Health-related quality of life among breast cancer patients compared to cancer survivors and age-matched women in the general population in Vietnam

Tran Thu Ngan (ntran02@qub.ac.uk)  
Queen's University Belfast  https://orcid.org/0000-0003-2771-9878

Vu Quynh Mai  
Hanoi University of Public Health

Hoang Van Minh  
Hanoi University of Public Health

Michael Donnelly  
Queen's University Belfast

Ciaran O’Neill  
Queen's University Belfast

Research

Keywords: HRQoL, breast cancer, health utility, Vietnam, EQ-5D-5L

DOI: https://doi.org/10.21203/rs.3.rs-120435/v1

License: © This work is licensed under a Creative Commons Attribution 4.0 International License. Read Full License
Abstract

Background

This study compared the health-related quality of life (HRQoL) of BC patients, survivors, and age-matched women from the general population in Vietnam in order to address the paucity of HRQoL research and contribute to the robust assessment of breast cancer (BC) screening and care in Vietnam.

Methods

The standardised EQ-5D-5L instrument was incorporated in an online survey and a hospital-based face-to-face survey, and together with data from the Vietnam EQ-5D-5L norms Study. χ² tests assessed EQ-5D health profile associations and a Tobit regression model investigated the association between overall health status (EQ-VAS/utility scores) and sociodemographic and clinical characteristics.

Results

A total of 309 participants (107 patients undergoing treatment and 202 survivors who had completed treatment) provided usable responses. The dimensions that affected most the HRQoL of women with BC were pain/discomfort and anxiety/depression. Current patients and survivors differed significantly regarding HRQoL dimensions of mobility, self-care, usual activities, and anxiety/depression. Their health utilities were 0.74 and 0.84, respectively, compared with 0.91 for age-matched Vietnamese women in the general population (p < 0.001). Treatment status (survivor vs patient), younger age, higher monthly household income, and higher education levels were associated with higher health utility.

Conclusions

The results point to unmet needs in mental health support and well-being and for attention to be given to the development of a biopsychosocial system of cancer diagnosis, treatment, and care. The results will also inform future assessments of the comparative value for money of interventions intended to impact on breast cancer in Vietnam.

1 Introduction

Breast cancer (BC) is the most common cancer among Vietnamese women [1]. In 2018, the estimated age-standardized incidence rate for breast cancer in Vietnam was 26.4/100,000 which accounted for 20.6% of all new cancer cases in women [1]. This rate is likely to be an underestimate due to the quality and coverage of data from cancer registries [2]. Data from a pilot screening program of 142,000 women reported an incidence rate of 58.5/100,000 [3]. Nevertheless, the incidence has risen steadily over years [4].

The five-year survival rate of BC patients treated at National Oncology Hospital and Hue Central Hospital was 86.4% and 74%, respectively [5, 6]. The former rate was on a par with several high-income countries such as Japan, Korea, and Canada [6]. However, an assessment of the value of BC tertiary care and other services in Vietnam is
seriously hampered by the paucity of quality of life data on BC patients and survivors relative to the general population. Studies reported that around 28% of Vietnamese cancer patients suffered serious depression and/or anxiety [7, 8]. Qualitative research also revealed the problems of overcrowded hospitals and poor communication from health care provider during diagnosis and treatment [9]. Therefore, the need for patient-reported outcomes (PROMs) such as health-related quality of life (HRQoL) is clear, especially to inform cost-effectiveness analyses.

There are very few studies about the HRQoL of BC patients in Vietnam [10, 11] and no studies about the HRQoL of breast cancer survivors. Given the high survival rate and the fact that 64.7% of new BC cases in Vietnam were in women below the age 50 [12], the population of BC survivors is considerable and lives longer. Studies of their HRQoL, therefore, are highly relevant and understanding the HRQoL of BC patients and survivors may provide valuable insights that could help improve treatment and follow-up care as well as contributing to the assessment of novel interventions in terms of value for money [13]. There is a need to address these knowledge gaps in HRQoL including assessing BC burden by comparing (for the first time) the HRQoL of BC patients/survivors and women in the general population. We used the generic instrument, EQ-5D-5L, to assess and compare the HRQoL of BC patients, BC survivors, and age-matched women from the general Vietnamese population.

2 Materials And Methods

2.1 Study design and patient involvement

We conducted an online survey and a hospital-based face-to-face survey to reach BC patients and survivors in different geographical locations in Vietnam. The hospital-based survey was conducted at Hanoi Oncology Hospital and Oncology Center of Hue Central Hospital (tertiary cancer treatment hospitals for the Northern and Central regions of the country, respectively).

The leaders (who are cancer survivors) of the two biggest breast cancer and cancer (in general) patient/survivor ‘clubs’ in the country were invited to the advisory board of the study. They did not involve in the questionnaire development as the EQ-5D-5L is a standard instrument and its license forbids any changes though they were asked to assess the sensitivity of the questions and whether the time required to answer the questionnaire may cause any burden to the patients during their treatment. The leaders actively contributed to the recruitment process by distributing information related to the study and encouraging their peers to participate. We intend to disseminate the main results to not only the participants but general breast cancer patients and survivors in Vietnam. The patient leaders will be consulted to choose an appropriate and effective method of dissemination.

