proportion of problematic groups according to the QLQ-BR23.

discussion

This large population-based study of Korean women suggests that almost all HRQoL scale scores—including overall QoL and some functioning and existential well-being scales—and those of many symptoms are comparable for disease-free breast cancer survivors and women in the general population who have never confronted cancer. There were clinically significant differences, however, in cognitive and social functioning, fatigue, insomnia, and financial difficulties. Thus, to improve the HRQoL of cancer survivors, healthcare providers should focus more on these effects in follow-up services.

Our multiple regression analysis of the data obtained from the QLQ-C30, its breast cancer-specific module (QLQ-BR23), MQoL, BDI, and BFI confirmed previous observations that beyond the first year after a diagnosis of breast cancer, the survivor's long-term HRQoL, except for body image, is more likely influenced by demographic characteristics than by the type of surgery [3, 15–18]. These findings lend further weight to the argument that BCS is a better treatment choice than mastectomy because treatment-related mortality and long-term survival are similar for both procedures but a better body image is a significant predictor of a woman being sexually active and is also associated with sexual satisfaction [17].

The goal of postoperative therapy is to reduce the rate of relapse and improve survival rates [18, 19]. In this study, systemic adjuvant treatment caused no clinically significant limitations in global HRQoL, functioning, existential well-being, or symptoms, nor did radiotherapy cause clinically significant HRQoL limitations. These findings agree with those of a recent Chinese study [3] but differ with findings from other studies suggesting that survivors who do not receive adjuvant therapy have a better HRQoL than those who do [19, 20]. More advanced postoperative treatments are now available [20], and recently treated patients may report fewer complications and a better HRQoL [21].

Demographic characteristics such as age, time since surgery, comorbidity, and health status were associated with HRQoL. Our finding that younger age was associated with worse emotional functioning, social functioning, and future perspectives confirms the findings of Western studies [22, 23].

Such age-related differences in HRQoL may result from younger patients receiving more aggressive treatment, experiencing greater psychological shock, possessing fewer coping strategies, or lacking the resources necessary to manage a life-threatening illness [22, 24].

We also observed that comorbid conditions were associated with a significant deterioration in self-reported global HRQoL; in physical, role, and cognitive functioning; and in future perspectives. Our finding that physical, role, emotional, and social functioning and future perspectives were associated with time since surgery can be explained by the fact that most of the limitations imposed by therapy and poor general health resolve with time [3, 20]. In multivariate analysis, depression and fatigue emerged as the strongest predictors of reduced HRQoL. These findings have been reported elsewhere [24, 25] and suggest potential intervention targets [26]. These results could also be interpreted as suggesting that fatigue and depression are associated with a more general tendency to complain (i.e. they represent a trait rather than a state).

Scores for patients and the general population can be compared in terms of either absolute or relative (percentage) differences [14]. In the current study, both comparisons yielded similar results, except for global HRQoL scores. It would be important to identify target populations who have moderate to severe limitations in functioning and symptoms and for whom interventions would improve HRQoL [14, 27].

In this study, multivariate-adjusted analyses showed that their sexual functioning was similar to that of women in the general population. These findings were consistent with those of a recent large cross-sectional study of breast cancer survivors for whom 3 years on average had passed since diagnosis [28]. Nevertheless, younger age, menopause, and depression may be more important risk factors for sexual dysfunction than the type of surgery received [22, 23]. To our knowledge, no other study has compared the body images of breast cancer survivors with those of the general population, and we were surprised to find that they did not differ significantly in the present study. Although the mastectomy group had a worse body image than general population, the BCS group reported a clinically significant better body image than the general population, which we did not expect. This might be understood from cancer survivors' developing positive attitudes from the cancer experience [29], but more study is required to clarify this.

This study was limited by its cross-sectional design, which restricted the generalizability of our findings to similar groups of breast cancer survivors. Another limitation was selection bias; our study sample may not have been representative of the general population of women with breast cancer because it was accrued from selected academic centers. Although there were no major differences in sociodemographic or treatment-related variables between the groups, the response rate was low. We may have underestimated HRQoL problems because nonresponders may have had a lower HRQoL. Additionally, the MQoL is questionable as a tool for evaluating breast cancer survivors and the general population. However, combining it with a cancer-specific questionnaire and its breast module provided valuable information.

In spite of its limitations, our study showed that disease-free survivors of breast cancer had good HRQoL, which was less affected by the type of treatment than it was by demographic characteristics, time since surgery, comorbidity, fatigue, and depression. This study suggests that potential intervention targets among breast cancer survivors would include younger survivors and those with comorbid conditions, fatigue, or depression. Along with earlier findings from Western samples, these results provide comprehensive information about the long-term HRQoL effects of standard breast cancer treatments. This information will be useful in guiding and informing the physicians charged with making cancer-treatment decisions for their patients because breast cancer will remain a major cause of morbidity and mortality in Western and Asian countries into the foreseeable future.

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