

Physical activity and quality of life among breast cancer survivors

Activité physique et qualité de vie chez les survivantes du cancer du sein

Nouha Ammar¹, Faten Ezzairi¹, Nihel Omri², Asma Ammar², Olfa Ezzi², Tessnim Ben ElGhali³, Mohamed Mahjoub², Imene Chabchoub¹, Slim Ben Ahmed¹, Mansour Njah²

1. Department of medical oncology, Farhat Hached university hospital Sousse Tunisia
2. Hospital hygiene department, Farhat Hached university hospital, Sousse Tunisia
3. Higher institute of nursing, Sousse, Tunisia

ABSTRACT

Background and purpose: To assess physical activity (PA) and its determinants in breast cancer survivors (BCS), attending a Tunisian hospital, as well as to assess their quality of life (QOL) and examine the relationship between PA and BCS'QOL.

Methods: We conducted a cross-sectional study among BCS attending the outpatient oncology, gynecology and radiotherapy clinics at a Tunisian hospital in April 2022 using a self-administered questionnaire. The valid Arabic version of the International Physical Activity. Questionnaire short version was used to assess PA and sitting time. QOL was assessed using the valid Arabic version of the 12-item Short-Form health survey .

Results: A total of 95 BCS were recruited. BCS reported overall moderate PA levels with a median MET of 1440 (IQR 680- 2400) minutes/week and a mean total sitting time of 281.79±134.36 minutes/day. Overall, patients aged 50 years and above had significantly lower levels of sitting time (231.43±129.32vs 332.14±121.63, p= 0.04). Similarly, subjects aged 50 years and above, and of rural origin had higher levels of PA (1908.5 (IQR 939.7-3268.5) vs. 1266 (IQR 471-2946), p= 0.114 and 1788.5 (IQR 1072.5-3252) vs. 1440 (IQR 537-3057), p= 0.259 respectively). Regarding BCS'QOL, they showed moderate disability in the physical component (39.3 ±7.08) , and mild disability in the mental component (43.94 ±9.23). BCS' QOL was significantly correlated to PA (r=0,258, p=0,012).

Conclusion: Adherence to regular PA is effective in improving BC patients' survival rate . Therefore to enhance survivors' QOL, a healthy lifestyle including regular PA is well recommended.

Key words: Breast Cancer; Survivor; Physical activity; Quality of life

RÉSUMÉ

Contexte et objectif: Évaluer l'activité physique (AP) et ses déterminants chez les survivantes du cancer du sein (SCS), fréquentant un hôpital tunisien, ainsi qu'évaluer leur qualité de vie (QV) et examiner la relation entre l'AP et la QV des SCS.

Méthodes: Nous avons mené une étude transversale parmi les SCS fréquentant les cliniques ambulatoires d'oncologie, de gynécologie et de radiothérapie d'un hôpital tunisien en avril 2022 à l'aide d'un questionnaire auto-administré. La version arabe valide de la version courte du questionnaire international sur l'activité physique a été utilisée pour évaluer l'AP et le temps passé en position assise. La qualité de vie a été évaluée à l'aide de la version arabe valide de l'enquête sur la santé en 12 points (Short-Form Health Survey).

Résultats: Au total, 95 SCS ont été recrutés. Les SCS ont rapporté des niveaux modérés d'activité physique avec un MET médian de 1440 (IQR 680- 2400) minutes/semaine et un temps moyen de position assise de 281.79±134.36 minutes/jour. Dans l'ensemble, les patients âgés de 50 ans et plus avaient un temps d'assise significativement plus faible (231.43±129.32vs 332.14±121.63, p= 0.04). De même, les sujets âgés de 50 ans et plus, et d'origine rurale avaient des niveaux plus élevés d'AP (1908.5 (IQR 939.7-3268.5) vs. 1266 (IQR 471-2946), p= 0.114 et 1788.5 (IQR 1072.5-3252) vs. 1440 (IQR 537-3057), p= 0.259 respectivement). En ce qui concerne la qualité de vie des SCS, ils ont montré une incapacité modérée dans la composante physique (39,3 ±7,08) et une incapacité légère dans la composante mentale (43,94 ±9,23). La QV des SCS était significativement corrélée à l'AP (r=0,258, p=0,012).

Conclusion: L'adhésion à une activité physique régulière est efficace pour améliorer le taux de survie des patients atteints de cancer des seins. Par conséquent, pour améliorer la qualité de vie des survivants, il est recommandé d'adopter un mode de vie sain et de pratiquer une activité physique régulière.