2.2 Participants and recruitment

The survey targeted: 1) BC patients (who were receiving hospital treatment) and 2) BC survivors (who finished treatment and discharged from hospital). Patients who were undergoing investigation for suspected BC but had not received a diagnosis were excluded. Participants for the online survey were recruited through official websites and/or social media of national BC organizations as well as (breast) cancer patient/survivor clubs. In addition, all BC patients/survivors who presented at the named tertiary treatment centres while the survey was underway were approached and asked to participate. Bearing in mind available resources and logistics of conducting face-to-face interviews, data collection was restricted to three months for the online survey and three days for the hospital surveys. The sample size comprised the number of people who responded by the end of the time restriction (whilst remaining mindful that studies of this type tend to require around 200 cases [14, 15]).
2.3 Health-related quality of life variables and measurements

The EQ-5D-5L instrument was used to measure HRQoL and the recently published EQ-5D-5L value set for Vietnam [16] was used to value health states. The EQ-5D-5L was chosen because of its wide use internationally [17] which enhanced opportunities to compare results with other studies; and because the recent completion of 5L values and norms in Vietnam allowed direct comparison with the Vietnamese general population.

2.3.1 Dependent variables: EQ-5D health profile, perceived rating of overall health status (EQ-VAS score), and utility score

Health profile was assessed through respondents’ reported levels of problems in the EQ-5D-5L dimensions: ‘mobility’, ‘self-care’, ‘usual activities’, ‘pain/discomfort’, and ‘anxiety/depression’. Respondents indicated their health state on each dimension by choosing the most appropriate response from: ‘no problems’, ‘slight problems’, ‘moderate problems’, ‘severe problems’, and ‘unable to/extreme problems’.

Respondents also assessed their own overall health status by indicating a score on a visual analogue scale (EQ-VAS score) with values from 0 to 100 corresponding to ‘worst imaginable health’ and ‘best imaginable health’, respectively.

A utility score was derived for each respondent by converting their health profile using the value set of EQ-5D normative scores for the general population of Vietnam[16] that reflected the relative weight that Vietnamese adults placed on the problem levels of each health dimension (see Additional file 1 for details about the calculation).

2.3.2 Independent variables and co-variates

The main independent variable was treatment status (patients vs survivors) derived from the question, “Have you finished treatment and been discharged from hospital?”. Co-variates included ‘age’, ‘education’, ‘marital status’, ‘occupation’, ‘residence area’, ‘household monthly income’, ‘cancer stage at diagnosis’, and ‘stage of treatment’ (based on the most recently used health services related to BC). A previous study about HRQoL of BC patients in Vietnam (using a different measurement tool), a systematic review of the HRQoL of Asian BC patients and several similar studies in neighbouring countries [10, 18–20] were used to select covariates and help guide analysis.

2.4 Statistical analysis

Sociodemographic characteristics of BC patients and survivors were compared using t-tests and χ² tests. 1) The EQ-5D health profile; 2) The overall self-rated health status EQ-VAS; and 3) The utility score (EQ-5D values) were used to compare BC patients, survivors, and age-matched women in the general population. HRQoL data of general population were extracted from an EQ-5D-5L standardised valuation study with a nationally representative sample conducted in 2017 [16]. Each BC patient/survivor (as case) was matched with a peer by age (as control) (1-to-1 match). Firstly, data was randomly sorted, each case was matched with a ‘nearest’ control with same age or difference within a caliper of 0.25*standard deviation of age (recommended caliper by literature [21]). The matched pair of case and control was removed from the pool before next matching was performed. In short, the nearest neighbour matching within a caliper and nonreplacement was the matching algorithm [21].
Regarding EQ-5D health profile, the frequencies and proportions of BC patients and survivors reporting each level of problem on each dimension was presented and $\chi^2$ tests were used to assess between-group differences. Level of problems on each dimension were dichotomised into ‘no problems’ and ‘any problems’ to undertake comparisons with women from the general population.

Corresponding to EQ-VAS and utility scores, descriptive statistics used mean value and the standard deviation (SD). Kruskal Wallis tests assessed differences in BC patients’ median EQ-VAS/utility scores by stage of tumour at diagnosis and stage of treatment. The most common regression techniques for analysing EQ-5D data, ordinary least squares (OLS), Tobit, and generalized linear model (GLM), were considered [22] in relation to conducting an assessment of the determinants of EQ-VAS and utility scores. Results from these models were similar. We decided to report the results from Tobit model as it takes account of the censored nature of EQ-5D data (bounds at full health and worst health state) [22]. Results from OLS and GLM models are provided in the Additional file 2. Two Tobit-derived models were presented. Model 1 contains all covariates based on literature review and binary analyses including treatment status (patients vs survivors), age, education level, residence area (urban vs rural), marital status, and household monthly income. Model 2 consisted only of those independent variables that were statistically significantly associated with EQ-VAS/utility scores (identified via a backward elimination approach). Model goodness-of-fit was compared using Akaike and Bayesian information criteria (AIC and BIC).

3 Results

3.1 Characteristics of study participants

The online survey was promoted via the communication channels of eight different stakeholders and it remained open from September 3 to December 3, 2019. During this period, 412 individuals clicked the survey link, 333 (81%) consented, and 230 (69%) completed the questionnaire; 21 were removed because they were non-breast cancer patients/survivors, leaving 209 respondents. In the hospital-based survey, 106 BC patients/survivors were approached, 101 (95%) consented, and 100 (99%) completed interviews. Thus, the combined dataset of breast cancer patients/survivors consisted of 309 observations (Fig. 1).

(Fig. 1 is about here)

The EQ-5D standardised valuation study [16] conducted in 2017 had 1200 participants drawn from the general population (both male and female, aged 18+). Of the 613 women in this dataset, 306 cases age-matched with our study’s data.

