WORK ABILITY IN HEALTHCARE WORKERS (HCWS) AFTER BREAST CANCER: PRELIMINARY DATA OF A PILOT STUDY

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Abstract – Objective: *Disabilities resulting from breast cancer (BC) treatment often reduce the quality of daily life and affect working and social life. This study investigated the residual work ability in a cohort of female healthcare workers (HCWs) suffering from BC.*

Patients and Methods: *The study analyzed a cohort of female HCW's operating at a hospital in Southern Italy. Each HCW underwent a medical examination and routine laboratory tests and a questionnaire on the Work Ability Index (WAI)*

Results: *Out of the 663 (100%) HCW's undergoing health surveillance, 6% (n=40) had been affected by BC; however, only 75% (n=30) agreed to join the study. 23 (77%) worked night shifts. The average number of days of absence from work was 155.8 ±205.4 days in nurses/technicians and 128.2 ±239.7 days for doctors/biologists. The WAI score was very low in 2 (7%) cases; moderate in 9 (30%) cases, good in 7 (23%) cases and excellent in 12 (40%) HCW's. The nursing/technical staff has lower WAI scores than the other health figures. Arm/shoulder pain, numbness, limited mobility in the upper limbs and lymphoedema were the main comorbidities reported by HCW's which affected WAI score.*

Conclusions: *A greater absence from work was observed in nurses and technicians compared to doctors/biologists, also justified by the different professional risks that see them perform a physically more demanding job, i.e. manual handling of loads. WAI showed lower scores in nurses/technicians than in doctors/biologists. Morbidity in the upper limbs is one of the main complications that can negatively affect any work activity. This seems to affect the return to work, evident in sick leave days and in the ability to perform tasks.*

KEYWORDS: *Work ability, Healthcare workers, Breast cancer, Night shift workers.*

INTRODUCTION

About 371,000 new cases of malignant cancer are yearly diagnosed in Italy; 178,000 of these affect women and breast cancer (BC) represents the 30% of the total[1].

Between 2003 and 2019, BC incidence rate was rising slightly (+0.3% year); whereas the mortality rate significantly continues to decline (-0.8% year). These data were due to the efficiency of new treatments as well to early diagnosis, that allows to detect cancer at an early stage[1].

Nowadays, the average survival, five years after the diagnosis, is 87% of total cases. The average survival 10 years after the diagnosis is 80%[1]. The total number of new cases of BC registered annually worldwide is about 1,700,000[2-4].

In the USA, each year about 10,000 new BC cases (5%) are recorded among women with an age <40 years; in Asia, as for the same age range, it gets to 13% [2,5,6]. BC is also confirmed as the leading cause of death from oncological disease in the Italian female population, with about 12,000 deaths/year[7].

There are many factors that affect the incidence of BC: increased life expectancy; changes in reproductive patterns; lifestyle; use of hormones during menopause; increasing prevalence of obesity; factors related to the socio-cultural environment and increased early diagnosis, mainly due to effective screening programmes[1,8].

The main recognized occupational risk factors are ionizing radiation, ethylene oxide and shift/night/ work[8-16]. These risk factors are often present in healthcare facilities[16].

According to recent scientific literature, there are correlations between shift work, especially night work, and an increase in the incidence of BC[17,18]. Night work, capable of disrupting the normal heart rhythm[19-22], has been classified by the International Agency for Research on Cancer (IARC) as a probable carcinogen factor for humans (Group 2A) [8,9,14].

The treatment of these tumors often involves surgical therapy combined with chemotherapy and radiotherapy[23]. These therapies are extremely aggressive with the tumor, often generating localized and systemic damage, which also causes severe disabilities[23]. Disabilities resulting from BC treatment often reduce the quality of daily life and affect working and social life[24-28].

Some studies[29,30] have pointed out that BC-treated women of lower working classes need a longer period of rest from work and an increased loss of working capacity.