Mots clés: Cancer du sein; Survivant; Activité physique; Qualité de vie

Correspondance

Nihel Omri

Hospital hygiene department, Farhat Hached university hospital, Sousse Tunisia

Email: nihel.omri94@gmail.com

INTRODUCTION

Breast cancer (BC), the most common female cancer worldwide, remains one of the most threatening public health concerns responsible for (55%) of women deaths in low- and middle- income countries, making it the leading cause of worldwide, despite being one of the most preventable cancers (1,2). Indeed, according to the Global Cancer Observatory estimates in 2018, BC represents the second most common cancer in the world with an increased incidence of more than 20% over the last four years, affecting 2.1 million women each year (3). Advances in BC screening, diagnosis, and treatment through time have significantly improved the life expectancy of survivors 4. In fact, the improved survival of BC patients does not only constitute a major medical achievement that poses new challenges for professionals and patients, but also brings attention to the post-treatment period, which is well characterized by the long-term impacts on patients' physical and mental health as well as long-term medical issues and lifestyle recommendations (4,5).

Since BC' therapeutic management is complex involving many treatment options , it can have substantial and lasting impacts ,in both the short and long term, on survivors' health-related quality of life (QOL), defined by WHO as *"an individual's perception of his or her place in life, in the context of the culture and value system in which he or she lives, in relation to his or her goals, expectations, norms and concerns"* (6,7). In fact, it has been well recognized as a broad concept that can be influenced in complex ways by the individual's physical health, psychological state and level of independence, social relationships, as well as his or her interaction with the environment ⁷. Moreover, it appears to be a multidimensional construct encompassing both positive and negative perceptions of dimensions such as physical, emotional, social, and cognitive functioning (8) .

Thus, to minimize the BC' therapeutic management psychological and physical effects, and to enhance survivors' QOL, a healthy lifestyle including regular physical activity (PA) is well recommended (9). In fact, according to Masson E et al, PA is not only limited to sports activities, it can be "total" including professional, domestic and leisure activities (10).

Associations between QOL, PA and mood states in patients with BC have not been well clarified. However, emerging studies have demonstrated that regular PA has positive effects on improving BC survivors' QOL and mood states, including mental stress, depression, anxiety and fatigue caused by BC treatment (11).

Despite the magnitude of BC morbidity and mortality in Tunisian women, there is a gap in data with most of work focusing on the assessment of clinical trends and, to date, little is known about changes in health status and QOL during the survivorship. Therefore, through this study, we aimed to assess PA and its determinants in BCS, attending a Tunisian University Hospital, as well as to assess their QOL and to examine the relationship between PA and BCS'QOL.

METHODS

Study design and participants

We carried out a cross-sectional study among female BCS consulting in the outpatient clinic of medical oncology, gynecology and radiotherapy at Farhat Hached university hospital, Sousse which is located in the central-eastern part of Tunisia. The study was performed during April 2022 using an anonymous, self-administered questionnaire. Only patients with BC over 20 years of age , without metastases or relapse, having completed their chemotherapy and presenting to the outpatient clinic for a control or a follow-up at a median of 45 (IQR: 21-69.75) days after the end of their last chemotherapy cure were eligible to participate in this study.

Measurement

The International Physical Activity Questionnaire, short version (short IPAQ)

The intensity of physical activity and sitting time was assessed by the valid Arabic version of the International Activity Questionnaire (IPAQ) (12). In fact, it was used to measure the time spent being physically active in the last seven days. Consisting of 7 items, it measures four domains of physical activity intensity: vigorous (refers to activities requiring intense physical effort resulting in much more normal breathing); moderate (refers to moderate physical activities requiring more difficult breathing than normal); walking and sitting. For each activity domain, subjects were asked to indicate the frequency and the amount of time (minutes/hours) usually spent on any of those days performing activities related to each domain (13). By referring to the IPAQ scoring protocol, metabolic equivalent task minutes per week (MET-minutes/week) were employed to calculate the physical activity level and intensity.

To compute the MET scores for each activity, the raw scores of total minutes spent over the last 7 days on vigorous activity, moderate-intensity activity and walking were multiplied by 8.0, 4.0, and 3.3, respectively. The total physical activity score was generated by summing up all the three sub-components of MET. Thus, METs were conceptualized into three physical activity levels: low (METs <600 min/week), moderate (METs 600-1,500 min/week), and high (METs>1500 min/week). The total sitting time (hours per day) was calculated based on subjects' recollections of total time spent sitting or lying down, excluding time spent sleeping, on a typical day (14,15).