Table 1 presents the sociodemographic characteristics of participants. There were no significant differences in terms of age, marital status, and occupation between BC patients and survivors. A significantly greater proportion of survivors attained a higher education level/monthly income and lived in urban areas. Compared with national data [23–25], the combined study sample contained a higher proportion of individuals who lived in urban areas and spent more years in formal education.
Table 1
Sociodemographic characteristics of participants

| Characteristics                        | BC Patients | BC Survivors | P-value | Total | National data |
|---------------------------------------|-------------|--------------|---------|-------|---------------|
|                                       | n (%)       | n (%)        | n (%)   |       | n (%)         |
| Total                                 | 107 (34.6)  | 202 (65.4)   |         | 309   | (100.0)       |
| Age, mean (SD)                        | 47 (11)     | 48 (10)      | NS      | 48 (10)| NA            |
| **Education level**                   |             |              |         |       |               |
| No formal education/ Not completed primary education | 9 (8.5)     | 6 (3.0)      | <0.001  | 15 (4.9) | 79.2<sup>a</sup> |
| Having completed primary education    | 11 (10.4)   | 5 (2.5)      |         | 16 (5.2)|               |
| Having completed secondary education  | 23 (21.7)   | 16 (8.0)     |         | 39 (12.7)|               |
| Having completed high school education| 19 (17.9)   | 38 (18.9)    |         | 57 (18.6)| 20.8<sup>a</sup> |
| Graduated university/college/vocational education | 38 (35.8)  | 122 (60.7)   |         | 160   | (52.1)        |
| Having completed post-graduated       | 6 (5.7)     | 14 (7.0)     |         | 20 (6.5)|               |
| **Marital status**                    |             |              |         |       |               |
| Single/separated/divorced/widow       | 26 (24.8)   | 44 (22.0)    | NS      | 70 (23.0)| NA            |
| Married                               | 79 (75.2)   | 156 (78.0)   |         | 235   | (77.0)        |
| **Occupation**                        |             |              |         |       |               |
| Government employee                   | 25 (23.6)   | 64 (32.2)    | NS      | 89 (29.2)| 45.0<sup>b</sup> |
| Non-government employee              | 12 (11.3)   | 32 (16.1)    |         | 44 (14.4)|               |
| Self-employed (included subsistence farming) | 35 (33.0)  | 44 (22.1)    |         | 79 (25.9)| NA            |
| Student/Homemaker/Housewife          | 11 (10.4)   | 16 (8.0)     |         | 27 (8.8)|               |
| Retired                               | 15 (14.2)   | 36 (18.1)    |         | 51 (16.7)|               |
| Unemployed                            | 8 (7.5)     | 7 (3.5)      |         | 15 (4.9)|               |
| Residence area: urban                 | 51 (53.7)   | 157 (77.7)   | <0.001  | 211   | (70.1)        |
| **Household monthly income**          |             |              |         |       |               |
| ≤ 3,000,000 VND (~£100)               | 25 (24.5)   | 18 (9.2)     | 0.001   | 43 (14.5)| NA            |
| 3,000,001–6,000,000 VND (~£100–200)   | 24 (23.5)   | 33 (16.9)    |         | 57 (19.2)|               |
3.2 Health profile across five health dimensions

Regarding mobility, self-care, usual activities, and anxiety/depression, a significantly greater proportion of current patients reported problems compared to survivors (Table 2). Pain/discomfort was the only dimension for which there was no statistically significant difference between patients and survivors. Overall, pain/discomfort and anxiety/depression were the two dimensions in which the highest proportion of respondents reported having any problems (75% and 57%, respectively). Self-care was the least affected dimension - only 17.6% respondents reported problems in this dimension.
| Dimension          | Total   | BC patients | BC survivors | p-value |
|--------------------|---------|-------------|--------------|---------|
| **Mobility**       |         |             |              |         |
| No problems        | 221 (71.5) | 65 (60.7)   | 156 (77.2)   | 0.014   |
| Slight problems    | 65 (21.0)  | 30 (28.0)   | 35 (17.3)    |         |
| Moderate problems  | 12 (3.9)   | 8 (7.5)     | 4 (2.0)      |         |
| Severe problems    | 10 (3.2)   | 4 (3.7)     | 6 (3.0)      |         |
| Unable/extreme problems | 1 (0.3) | 0 (0.0)     | 1 (0.5)      |         |
| **Self-care**      |         |             |              |         |
| No problems        | 255 (82.5) | 74 (69.2)   | 181 (89.6)   | < 0.001 |
| Slight problems    | 36 (11.7)  | 18 (16.8)   | 18 (8.9)     |         |
| Moderate problems  | 11 (3.6)   | 9 (8.4)     | 2 (1.0)      |         |
| Severe problems    | 7 (2.3)    | 6 (5.6)     | 1 (0.5)      |         |
| **Usual activities** |      |             |              |         |
| No problems        | 209 (67.6) | 64 (59.8)   | 145 (71.8)   | 0.002   |
| Slight problems    | 83 (26.9)  | 30 (28.0)   | 53 (26.2)    |         |
| Moderate problems  | 10 (3.2)   | 8 (7.5)     | 2 (1.0)      |         |
| Severe problems    | 6 (1.9)    | 5 (4.7)     | 1 (0.5)      |         |
| Unable/extreme problems | 1 (0.3) | 0 (0.0)     | 1 (0.5)      |         |
| **Pain/discomfort** |        |             |              |         |
| No problems        | 76 (24.6)  | 22 (20.6)   | 54 (26.7)    | NS      |
| Slight problems    | 170 (55.0) | 54 (50.5)   | 116 (57.4)   |         |
| Moderate problems  | 40 (12.9)  | 19 (17.8)   | 21 (10.4)    |         |
| Severe problems    | 19 (6.1)   | 8 (7.5)     | 11 (5.4)     |         |
| Unable/extreme problems | 4 (1.3) | 4 (3.7)     | 0 (0.0)      |         |
| **Anxiety/depression** |    |             |              |         |
| No problems        | 132 (42.7) | 32 (29.9)   | 100 (49.5)   | < 0.001 |
| Slight problems    | 116 (37.5) | 37 (34.6)   | 79 (39.1)    |         |
| Moderate problems  | 27 (8.7)   | 14 (13.1)   | 13 (6.4)     |         |
| Severe problems    | 26 (8.4)   | 17 (15.9)   | 9 (4.5)      |         |
|                          | Total n (%) | BC patients n (%) | BC survivors n (%) | p-value |
|--------------------------|-------------|-------------------|-------------------|---------|
| Unable/extreme problems  | 8 (2.6)     | 7 (6.5)           | 1 (0.5)           |         |

*BC: Breast cancer / NS: Not significant*

Figure 2 shows that a significantly greater proportion of BC patients/survivors reported problems in all five EQ-5D dimensions (chi square tests, \( p < 0.001 \), test results are not shown in the figure) compared to women from the general population. A clear and consistent group hierarchy is evident in terms of experience of problems across domains.