In this study, the residual working ability was investigated in a cohort of female healthcare workers (HCWs) who were suffering from BC.

PATIENTS AND METHODS

The study was conducted in 2018 and it involved female HCW's operating at a hospital in Southern Italy. Inclusion criterion was women with previous BC diagnosis.

Exclusion criteria were presence of other systemic diseases such as heart disease; diabetes; not being retired.

All HCW's invited to take part in the project were informed about the study's objectives and procedures. Adherence to the study was on a voluntary basis. Each subject signed the informed consent. The study was approved by the University of Catania's Ethics Committee (Catania, Italy).

For each worker, a careful family, pathological and work history was carried out, in order to highlight any occupational exposures that might have influenced the tumor onset. Using a questionnaire, the voluptuous habits of each individual worker and the activities carried out in her time off were investigated[31].

In addition, the oncology diary was requested for each HCW, updated to the latest therapies and monitoring performed, as well as all genetic, histological and diagnostic imaging tests already made[32,33].

Each HCW underwent medical examination and routine laboratory tests plus a questionnaire on the Work Ability Index (WAI)[34].

Shortly, WAI is a synthetic index used to evaluate an operator's individual work ability with the aim of determining working skills according to age, pathologies, etc[35]. WAI scores were calculated based on the standard method provided by the Finnish Institute of Occupational Health (FIOH)[35,36].

WAI contains 7 questions investigating the following areas: current working capacity compared with one's best life period (0-10 points); ability to work in relation to the job requirements (2-10 points); diagnosed pathologies (1-7 points); reduction of working capacity due to illness, estimated by the individual (1-6 points); sick leave over the past 12 months (1-6 points); personal expectations of one's work skills two years onwards (1-7 points); psychological conditions/resources (1-4 points)[37-39].

The WAI score (score: 7-49) is divided into 4 levels: low (score 7-27); moderate (score 28-36); good (score 37-43); excellent (score 44-49) [34,35,38].

A homogeneous 1:1 matching control OS group was selected for anthropometric characteristics, work history, etc. Inclusion criteria: women who had never had BC and still in service. Exclusion criterion: presence of systemic diseases such as heart disease, diabetes, etc.

Statistical Analysis

Statistical analysis was carried out with SPSS software (IBM Corp., SPSS Statistics for Windows, Version 23.0. Armonk, NY, USA). The collected data were included in an ad hoc built database. The descriptive statistics was used to characterize the groups of subjects in the study and the associa-
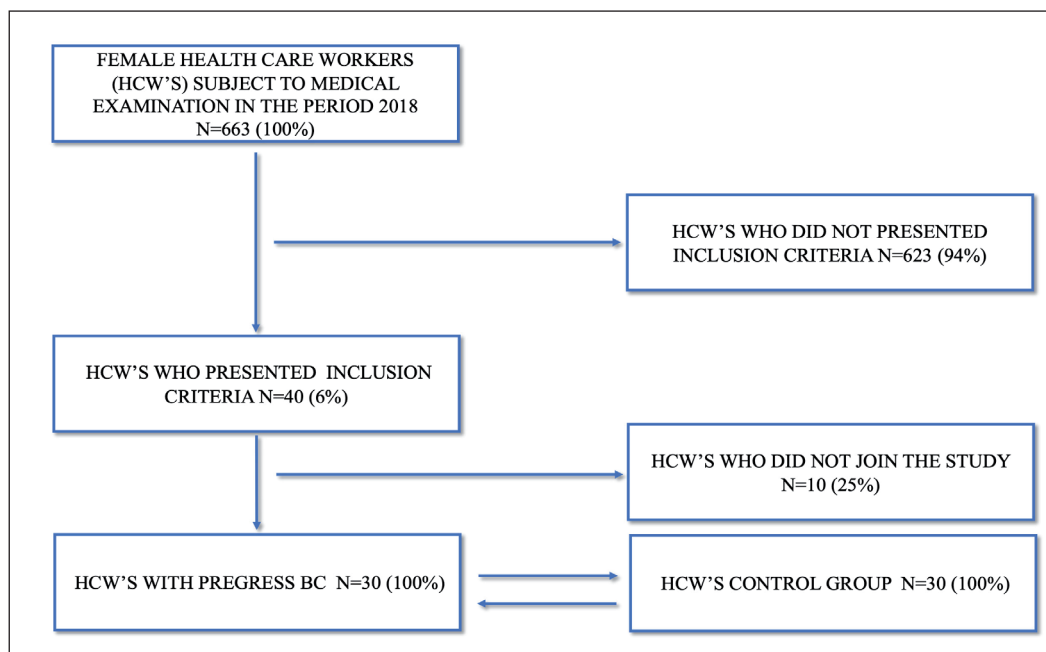
Fig. 1. Descriptive flow-chart of the studied sample.