The 12-item Short-Form health survey (SF-12)

Is the shortened version of the original 36-item Short-Form Health Survey (SF-36) (16). In fact, consisting in 12 items covering eight dimensions, it predicts at least 90% of the variance of the physical and mental summary scales derived from the SF-36 (15). All 12 items are conceptualized in two components: the "Physical Component Summary" (PCS-12) including General Health (GH), Physical Functioning (PF), Role Physical (RP),

and Body Pain (BP) and “Mental Component Summary” (MCS-12) including Vitality (VT), Social Functioning (SF), Role Emotional (RE), and Mental Health (MH) (16).

We used the Arabic version of the SF-12 which is a valid tool with Cronbach’s alpha values: MCS-12 ($\alpha = 0.707$) and PCS-12 ($\alpha = 0.743$) (17). For each participant, we calculated two summary scores of the MCS-12 and PCS-12 SF-12 (18). The score for each subscale ranges from 0 to 100. An overall score of 30 or less is indicative of a severe disability, a score of 30 to 39 is indicative of moderate disability, a score of 40 to 49 is indicative of mild disability and a score of 50 or more is indicative of an average quality of life. Thus, zero reflects the lowest health level and 100 the highest level 18, 19.

Statistical analyses

Statistical analyses were conducted using the Statistical Package for the Social Sciences (SPSS) for Windows version 21. For qualitative data, variables were expressed as frequencies and percentages. For quantitative data, the normality of the distribution was tested by the Kolmogorov-Smirnov test and the Shapiro-Wilk test. Quantitative variables with a normal distribution were expressed as means \pm standard deviation, those without a normal distribution were expressed as medians with inter-quartile range (IQR). The Student t-test and ANOVA test were used to compare means, the Mann Whitney U test and the Kruskal-Wallis test to compare medians. Correlations between medians were performed using Spearman's Rho Test. We set the statistical significance threshold P value at 0.05.

Ethical considerations

The survey protocol was approved by the Ethics Committee at the University Hospital Farhat Hached, Sousse, Tunisia. Approval number CER:06-2023 written administrative authorizations were requested from the heads of the departments concerned. A trained member of the study team distributed the questionnaires and explained the purpose of the study to each participant. Verbal informed consent was obtained from all of the patients. Respondents were free to refuse participation. Anonymity and confidentiality were ensured.

RESULTS

General characteristics of the study respondents

A total of 95 BCS were recruited, with a mean age of 50.2 ± 10.5 years. Over half of the samples (57%) were married. The majority (84%) had low educational attainments and half were housewives. For two-thirds of the participants (66%), the time since diagnosis was less than 5 years. Almost half of the patients (42.10%) were diagnosed with locally advanced cancer. Three out of four patients (75%) underwent surgery, (56%) received chemotherapy, and (73%) received radiation therapy. The mean BMI among cancer survivors was 25.55 ± 4.7 kg/m²

with almost two thirds were obsesses. More details are summarized in Table1.

Table 1. Participants’ Socio-demographic and Clinical Characteristics (N=95)

Socio-demographic and Clinical Characteristics	(Mean \pm SD)/ n (%)
Age (years)	50.2 \pm 10.5
Marital status	
Single	24(24)
Married	55(57)
Divorced	16(19)
Origin	
Urban	65(69)
Rural	30(31)
Educational attainments	
Primary and below	80(84)
Secondary and above	15(16)
Employment status	
Employed	45(47.36)
Non employed	50(52.64)
Socio-economic level	
High	22(24)
Medium	70(72)
Low	3(4)
Duration of survivorship (years)	
≤ 5	64(66)
> 5	31(44)
Stage of cancer	
Located	40(42.10)
locally advanced	55(57.90)
Surgery	
Yes	70(75)
No	25(25)
chemotherapy	
Yes	52(56)
No	43(44)
Radiotherapy	
Yes	70(73)
No	25(27)
Hormone therapy	
Yes	48(51)
No	47(49)
Surgical intervention	
Mastectomy	35(45.3)
Tumorectomy	60(54.7)
BMI(kg/m²)	25.55 \pm 4.7

Measure of physical activity among breast cancer survivors using the International Physical Activity Questionnaire, short version (short IPAQ)

Table 2 illustrates PA among BCS according to the short IPAQ items. In fact, most of them (45%) tended to have overall moderate PA levels with a median total MET of 1440 (IQR 680-2400) minutes/week and a mean total sitting time of 281.79 ± 134.36 minutes/day. More than half of the respondents (56%) reported being sedentary on the weekend.