(Fig. 2 is about here)

### 3.3 EQ-VAS and utility scores

The mean (SD) EQ-VAS and utility scores of BC patients were 64.9 (20.1) and 0.74 (0.22) which were significantly lower than BC survivors, 76.2 (15.7) and 0.84 (0.15), respectively (Mann Whitney U test, \( Z = -4.2, p < 0.001 \)) (Fig. 3, test results are not shown). These scores were lower than age-matched women from the general population, 77.9 (15.0) and 0.91 (0.1), respectively.

(Fig. 3 is about here)

Table 3 shows BC patients’ mean EQ-VAS and utility scores by stage of tumour at diagnosis and stage of treatment. There were no significant differences on both EQ-VAS scores and utility scores between those who were diagnosed at different stages of BC (Kruskal-Wallis tests). While these two scores showed clear differences between those at different stages of treatment, the difference was also not statistically significant (Kruskal-Wallis tests). Lowest scores were reported when the patients have just finished mastectomy (mean EQ-VAS score = 54, mean utility score = 0.68). The next stages with low scores included chemotherapy, radiotherapy, and targeted therapy with scores ranged from 61.8 to 70.1 for EQ-VAS and 0.71 to 0.80 for utility. In most cases, scores of those in active treatment were lower than those of the survivors except in the cases of lumpectomy and breast reconstruction surgery where patients had higher EQ-VAS and utility scores than survivors (EQ-VAS: 90.5 and 80.0 vs 76.2; Utility score: 0.88 and 0.92 vs 0.84, respectively).
| Patients’ stage of breast cancer at diagnosis | EQ-VAS scores | Utility scores |
|---------------------------------------------|--------------|---------------|
|                                             | n           | mean (SD)          | n         | mean (SD)          |
| Stage 0/I                                   | 29          | 58.2 (26.0)       | 29        | 0.74 (0.24)       |
| Stage II                                    | 46          | 66.0 (17.6)       | 42        | 0.72 (0.23)       |
| Stage III                                   | 19          | 72.2 (15.2)       | 19        | 0.74 (0.20)       |
| Stage IV                                    | 5           | 70.2 (14.8)       | 5         | 0.89 (0.07)       |
| Don’t know/Don’t remember                   | 8           | 58.1 (18.9)       | 8         | 0.76 (0.14)       |
|                                             | 100         | NS\(^a\)          | 100       | NS\(^a\)          |

| Patients’ stage of treatment (based on most recent use of health services related to breast cancer) | EQ-VAS scores | Utility scores |
|-----------------------------------------------------------------------------------------------|--------------|---------------|
|                                                                                               | n           | mean (SD)          | n         | mean (SD)          |
| Lumpectomy                                                                                   | 2           | 90.5 (0.7)       | 2         | 0.88 (0.08)       |
| Mastectomy                                                                                  | 10          | 54.0 (29.4)      | 10        | 0.68 (0.30)       |
| Breast reconstruction surgery                                                                | 1           | 80.0 (0.0)       | 1         | 0.92 (0.00)       |
| Chemotherapy                                                                                 | 51          | 61.8 (19.2)      | 51        | 0.71 (0.24)       |
| Targeted (biological) therapy                                                                | 14          | 69.6 (15.6)      | 14        | 0.80 (0.13)       |
| Radiotherapy                                                                                 | 24          | 70.1 (21.7)      | 24        | 0.77 (0.20)       |
|                                                                                               | 102         | NS\(^a\)          | 102       | NS\(^a\)          |

| Survivors                                                                                   | 200         | 76.2 (15.8)      | 201       | 0.84 (0.15)       |

**NS**: Not significant | **SD**: standard deviation

\(^a\) Differences amongst stage of tumour at diagnosis and amongst stage of treatment groups were analysed with the Kruskal-Wallis tests