tion between the different variables were analyzed with chi-square test (X_2) or Fisher's exact test and Student's *t*-test. The appropriate association measures were estimated by means of the odds ratio (OR; 95% CI). Significant factors/variables to the univariate analysis and logistic regression models were applied. Statistical significance was set for *p*<0.05.

RESULTS

Out of the 663 (100%) HCW's undergoing health surveillance in 2018, 6% (n=40) had been affected by BC. The diagnoses had been made in the period 2002-2017. Only 75% of the 40 HCWs (n=30) agreed to join the study. Of the 10 HCW's not joining the study, 9 (90%) refused, for work reasons, for not having enough time to participate in the study; 1 (10%) did not want to live a dramatic event in her life again. Figure 1 shows the descriptive flow-chart of the sample recruitment.

The average age of HCW's was 53.7 ±7.4 years, with service length of 26.1 ±7.5 years. Their average BMI was 25.1 ±2.7 (overweight). Table 1 shows the main characteristics of the sample.

Out of the HCW's that took part in the study, 23 (77%) worked shifts, including night ones. 11 (37%) belonged to the medical area, 9 (30%) to the surgical area, 10 (33%) to the service area. 13 (43%) were doctors/biologists, 17 (57%) were nurses/technicians.

The average age of the menarche was 11.7 ±1.2 years; the average age of menopause was 44.7 ±4.9 years, although 3 (10%) HCWs were still menstruating. 10 HCW's (33%) were nulliparous, 20 (66%) had 1.7 ±0.6 children. Of these last 20, 18 (90%) had breastfed their children. 11 (36%) had undergone hormone therapies during their lifetime. Only 9 (30%) HCW's reported familiarity for BC.

A comparison between the cases and controls showed a statistically significant difference in familiarity for BC and hormone therapy.

At diagnosis, the HCW's average age was 45.1 ±7.1 years and an average length of service of 16.6±8.7 years. 23 (77%) HCW's worked shifts, including night work. 53% of HCW's (n=16) used oral contraceptives. Table 2 shows the main characteristics of the sample at the time of diagnosis.

The job-related risks identified for each worker were: 30 (100%) biological risk; 21 (37%) use of video display units; 17 (57%) hand lifting of patients; 23 (77%) shift work, including night work. In no case had there been exposure to known carcinogens.

From the analysis of the association between BC and risk factors, only a significant correlation with shift work was observed: OR=1.51, CI 95% (1.47-1.56).

Examination of medical records concerning BC showed that 20 (67%) HCW's had had BC, histologically classified as Luminal-A (ER+ and/or PgR +HER2-); 4 (13%) HCW's had the Lu-

TABLE 1. Main characteristics of the sample.