Table 2. Measure of physical activity among breast cancer survivors using the International Physical Activity Questionnaire, short version (short IPAQ) (N=95)

Physical activity intensity	METs (minutes/week): Median [IQR]/ Mean±SD
Mild physical activity (METs <600 min/week)	231[148.5; 462]
Moderate physical activity (METs 600-1,500 min/week)	1440[680; 2400]
Vigorous physical activity METs>1500 min/week	480[160; 560]
Total	1638 [622; 3102]
Sitting time (in minutes/day)	281.79±134.36

aMET: metabolic equivalent task

Measure of breast cancer survivors’ quality of life using the 12-item Short-Form health survey (SF-12)

Overall, BCS tended to have moderate disability in the physical component (PCS-12) with a mean score of 39.3 ±7.08, and mild disability in the mental component (MCS-12) with a mean score of 43.94 ±9.23. Among the individual dimensions, ‘Vitality’ earned the highest score (60.22±11.63), followed in order by ‘Mental health’ (53.81±12.61), ‘Physical functioning’ (43.15±9.71) and ‘General health’ (42.06±11.96). On the other hand, the lowest scores were for ‘Role physical’ and ‘Role emotional’ (25.94 ±4.01 and 18.67±4.54 respectively) (Table3).

Table 3. Breast cancer survivors’ quality of life according to the 12-item Short-Form health survey (SF-12) (N=95)

Dimensions / Component summary	Mean±SD
Physical functioning (PF)	43.15±9.71
Social Functioning (SF)	41.52±12.79
Role physical (RP)	25.94 ±4.01
Role emotional (RE)	18.67±4.54
Body pain (BP)	40.83±9.57
Vitality (VT)	60.22±11.63
Mental health (MH)	53.81±12.61
General health (GH)	42.06±11.96
“Physical Component Summary” (PCS-12)	39.3±7.08
“Mental Component Summary” (MCS-12)	43.9±9.23

Association between participants’ socio-demographic, clinical characteristics and Short IPAQ scores

There were no significant differences in PA among all subjects based on the socio-demographic, clinical and anthropometrics characteristic. Despite this, subjects younger than 50 years, divorced, and of rural origin had higher PA levels (1908.5 (IQR 939.7-3268.5) vs. 1266 (IQR 471-2946), p= 0.114 ; 2133 (IQR 458.5-3533) vs. 1290 (IQR (607.5-3034.5), p=0.588; and 1788.5 (IQR 1072.5-3252) vs. 1440 (IQR 537-3057), p= 0.259 respectively).

Likewise, BCS with locally advanced cancer and those cancer had been diagnosed for more than 5 years reported higher levels of PA compared with other groups (1828 (IQR 791-2826) vs. 1578 (IQR 562.5-3252), p=0.870 and 1911(IQR951-3252) vs. 1512 (IQR 503.25-2965), p=0.18 respectively). In the other hand, patients aged 50 years and above had significantly lower levels of sitting time (231.43±129.32 vs. 332.14±121.63, p= 0.04). More details are summarized in Table 4.

Table 4. Association between socio-demographic and clinical characteristics of breast cancer survivors and Short IPAQ scores (N=95)