In the Tobit model, compared with BC patients, the survivors reported a 9.3 point higher score EQ-VAS ($\beta = 9.5$, $p < 0.001$; Model 1: treatment status was adjusted for age group, education level, household monthly income, residence area, and marital status) and 0.07 higher utility score ($\beta = 0.07$, $p < 0.001$; Model 2: treatment status was adjusted for age group, education level, and household monthly income) (Table 4).
| Variable                  | EQ-VAS score |                      | Utility score |                      |
|--------------------------|--------------|----------------------|---------------|----------------------|
|                          | Model 1<sup>a</sup> | Model 2<sup>b</sup> | Model 1<sup>a</sup> | Model 2<sup>b</sup> |
|                          | n = 287      | n = 306              | n = 288       | n = 296              |
| β coeff                  | β coeff      | 95% CI               | β coeff       | 95% CI               | β coeff       | 95% CI               |
| Treatment status         |              |                      |               |                      |               |                      |
| Patient (ref)            |              |                      |               |                      |               |                      |
| Survivor                 | 9.3<sup>*</sup> | 4.5–14.1             | 9.0<sup>*</sup> | 4.4–13.6             | 0.06<sup>*</sup> | 0.01–0.11            |
| Age group, years         |              |                      |               |                      |               |                      |
| < 40 (ref)               |              |                      |               |                      |               |                      |
| 40–49                    | -0.1         | -5.1–4.9             | -0.6          | -5.3–4.1             | -0.05         | -0.09–0.00           |
| 50–59                    | -4.5         | -10.7–1.6            | -4.8          | -10.6–0.9            | -0.04         | -0.12–0.03           |
| 60+                      | -9.4<sup>*</sup> | -16.9–1.8           | -9.2<sup>*</sup> | -16.2–2.2           | -0.11<sup>*</sup> | -0.18–0.03           |
| Residence                |              |                      |               |                      |               |                      |
| Rural (ref)              |              |                      |               |                      |               |                      |
| Urban                    | 1.1          | -4.2–6.5             | 0.03          | -0.04–0.10           |               |                      |
| Education level          |              |                      |               |                      |               |                      |
| Completed up to secondary school (ref) |              |                      |               |                      |               |                      |
| Completed high school    | 4.7          | -3.2–12.6            | 5.8           | -1.1–12.8           | 0.05          | -0.03–0.13           |
| Completed graduate       | 5.8          | -1.1–12.7            | 7.8<sup>*</sup> | 2.2–13.4           | 0.06          | -0.01–0.13           |
| Completed postgraduate   | 7.4          | -3.8–18.6            | 9.6<sup>*</sup> | 0.5–18.7           | 0.10<sup>*</sup> | 0.00–0.19           |
| Marital status           |              |                      |               |                      |               |                      |
| Single/separated/divorce/widow (ref) |              |                      |               |                      |               |                      |
| Married                  | -1.1         | -6.5–4.3             | 0.01          | -0.01–0.09           |               |                      |
### Variable

| Variable                      | EQ-VAS score | Utility score |
|-------------------------------|--------------|---------------|
|                               | Model 1<sup>a</sup> | Model 2<sup>b</sup> | Model 1<sup>a</sup> | Model 2<sup>b</sup> |
|                               | n = 287      | n = 306       | n = 288          | n = 296          |
|                               | β coeff | 95% CI | β coeff | 95% CI | β coeff | 95% CI | β coeff | 95% CI |
| Household monthly income      |          |          |          |          |          |          |          |          |
| ≤ 3,000,000 VND (~£100)<sup>ref</sup> |          |          |          |          |          |          |          |          |
| 3,000,001–6,000,000 VND (~£100–200) | 2.0     | -6.5–10.4 | 0.04    | -0.06–0.14 | 0.04    | -0.05–0.14 |          |          |
| 6,000,001–9,000,000 VND (~£200–300) | 3.9     | -5.0–12.7 | 0.07    | -0.03–0.17 | 0.07    | -0.02–0.17 |          |          |
| 9,000,001–12,000,000 VND (~£300–400) | 2.4     | -6.2–11.0 | 0.09    | -0.01–0.18 | 0.09*   | 0.00–0.18 |          |          |
| > 12,000,000 VND (~£400)      | 3.0      | -5.6–11.5 | 0.07    | -0.02–0.16 | 0.08    | -0.01–0.17 |          |          |

**AIC**

- 2463 
- 2605 
- 2463 
- 2605

**BIC**

- 2518 
- 2638 
- 2518 
- 2638

<sup>a</sup> Model with all exploratory variables | <sup>b</sup> Model included only variables with significant coefficients (Backward elimination)

β coeff: Beta coefficients of the Tobit model | <sup>ref</sup>: Reference group | * p < 0.05 versus reference group

VND: Vietnamese Dong. Exchange rate in October 2020: £1 ~ 30,000 VND

Other sociodemographic characteristics significantly associated with both EQ-VAS and utility scores were age. Specifically, from the age 60, advancing age was significantly associated with a negative impact on both EQ-VAS scores and utility scores (this trend was not presented in the group under 60 years old). Completion of university or above and having household monthly income in the range of 9,000,001–12,000,000 Vietnamese Dong-VND (~£300–400) were associated with higher utility scores (p < 0.05 compared with completion up to secondary school and income of < 3,000,000 VND ~ £100, respectively) but not for EQ-VAS scores.

## 4 Discussion

### 4.1 Health profile across five health dimensions

Pain/discomfort and anxiety/depression were the dimensions of HRQoL where BC patients/survivors were more likely to report problems (75.4% and 57.3%, respectively) - these problems were 2–2.5 times more prevalent than any problems on other dimensions. In fact, these were also the two dimensions where severe or extreme problems were most likely to be reported by BC patients and survivors. The dimension where problems were least likely to be reported by those with BC was self-care (17.5%). These results are similar to findings from other research such as studies in China (n = 2626 BC patients), Korea (n = 827 BC patients), and Malaysia (n = 150 BC survivors) [20, 26, 19].
Pain/discomfort presents even years after the diagnosis and treatment as BC patients and survivors reported no difference in the level of problems in this dimension (79.2% and 73.5% respectively). It also indicates that self-reported pain may not decrease for BC survivors after finishing treatment or may recur at given time points. In all other dimensions (mobility, self-care, usual activities, and anxiety/depression), the survivors had significantly better health status though the extent of the difference varied. The dimension with least difference between patients and survivors was usual activities (8%). The biggest difference between patients and survivors with respect to having problems lay on the dimensions of self-care and anxiety/depression (18%).

Compared to age-matched peers in the general population, BC patients and survivors were significantly more likely to have problems in every dimension, especially in relation to pain/discomfort and anxiety/depression. The difference between patients and general population in these two dimensions were approximately 40–48 percentage points, respectively. The difference between survivors and general population in these two dimensions were 35 and 29 percentage points, respectively. In these other three dimensions, the differences were around 30 percentage points between patients and general population and 13–25 percentage point between survivors and general population. Although the differences are larger than a similar study in Malaysia (compared survivors and general population), the trend is the same [26]. These results indicate the potentially profound psychological impact of BC on those who experienced the disease and imply the importance of not only care for physical health but also mental health of BC patients/survivors.