	HCW's with previous BC 30 (100%)	Control group 30 (100%)	p-value
Average age (years)	53.7 ±7.07	52.9 ±6.9	n.s.
Menarche (years)	11.7±1.2	12.1±1.4	n.s.
Menopause (years)	44.7 ±4.9	45.2 ±4.7	n.s.
Length of service (years)	26.1±7.5	24.9±6.2	n.s.
Shift workers	23 (77%)	15 (50%)	n.s.
BMI (Kg/m^2)	25.1 ±2.7	25.3 ± 2.4	n.s.
Smokers	3 (10%)	5 (16%)	n.s.
Packages/year	14.5 ±2.5	15.1 ±2.1	n.s.
Alcohol intake	2 (7%)	3 (10%)	n.s.
N° Doctors/biologists	13 (43%)	11 (37%)	n.s.
N° Nurses/technicians	17 (57%)	19 (63%)	n.s.
Surgical area	9 (30%)	8 (27%)	n.s.
Medical area	11 (37%)	13 (43%)	n.s.
Service area	10 (33%)	9 (30%)	n.s.
Nulliparous	10 (33%)	9 (30%)	n.s.
BC Familiarity	9 (30%)	1 (3%)	p<0.05
Hormonal therapy	11 (36%)	0	p<0.05
Breastfeeding	18 (60%)	16 (54%)	n.s.

minal-B form (ER+ and/or PgR+ HER2+) and 6 (20%) HCW's had the Her2+ form. Table 3 summarizes the therapy adopted in relation to the histological classification.

Mastectomy was necessary in 20% (n=4) HCW's, with histological classification of Luminal-A and in 67% (n=4) HCW's classified Her2+. The quadrantectomy had been performed in 80% (n=16) of the HCW's, Luminal-A positive; in 100% (n=4) of the positive Luminal-B HCW's and in 33% (n=2) of the Her2+ ones.

Lymphadenectomy was applied in all cases (n=18) of positive sentinel lymph node. In 23 (77%) HCW's, it was necessary to apply a combined chemo and radiotherapy protocol; while in the remaining 7 (23%), all Luminal-A positive, only the protocol with radiotherapy was applied.

According to the TNM (Tumor-Nodes-Metastasis) classification[40], 30% (n=9) of the HCW's, at diagnosis, presented stage I tumor form with no lymph nodes involved and distant metastasis; 13% (n=4) had a tumor *in situ*, Stage 0; instead, 20% (n=6) was in Stage II A and another 20% at Stage II B. 14% (n=4) of HCW's at diagnosis were already at Stage III A and only 1 (3%) at Stage IV. Table 4 shows the subdivision of the sample according to the TNM classification.

Only 10 (33%) HCW's were followed-up with half-yearly periodic checks; 19 OS (64%) had had BC more than 5 years before and were currently undergoing screening programs. At the time of the questionnaire, only one HCW's was undergoing chemotherapy again, with distant bone and lymph node metastases.

All 30 (100%) workers had returned to work. The average number of days of absence from work was 155.8 ±205.4 days in nurses/technicians, compared to 128.2 ±239.7 days for doctors/biologists.

TABLE 2. Main characteristics of the cases of HCW's with BC at the time of diagnosis.

	HCW's with previous BC=30 (100%)
Age at diagnosis	45.1 ±7.1
Length of service (years)	16.6 ±8.7
Shift workers	23 (77%)
BMI (Kg/m^2)	23.6 ± 5.1
Smokers	13 (43%)
Packages/year	16.1 ±2.8
Alcohol intake	9 (30%)
Nulliparous	12 (40%)
Familiarity BC	9 (30%)
Hormonal contraception	16 (53%)
Breastfeeding	18 (60%)

TABLE 3. Therapy carried out in relation to the cancer histological classification.

	Luminal-A	*Luminal-B*	*Her 2+*
N° HCW's	20 (67%)	4 (13%)	6 (20%)
Mastectomy	4 (20%)	0	4 (67%)
Quadrantectomy	16 (80%)	4 (100%)	2 (33%)
Lymphadenectomy	10 (50%)	4 (100%)	4 (67%)
Chemotherapy	/	/	/
Radiotherapy	7 (35%)	/	/
Chemo/Radiotherapy	13 (65%)	4 (100%)	6 (100%)

Therefore, the return to work of nurses/technicians took an average time that was longer but not statistically significant, compared to the medical/biologist staff.