Characteristics	METs (minutes/week): Median [Q1-Q3]	p-value*	Sitting time (minutes/day) Mean±SD	p-value*
Age(years)^{a,c}		0.114		0.04
<50	1908.5[939.7-3268.5]		231.43±129.32	
>=50	1266[471-2946]		332.14±121.63	
Origin^{a,c}		0.259		0.812
Rural	1788.5[1072.5-3252]		274.29±165.93	
Urban	1440[537-3057]		284.29±124.35	
Educational attainments^{a,c}		0.868		0.489
Primary and below	1638[612-3102]		286.53±135.97	
Secondary and above	1433[623 -3390.2]		248.57±126.94	
Marital status^{b,d}		0.588		0.747
Single	1753[993.2-3237]		286.15±151.3	
Married	1290[607.5-3034.5]		289.09±119.48	
Divorced	2133[458.5-3533]		252±166.85	
Employment status^{a,c}		0.088		0.823
Non employed	2142[715.25-3301.5]		286.15±146.28	
Employed	1172[612-2133]		278 ±125.54	
Socio-economic level^{b,d}		0.104		0.349
Low	922[411.7-2624.2]		330±150.27	
Medium	1871[874.5-3171.7]		266.34±132.17	
High	951[372 ;1520]		300±60	
BMI(kg/m²)^{a,c}		0.136		0.689
Underweight or normal	2022[620.2-3692.2]		272.73±134.45	
Overweight or obese	1398[617-2767.5]		287.65±136.005	
Cancer stage^{a,c}		0.870		0.759
Located	1578[562.5-3252]		288±110.9	
Locally advanced	1828[791-2826]		276.77±152.3	
Surgical intervention^{a,c}		0.505		0.895
Yes	1638[625-3151.5]		280.47±130.091	
No	1534.5[429-3075]		286.15±153.272	
Intervention type^{a,c}		0.088		0.834
Mastectomy	1091[504 -2767.5]		276.52±144.43	
Tumorectomy	1938[1156.5-3351]		285 ±114.96	
Medical intervention chemotherapy^{a,c}		0.264		0.633
Yes	1671[682,5-3330]		274.55±129.93	
No	1243[577.5-3025.5]			
Radiotherapy^{a,c}		0.440		0.812
Yes	1638[570-3039]		284.29±135.18	
No	1654.5[846.7-3352.5]			
Hormone therapy^{a,c}		0.715		0.888
Yes	1578[700.5-3075]		279.31±139.12	
No	1671[617-3255]			
Current disease evolution^{a,c}		0.935		0.393
Remission	1422[736-3192]		261±138.02	
Stable	1671[612-3102]		293.33±132.83	

Association between participants’ physical activity and health related quality of life

The PCS-12 was found to be significantly and positively correlated with PA (r=0,258, p=0,012).Furthermore, regarding individual dimensions a significant positive correlation was observed between ‘General health’ and PA (r= 0.34, p= 0.001).

Thus, patients with higher PA levels showed better physical and general health. More details are provided in Table 5.

DISCUSSION

It is well recognized that cancer, regardless of its type, has a significant psychological and physical impact not only on patients undergoing treatment, but also on cancer survivors (10). Measuring the QOL of cancer survivors seems to be crucial for assessing patients' attitudes, treatment side effects, disease impact, treatment effectiveness, and thus for assessing the psychological and physical well-being of patients (13). Accordingly, the primary objective of this survey was to assess PA and its determinants in BCS, attending a Tunisian university hospital, as well as to assess their QOL and to examine the relationship between PA and BCS' QOL. Most BCS tended to have moderate overall PA levels and high levels of daily sitting time. It is now obvious that a substantial number of socio-demographic and clinical cancer features have been identified as influencing PA levels in BCS. In terms of QOL, BCS reported mild to moderate disability. Moreover, BCS' QOL was significantly and positively correlated with PA. This study seems to be one of the first to deal with this topic in the Tunisian context.

Overall, respondents reported moderate levels of PA which is consistent with previous studies' findings (20,21). On the other hand, this study revealed significantly higher PA levels within our sample compared with those observed among BCS in similar researches (13, 22, 23). Although the likely reason for PA avoidance is the physical pain, which has been described, in the fear-avoidance model disseminated by Vlaeyen as the major barrier, the sampled BCS appear to have satisfactory PA. This could be attributed to the significant role that women play in Tunisian families despite their sometimes disabling illness. It should be noted that lymphedema has long been described as a limiting factor to PA identifying as a barrier by BCS (23,26). However, other researches have shown that PA does not increase the risk of lymphedema and does not worsen secondary lymphedema. It may even contribute to a reduction in its size (27).

BCS younger than 50 years reported higher levels of PA which is in agreement with emerging studies (23, 28). In this context, an Italian meta-analysis conducted by Spei et al. revealed that PA was significantly more common among younger patients. Thus, advanced age was a determinant factor of lower levels of PA after BC diagnosis (25). Because older patients have comorbidities, and limited physiological physical abilities, they are more likely to engage in sedentary behavior (13). Our study highlights the need for clinical and public health interventions as well as individual assistance targeting BCS, as morbidity and mortality rates are highest in this group.

Furthermore, patients of rural origin had higher levels of PA which is consistent with earlier researches (29).