4.2 EQ-VAS scores and utility scores

The mean (SD) EQ-VAS and utility scores of BC patients were 64.9 (20.1) and 0.74 (0.22) which were significantly lower than that of BC survivors at 76.2 (15.7) and 0.84 (0.15), respectively. Both EQ-VAS and utility scores indicate the level of health (with 1 or 100 is full health) but their measurements are not the same. EQ-VAS is the score that respondents gave themselves based on their own perspective/evaluation while utility scores were calculated using respondents’ self-reported status of five health dimensions and the general population's perspective on the value of those health dimensions (the country value set). While patients report a lower VAS score than utility score, interestingly the difference between patients and women from the general population is greater when measured with a utility score than with the VAS. In other words, the utility score suggests that the general population (whose views determine the weight in the utility index) assess the impact on QoL as more dramatic than those who experience it. This may indicate a degree of adaption among BC patients to their predicament though further research is required to assess this more fully.

EQ-VAS and utility scores of both BC patients and survivors were also lower than that of age-matched women from the general population at 77.9 (15.0) and 0.91 (0.1), respectively, which speaks to the face validity of the findings. The pattern is clear and consistent as patients have the lowest HRQoL and even when they survived and recovered from cancer, their HRQoL is still lower than general women drawn from the general population. Both cross-sectional studies with matched women from general population [26, 27] and longitudinal study (using other measurement) [28] reported the same pattern of HRQoL. Compared with similar studies that used EQ-5D-5L, mean utility scores of BC patients in our study is quite similar with China and Malaysia but much lower than Korea (0.75 vs 0.78, 0.71, and 0.92, respectively) [20, 19, 26].

Apart from status of treatment (patients vs survivors), those who are younger, have higher education and household monthly income are more likely to report higher HRQoL. These results are similar to findings from previous studies, including studies that used different instruments for measurement [29, 28, 30–32] and are again
suggestive of face validity. Other sociodemographic characteristics such as marital status and living residence area (urban/rural) are not significantly related to either EQ-VAS or utility scores. We also did not find difference in HRQoL amongst patients diagnosed at different stages of BC, unlike the results from study of Wang et al (2018) [20]. This may be due to our small sample size of BC patients (100 vs 2626 in Wang’s study).

Among BC patients, the observed trend in HRQoL amongst different stage of treatment was clear and consistent for both EQ-VAS and utility scores. Lowest HRQoL were reported by patients who have just gone through mastectomy (EQ-VAS = 54, utility score = 0.68). Patients who were being treated with chemotherapy, radiotherapy, or targeted therapy reported the next three lowest HRQoL (respectively, EQ-VAS = 61.8, 70.1, and 69.6; utility score = 0.71, 0.77, and 0.80). Patients who had just completed lumpectomy or breast reconstruction surgery reported better HRQoL than the survivors and on par or even higher than general population (in order of lumpectomy, breast reconstruction surgery, survivors, general population: 90.5, 80.0, 76.2, 77.9 for EQ-VAS; 0.88, 0.92, 0.84, 0.91 for utility score). The results were similar with a recent qualitative study in which Vietnamese BC patients claimed that mastectomy and chemotherapy were the two biggest challenges during their treatment (reference: manuscript under submission). Participants in this study also expressed the hope to regain their body image with breast reconstruction surgery. One said “I only know how bad it is after having a mastectomy... I feel so terrible. To be honest, whenever my husband holds me, I feel the emptiness... I hope that I can have reconstructive surgery because I cannot bear the defective body like that. I want my body to be normal again... Even if I die, I still want to die with a normal body... It is worse than losing my arm. Breast is a special symbol of women's beauty and every woman wants to be beautiful”. Although the results were not statistically significant due to small sample size, it is consistent with previous findings of original studies and systematic reviews with meta-analysis [30, 33, 31, 34–36].

4.3 Strengths and limitations

This is the first study to report EQ-5D-5L data for BC patients and survivors in Vietnam. The use of the standardised EQ-5D-5L instrument also enabled the first comparative study of HRQoL of BC patients, survivors, and age-matched women from the country’s general population. Although the sample size is not large in absolute terms, it is more than twice the minimum requirements for running analysis models [14, 15] and on par with similar studies in Vietnam and elsewhere [10]. Thus, it is sufficient to provide novel and valuable insights into the HRQoL of BC patients and survivors in Vietnam, including its determinants as well as comparison with the general population. The results should continue to be treated with some caution however as they may not generalize to the whole country as the study could not conduct a hospital-based survey in the South region (due to limited resources) which led to the under-representation of this region in the sample. In addition, it is important to note that our sample was dominated by respondents who lived in urban areas, were more educated, and had higher household monthly income even though we applied two data collection methods in order to extend reach to respondents.

5 Conclusions

BC survivors showed higher HRQoL in various dimensions compared to patients who were receiving treatment. However, survivors’ health utilities were still much less than age-matched women in the general population. The two most affected dimensions by BC were pain/discomfort and anxiety/depression. As such, mental health support and well-being appear to be unmet needs that require more attention from oncology and related services such as psychology and social services. Regarding types of treatment, women undergoing or having just
completed mastectomy and chemotherapy were associated with the largest negative affect on HRQoL while those undergoing or having recently completed breast construction surgery had higher quality of life suggesting women at this stage of their cancer journey may be regaining HRQoL on par with general population. Sociodemographic characteristics that appear to be independently associated with HRQoL include age (negative impact), education level (positive impact), and household monthly income (positive impact). These results should help inform future assessments of the comparative value for money of interventions intended to impact on BC in Vietnam.