WAI average score was good in HCW's with BC (37.8 ±7.7) but lower than those obtained with the HCW's control group (38.2 ±7.7). In particular, the WAI score was very low in 2 (7%) cases; moderate in 9 (30%) cases, good in 7 (23%) cases and excellent in 12 (40%) HCW's with BC. The values observed in BC subjects were lower than those found in the control group, but in a non- statistically significant way (data not shown). Therefore, in the HCW's group with previous BC there had been a good functional recovery. Table 5 reports the results of the WAI questionnaire in relation to the therapy adopted.

By analyzing the type of therapy and the residual working ability, it was observed that HCW's treated with quadrantectomy (n=23) had a higher WAI score than those who had undergone a mastectomy (n=7); moreover, HCW's who underwent radiotherapy (n=7) had a higher WAI score than those who underwent chemo/radiotherapy (n=23).

Moreover, the nursing/technical staff revealed lower WAI scores than other health employees.

Arm/shoulder pain, numbness, limited mobility in the upper limbs and lymphoedema were the main comorbidities reported by the HCW's that affected WAI score.

DISCUSSION

Over the previous 3 decades, BC survival has significantly increased due to scientific and technological evolution in both diagnostic and therapeutic fields[23,41,42]. However, these treatments, often used in combination, have several side effects which, added to the effects produced by the disease, cause temporary and permanent inabilities[43-45].

The state of inability raises the question of reintroducing the BC patient to the workplace, enhancing the residual working ability. The integration at work of this group of people causes objective but also subjective difficulties, often related to psychological block and insecurities which, at times, generate in the patient the idea of refusing going back to work [46,47].

TABLE 4. TNM staging and classification.

				N° HCW's
STAGE 0	Tis	N0	M0	4 (13%)
STAGE I	T1	N0	M0	9 (30%)
STAGE II A	T0	N1	M0	/
	T1	N1	M0	5 (17%)
	T2	N0	M0	1 (3%)
STAGE IIB	T2	N1	M0	3 (10%)
	T3	N	M0	3 (10%)
STAGE III A	T0	N2	M0	/
	T1	N2	M0	2 (8%)
	T2	N2	M0	1 (3%)
	T3	N1,N2	M0	1 (3%)
STAGE III B	T4	N1,N2,N3	M0	/
STAGE III C	Ogni T	N3	M0	/
STAGE IV	Ogni T	Ogni N	M1	1 (3%)

TABLE 5. Results of the WAI questionnaire in relation to the therapy.

WAI Score	7-27 (Low)	28-36 (Moderate)	37-43 (Good)	44-49 (Excellent)
Quadrantectomy	1 (3%)	6 (20%)	5 (17%)	10 (33%)
Mastectomy	/	1 (3%)	5(17%)	2 (7%)
Lymphadenectomy	1 (3%)	5 (17%)	3 (10%)	5 (17%)
Chemotherapy	/	/	/	/
Radiotherapy	/	1 (3%)	2 (7%)	4 (13%)
Chemo/Radiotherapy	4 (13)	6 (20%)	10 (33%)	3 (10%)

Indeed, chemotherapy, radiotherapy, hormonal therapy and biological-immunological therapies in various combinations have influenced survival, increasing it by 30%, compared to all the disease stages[43,44]. BC treatment side effects arise in 80% of patients and may persist even after the end of therapy[44,46,48,49]. Morbidity in the upper limbs is one of the main complications that can negatively affect one's working activity, the psychosocial sphere and generally the quality of life[46,48].

Arm/shoulder pain, numbness, limited mobility in the upper limbs and lymphedema are the main comorbidities detectable after therapy[44,50].

This seems to affect the return to work, evident in sick leave days and in the ability to perform one's task[51]. Actually, few studies have analyzed residual working ability upon returning to work[51].