In this way, a recent Canadian study investigated whether certain demographic and geographical characteristics were associated with early cancer death revealed that living in urban areas was an adverse prognostic factor for having a good QOL (30). Our findings are likely explained by the fact that Tunisian women living in rural areas may have less access to a personal or family vehicle and fewer public transport infrastructure

close to their homes. Improved transport conditions can be accompanied by a decrease in walking, a practice which is nonetheless beneficial to health particularly in BCS.

Divorced BCSs reported higher levels of PA, which is in concordance with prior surveys (25,31). In fact, the transition to divorce expects an increase in PA as women take on additional responsibilities. This specific factor seems to be closely related to the cultural aspects of Tunisian society, which relies on women to keep the home running.

Women with locally advanced cancer reported higher PA levels than other groups, which is consistent with a large number of studies worldwide (32). In fact, there is a common belief that women survivors of BC reduce their PA and that this reduction depends on the stage of the cancer, which explains why the emerging literature has focused on women with locally advanced cancer or stage I to III cancer and has seemed to exclude women with stage IV/advanced cancer, as they do not appear to be well enough to practice PA (33).

Similar findings were reported among those with a cancer diagnosis older than 5 years who reported higher PA levels, which is consistent with earlier researches disclosing that BCS were significantly less physically active within their first year after diagnosis (34). In fact, recent trends have revealed that within one to four years post BC diagnosis, patients still have not fully recovered to their pre-diagnosis PA levels (35). Thus, BCSs seem to adopt a self-restrictive attitude for fear of relapse or recurrence or the risk of worsening treatment-related symptoms.

This decrease in PA after BC diagnosis was identified as leading to increased body weight. In the same way, obese BCS were more likely to be sedentary, so reporting lower PA levels.

Indeed, the BC survivorship literature has commonly focused on the ways in which obesity negatively impact BCS' ability to engage in regular PA (14,34). This highlights the need for PA programs targeting obese BCS in order to improve not only their QOL but also their cancer outcomes and prognosis.

In terms of QOL, BCS tended to have mild to moderate disability. In fact, our findings corroborate the growing evidence that, after treatment, BCS maintain satisfactory levels in both physical and mental health component (36). Moreover, sampled BCS showed a mild disability in the mental component which is consistent with a previous study suggesting that BCS' mental well-being appears to be positively associated with long-term patient engagement in PA (37).

The PCS-12 was significantly and positively correlated with PA. Similar findings have been well reported (4,36). Moreover, regarding individual dimensions a significant positive correlation was observed between 'General health' and PA. Indeed, a recent Brazilian study revealed a statistically significant negative correlation between fatigue scores and PA as well as QOL scores. Thus, the most physically active BCS experienced the lowest level of fatigue symptoms (38). A likely explanation is that regular PA has been shown to be protective of the arm and shoulders, reducing the incidence of lymphedema and functional discomfort.

Moreover, numerous randomized controlled trials have demonstrated that PA improves functional capacity, cardio-respiratory fitness and endurance during and after treatment as well as it attenuates treatment-related symptoms particularly fatigue (23). This being the case, it allows BCS to

be independent and thus have a satisfactory QOL. In light of the results obtained, it seems crucial to implement new prevention strategies in order to improve BCS'QOL, including a national oncology supportive care strategy providing a "supportive care basket" that encompasses both physical and psychological care for BCS, implementation of listening cells, education and coping skills programs particularly cognitive behavioral therapies as well as PA awareness among BCS to improve their engagement in regular PA and therefore improve their QOL.

Only a few Tunisian studies have focused on the analysis PA and its determinants in BCS as well as its association with their QOL. Thus, our survey seems to be one of the first Tunisian studies to deal with this subject based on a rigorous methodology with reliable and valid tools. However, the current study has some limitations that should be acknowledged. Firstly, the cross-sectional nature of the data did not allow us to draw causal conclusions, but only simple associations, further longitudinal studies on this topic are desired in the future. Second, the present survey was conducted in a single Tunisian region, which limits the representativeness of our findings. In addition, data were self-reported which might be subject to social desirability bias. Finally, it's worth noting that we did not have a base line evaluation of PA and QOL before the cancer diagnosis or before therapy, it is possible that the observed results were independent to BC diagnosis.

CONCLUSION

This survey pointed out multiple factors that may influence BCS' engagement in PA. Regular PA was highlighted as having beneficial effects on BCS'QOL. Therefore, there is a pressing need to evaluate BCS'PA in the medium and long term post treatment. Moreover, in order to achieve the 'Healthy survivorship' goal, further effective strategies and policies should be implemented.

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