**Abbreviations**

BC  
Breast cancer  
HRQoL  
Health-related quality of life  
VND  
Vietnamese Dong

**Declarations**

**Ethics approval and consent to participate.** All procedures performed in the study were in accordance with the ethical standards of Hanoi University of Public Health and/or Vietnam research committee and with the 1964 Helsinki declaration and its later amendments. The study received the ethical approval No. 265/2019/YTCC-HD3 dated 25\textsuperscript{th} April 2019 from Hanoi University of Public Health's Institutional Review Board. Informed consent was obtained from all individual participants included in the study.

**Consent for publication.** Not applicable

**Availability of data and material.** All data generated or analysed during this study are included in this published article and additional files.

**Competing interests.** The authors declare that they have no competing interests.

**Funding.** The work reported in this paper was undertaken during TTN's PhD studies which is funded by the Profs Murray-Yarnell PhD studentship from Faculty of Medicine and Health Sciences, Queen's University Belfast (United Kingdom). The funder of the study had no role in study design, data collection, data analysis, data interpretation, or writing of the report. The corresponding author had full access to all the data in the study and had final responsibility for the decision to submit for publication. Queen's University Belfast was also the sponsor for open access fee of this paper.

**Authors' contributions.** TTN, CON, and MD conceived and designed the study as well as contributed to the interpretation of the findings. TTN and VQM collected the data for this study. VQM provided the data from EQ-5D standardised valuation study (for comparison with general population). TTN performed the analyses and prepared first draft of the manuscript. CON, MD, and HVM provided supervisory support and reviewed this paper. All authors contributed to the revision of the manuscript and approved the final version of the paper.

**Acknowledgements.** The authors express our sincerest thanks to Centre for Population Health Sciences (Hanoi University of Public Health), Fight against Cancer Club, Resilient Women Club, Pink Ribbon Club, Support Breast
Cancer Patients Club, Lavender Ribbon non-profit organization, and nurses/Doctors at Hanoi Oncology Hospital and Oncology Center of Hue Central Hospital, for their support in the recruitment process.

References

1. Ferlay J, Ervik M, Lam F, Colombet M, Mery L, Piñeros M et al. Global Cancer Observatory: Cancer Today. International Agency for Research on Cancer, Lyon, France. 2018. http://gco.iarc.fr/today. Accessed November 26 2018.

2. Vietnam Ministry of Health, Health Partnership Group. Join Annual Health Review 2014: Strengthening prevention and control of non-communicable diseases. Hanoi, Vietnam: Medical Publishing House; 2015.

3. Vietnam Ministry of Health. National Strategy for the Prevention and Control of Noncommunicable Diseases, period 2015-2025. Hanoi, Vietnam. 2015.

4. Jenkins C, Minh LN, Anh TT, Ngan TT, Tuan NT, Giang KB et al. Breast cancer services in Vietnam: a scoping review. Global health action. 2018;11(1):1435344-. doi:10.1080/16549716.2018.1435344.

5. Vu Hong T, Nguyen Ba D, Skoog L, Ta Thanh V, Tani E. Breast Cancer Survival Defined by Biological Receptor and Menopausal Status in Vietnamese Women. Cancer Control. 2019;26(1):1073274819865279-. doi:10.1177/1073274819865279.

6. Lan NH, Loahasiriwong W, Stewart JF. Survival probability and prognostic factors for breast cancer patients in Vietnam. Glob Health Action. 2013;6:1-9. doi:10.3402/gha.v6i0.18860.

7. Yen NTK, Weiss B, Trung LT. Caseness rates and risk factors for depression among Vietnamese cancer patients. Asian J Psychiatr. 2016;23:95-8. doi:10.1016/j.ajp.2016.07.020.

8. Truong DV, Bui QTT, Nguyen DT, Moore J. Anxiety Among Inpatients With Cancer: Findings From a Hospital-Based Cross-Sectional Study in Vietnam. Cancer Control. 2019;26(1):1073274819864641. doi:10.1177/1073274819864641.

9. Jenkins C, Ngan TT, Ngoc NB, Hien HT, Anh NH, Lohfeld L et al. Experiences of accessing and using breast cancer services in Vietnam: a descriptive qualitative study. BMJ Open. 2020;10(3):e035173. doi:10.1136/bmjopen-2019-035173.

10. Tran TH, Trinh NL, Hoang Y, Nguyen TL, Vu TT. Health-Related Quality of Life Among Vietnamese Breast Cancer Women. Cancer Control. 2019;26(1):1073274819862787-. doi:10.1177/1073274819862787.

11. Ha NT, Binh TTT, Anh NQ. Quality of life of breast cancer patients measured by QLQ-C30 and related factors in Oncology hospitals in Vietnam [In Vietnamese]. Vietnam J Prev Med. 2017;27(5):102.

12. Trieu PDY, Mello-Thoms C, Brennan PC. Female breast cancer in Vietnam: a comparison across Asian specific regions. Cancer biology & medicine. 2015;12(3):238-45. doi:10.7497/j.issn.2095-3941.2015.0034.

13. Montazeri A. Quality of Life in Breast Cancer Patients: An Overview of the Literature. In: Preedy VR, Watson RR, editors. Handbook of Disease Burdens and Quality of Life Measures. New York, NY: Springer New York; 2010. p. 2829-55.

14. Kline RB. Principles and Practice of Structural Equation Modeling, Third Edition. Third Edition ed. New York: The Guilford Press; 2011.

15. Wolf EJ, Harrington KM, Clark SL, Miller MW. Sample Size Requirements for Structural Equation Models: An Evaluation of Power, Bias, and Solution Propriety. Educ Psychol Meas. 2013;76(6):913-34. doi:10.1177/0013164413495237.
16. Mai VQ, Sun S, Minh HV, Luo N, Giang KB, Lindholm L et al. An EQ-5D-5L Value Set for Vietnam. Quality of Life Research. 2020. doi:10.1007/s11136-020-02469-7.