The purpose of this study was to analyze a cohort of HCW's, with previous BC, in order to assess residual working abilities in relation to age and pathology, considering the return to work as an important part of the recovery process.

The average age of the sample was around 54 years, in accordance with the data of the scientific literature that identifies the post-menopausal age as the most at risk[29]. From the analysis of the sample studied, 77% of the HCW's were shift-workers. Voluptuous habits such as smoking and alcohol were not very significant due to the low frequency in the sample (3 out of 30 women smoked and 2 said they usually took alcoholic beverages).

Instead, the OR analysis confirms that night work seems to be a risk factor[52] for the onset of BC, according to the IARC, which confirms that night shift work is probably carcinogenic to humans (Group 2 A)[14].

There was a higher frequency of BC among nurses and technicians than other health employees. In the same way, a greater absence from work was observed in nurses and technicians compared to doctors/biologists, also justified by the different professional risks that see them perform a physically more demanding job, such as for example manual handling of loads. As reported by the literature, the so-called "blue-collar employees" rather than the "white-collar ones" are those who delay the return to work the most[29,30]. Confirming this, the administration of the WAI questionnaire showed lower scores in nurses and technicians than doctors and biologists.

A significant variation was also observed in the WAI index score in relation to the type of treatment: the most disabling one (mastectomy + chemotherapy + radiotherapy) had led to such massive presence of side effects as to affect working capacity. The type of treatment received, surgery, chemotherapy, radiotherapy and hormone therapy, significantly influenced recovery times and their return to work; according to Gregorowitsch et al[53], patients' reported working capacity is severely reduced during breast cancer treatment and further reduced when undergoing chemotherapy or lymphadenectomy. It turned out that chemotherapy had been the most disabling treatment, increasing the absence due to its side effects. Arm/shoulder pain, numbness, limited mobility in the upper limbs and lymphedema are the main comorbidities reported by the HCW's (n=14) undergoing lymphadenectomy, with negative impact on normal daily life activities, as well the psychological sphere and, not least, their working activities. Since these are people who fall into the economically active domain, an early return, besides facilitating the recovery of the worker's healthy conditions, reduces chronicization risks which would further aggravate her condition.

About 50% of the HCW's had a stage 0-1 tumor at diagnosis, certainly thanks to the important screening programs that have allowed, over the years, a diagnosis of the disease at an increasingly earlier stage.

From the analysis of the economic impact for the hospital, it is highlighted that the average cost of lost working days amounts to approximately € 9,828.00; while a loss of productivity of about 30% was observed with an annual economic damage of € 32830,15 which must be calculated for the remaining years of work.

Return to work should symbolize a return to normal life and social reintegration, representing a challenge for the Occupational Physicians that can enhance their key role within the workplace and in society[24]. Scientific evidence suggests that a multidisciplinary approach would be preferred. Occupational health professionals should take note of individual and collective risk assessments, promote a healthy lifestyle (i.e., Mediterranean diet) before and after sick leave, encourage rehabilitation, and propose solutions to improve the interactions between employees and the workplace[15,54,55].

Encouraging patients with low-stage diagnoses to return to work would be advisable, enhancing their quality of life and reducing days of sick leave and requests for disability pension. High-stage patients could need more time to recover from chemotherapy; however, they should be encouraged if their general condition allows for it[15,24,56].

Study findings should be considered in terms of study limitations. The sample size was small and consisted of predominantly well-educated Caucasian women. Nonetheless, the findings provide initial evidence of a relationship between shift work and BC. Future studies should include larger and more diversified samples.

CONCLUSIONS

The correlation between shift work, including night work, and BC onset is confirmed by our study. Early diagnosis will result in less demolition procedures and the possibility of avoiding highly disabling treatments, such as chemotherapy[23,40]. This is accompanied, as highlighted in our study, by significantly higher WAI scores, therefore higher residual working abilities, this leading to guarantee an earlier return of women to the world of work.

CONFLICT OF INTEREST:
The authors declare no conflict of interest.

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