17. Devlin NJ, Brooks R. EQ-5D and the EuroQol Group: Past, Present and Future. Applied Health Economics and Health Policy. 2017;15(2):127-37. doi:10.1007/s40258-017-0310-5.

18. Ho PJ, Gernaat SAM, Hartman M, Verkooijen HM. Health-related quality of life in Asian patients with breast cancer: a systematic review. BMJ Open. 2018;8(4):e020512. doi:10.1136/bmjopen-2017-020512.

19. Kim S-H, Jo M-W, Lee J-W, Lee H-J, Kim JK. Validity and reliability of EQ-5D-3L for breast cancer patients in Korea. Health and Quality of Life Outcomes. 2015;13(1):203. doi:10.1186/s12955-015-0399-x.

20. Wang L, Shi JF, Zhu J, Huang HY, Bai YN, Liu GX et al. Health-related quality of life and utility scores of patients with breast neoplasms in China: A multicenter cross-sectional survey. Breast (Edinburgh, Scotland). 2018;39:53-62. doi:10.1016/j.breast.2018.03.004.

21. Guo S, Fraser MW. Propensity Score Analysis: Statistical Methods and Applications - 2nd Edition. Advanced Quantitative Techniques in the Social Sciences Series, vol 11. United States of America: SAGE Publications; 2015.

22. Devlin N, Parkin D, Janssen B. Methods for Analysing and Reporting EQ-5D Data. Switzerland: Springer 2020.

23. Vietnam General Statistics Office, Central Population and Housing Census Steering Committee. Vietnam Population and Housing Census 2009. Hanoi, Vietnam2009.

24. Ministry of Labour – Invalids and Social Affairs. Decision No. 1052/QĐ-LĐTBXH: Annoucement of the results of 2018 poor and near-poor household survey. Hanoi, Vietnam. 2019.

25. General Statistics Office of Vietnam. Statistical summary book of Vietnam 2017. Hanoi, Vietnam: Statistical Publishing House; 2017.

26. Matalqah LM, Radaideh KM, Yusoff ZM, Awaisu A. Health-related quality of life using EQ-5D among breast cancer survivors in comparison with age-matched peers from the general population in the state of Penang, Malaysia. Journal of Public Health. 2011;19(5):475. doi:10.1007/s10389-011-0406-6.

27. LeMasters T, Madhavan S, Sambamoorthi U, Kurian S. A population-based study comparing HRQoL among breast, prostate, and colorectal cancer survivors to propensity score matched controls, by cancer type, and gender. Psycho-oncology. 2013;22(10):2270-82. doi:10.1002/pon.3288.

28. Kao H-Y, Wu W-H, Liang T-Y, Lee K-T, Hou M-F, Shi H-Y. Cloud-Based Service Information System for Evaluating Quality of Life after Breast Cancer Surgery. PloS one. 2015;10(9):e0139252. doi:10.1371/journal.pone.0139252.

29. Huang H-Y, Tsai W-C, Chou W-Y, Hung Y-C, Liu L-C, Huang K-F et al. Quality of life of breast and cervical cancer survivors. BMC Women's Health. 2017;17(1):30. doi:10.1186/s12905-017-0387-x.

30. Yan B, Yang L-M, Hao L-P, Yang C, Quan L, Wang L-H et al. Determinants of Quality of Life for Breast Cancer Patients in Shanghai, China. PloS one. 2016;11(4):e0153714. doi:10.1371/journal.pone.0153714.

31. Ohsumi S, Shimozuma K, Morita S, Hara F, Takabatake D, Takashima S et al. Factors Associated with Health-related Quality-of-life in Breast Cancer Survivors: Influence of the Type of Surgery. Japanese journal of clinical oncology. 2009;39(8):491-6. doi:10.1093/jjco/hyp060.

32. Shi HY, Uen YH, Yen LC, Culbertson R, Juan CH, Hou MF. Two-year quality of life after breast cancer surgery: A comparison of three surgical procedures. European Journal of Surgical Oncology. 2011;37(8):695-702. doi:10.1016/j.ejso.2011.05.008.
33. Ou HT, Chung WP, Su PF, Lin TH, Lin JY, Wen YC et al. Health-related quality of life associated with different cancer treatments in Chinese breast cancer survivors in Taiwan. European journal of cancer care. 2019;28(4):e13069. doi:10.1111/ecc.13069.

34. Ng TE, Ang ZR, Tran XB, Ho SC, Zhang Z, Tan W et al. Comparing Quality of Life in Breast Cancer Patients Who Underwent Mastectomy Versus Breast-Conserving Surgery: A Meta-Analysis. International Journal of Environmental Research and Public Health. 2019;16(24). doi:10.3390/ijerph16244970.

35. Zehra S, Doyle F, Barry M, Walsh S, Kell MR. Health-related quality of life following breast reconstruction compared to total mastectomy and breast-conserving surgery among breast cancer survivors: a systematic review and meta-analysis. Breast Cancer. 2020;27(4):534-66. doi:10.1007/s12282-020-01076-1.

36. Reimer T, Gerber B. Quality-of-life considerations in the treatment of early-stage breast cancer in the elderly. Drugs & aging. 2010;27(10):791-800. doi:10.2165/11584700-000000000-00000.

**Additional Material**

File name: Additional file 1

File format: .pdf

Title of data: The calculation of utility scores from EQ-5D-5L health profile

Description of data: Detail calculation of utility scores from EQ-5D-5L health profile using the value set of Vietnam

File name: Additional file 2

File format: .pdf

Title of data: Additional analysis

Description of data: Results from ordinary least square (OLS) regression models and generalized linear models (GLM) in relation to the assessment of the determinants of EQ-VAS and utility scores