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Prevalence of physical activity and its associated factors among breast cancer patients in Peninsular Malaysia: A multi-centre cross-sectional study

Abstract—Shift in the dispersion of breast cancer population continues to be a major health concern for women in the developing countries. However, prevalence and associated factors of physical activity among this population have not been explored in Malaysia. This study determined the profile and factors associated with physical activity in the breast cancer women. A multi-center cross-sectional survey was conducted among 399 breast cancer women. Socio-demographic questionnaire was used to generate socio-demographic and clinical data. Physical activity was assessed using the international physical activity questionnaire (IPAQ-SF). Sociodemographic variables were summarized by descriptive statistics. Factors associated with physical activity were identified using Logistic regression analyses. Majority of the participants were married (83.9%), had surgery (92.4%) and menopause (74.1%). The overall physical activity prevalence was 39.4%. Non formal education (Adjusted Odds Ratio [AOR] 5.80; 95%CI: 1.65, 52.15; p=0.017), having had surgery (AOR 0.18; 95%CI: 0.04, 0.79; p=0.023), <1 year post diagnosis (AOR 1.16; 95%CI: 1.02, 5.36; p=0.039) and attaining menopause (AOR 4.50; 95%CI: 2.07, 7.28; p=0.005) were the significant factors associated with physical activity. Physical activity participation was low in the studied population. Non formal education, undergoing surgery, early diagnosis and menopausal status were associated with poor physical activity.

Keywords —Breast cancer survivors, IPAQ, Malaysian Women, Physical activity, Sociodemographic

1 INTRODUCTION

In the past two decades, about 59% of breast cancer cases were said to have occurred in the developed countries comprising North America, Europe, Australia, New Zealand and Japan, even though these countries contributed less than 25% of the female population in the world as at the time of the report [1]. There was a tremendous change in the events afterwards whereby, the total number of newly diagnosed breast cancer cases spread evenly between the developed and developing countries [2, 3]. It was reported recently that majority of female breast cancer cases were occurring in the developing countries [4]. This shift in the global dispersion of the cases features continues emergence of breast cancer as a major health concern for women in Asia, Africa and South America [5]. The disease ranked first for females in majority of countries in the Asia-Pacific and accounts for 18% of all cancer diagnoses within the region. The burden among Malaysian women is substantial and has become a matter of interest to the public health [5]. This can be proven by the attention it is receiving in terms of the number of organizations that are being

established. In addition, most of the campaigns carried out for the awareness of cancer gave breast cancer much priority [6].

Breast cancer etiology is heterogeneous [7] and various risk factors have been reported. Broadly, risk factors implicated for development of breast cancer may be categorized into the modifiable and non modifiable. The modifiable factors include lifestyle parameters such as dietary habit and physical activity. Changes in lifestyle such as unhealthy dietary habit and physical inactivity witnessed in the Asian countries are attributable to the so called "Westernization" [8]. Physical inactivity is linked to poor prognosis among breast cancer patients whereas participation in physical activity, which is also a modifiable risk factor for other non communicable diseases, has been shown to reduce the risk of breast cancer. Physical activity (PA) has also been shown to have myriads of beneficial effects following breast cancer diagnosis. Physical activity helps in the prevention as well as the alleviation of the negative side effects such as fatigue, functional decline, added weight, sleeplessness, and deterioration in quality of life commonly

encountered by breast cancer patients during and after treatment. Regrettably, the health care delivery system in most of the low and middle income countries (LMICs) tend to give much consideration to the cure facet of cancer care continuum thus, the survivorship aspect is given less concern than it requires. Customarily, attending clinicians would advise the patients not to engage in PA or exercise, but nowadays, emerging evidences have proven the safety of physical activity both during and after cancer treatments [9].

All over the globe, the prevalence of physical activity varies widely; in women it ranges from 28% to 96.2% [10]. In Malaysia, there have been improvement in the levels of physical activity participation over the decade, may be because of the government's commitment to promoting healthy lifestyle [11]. However, the focus has been the general population, thereby, not giving attention to the cancer population which is continuously expanding. In addition, although emerging literature is showing a shift of breast cancer incidence towards the LMICs, available data linking physical activity and the risk of breast cancer are rare. In Malaysia for instance, only a few studies recently assessed the role of lifetime physical activity on breast cancer occurrence [12, 13]. However, these studies focused on a particular area in Malaysia. Meanwhile, prevalence and associated factors of physical activity participation among this ever increasing population have not been explored. Thus determining the physical activity profile and factors associated with physical activity participation in this population may give first hand data that may be used for developing strategies to encourage and/or maintain physical activity participation. In this study, a multi-centre approach was used which provided wider and broader assessment of physical activity among the breast cancer survivors.

2 METHODS

The study was a multi-centre cross-sectional survey that determined the prevalence and associated factors for physical activity participation among breast cancer population. It was conducted in 6 selected hospitals from three states of Kedah, Kelantan & Penang in Peninsular Malaysia. The data was collected between June 2013 and April 2014. The sample size was determined based on proportional sample calculation as described by

Arya and colleagues [14]. Hence, 399 participants were needed.

Demographic data questionnaire was used to collect socio-demographic information which included age, marital status, educational status, and employment status and income level. Relevant clinical data which included duration since diagnosis, breast cancer stage at diagnosis, and type of adjuvant therapy were also collected. Participants' physical activity was assessed using the short form International Physical Activity Questionnaire (IPAQ-SF) that was translated into Malay from the original English version and tested for psychometric properties [11]. The self-reported physical activity of at least ten minutes done at once is measured and recorded in metabolic equivalent (MET) based on the intensities. Index of physical activity was dichotomized into sufficient and insufficient. Sufficient category identified participants who accumulated a minimum of 600 MET-minutes/week from a combination of any of the vigorous-, moderate-intensity activities or walking as recorded in the last seven days. This cut off value was used to present result of a study from the data of the Malaysian National Health and Morbidity Survey [11]. Hence this offered ease of comparison of the findings from the present study. Details of the IPAQ-SF information can be obtained at <http://www.ipaq.ki.se/scoring.pdf>.

Inclusion/ exclusion criteria

Malaysian breast cancer patients receiving treatment and/or attending follow-up clinics at the selected hospitals were eligible to participate in the study, provided they meet the inclusion criteria; female (aged 18-69 years) with histologically confirmed diagnosis of breast cancer, breast cancer patient that underwent any type of breast surgery and/or receiving any chemo/radiotherapy. Breast cancer patient having poor performance status (ECOG<1; i.e. unable to walk or perform light work) were excluded.

Ethical approval of the study was granted by the Human Research Ethics Committee, Universiti Sains Malaysia. All protocols of the study were carried out in accordance with good research practice principles as enshrined in the Helsinki Declaration.

Study procedure

Convenient sampling was adopted where breast cancer patients were approached when they

sought treatment or went for their follow-up appointment at the respective hospitals. The data were collected by a locally trained enumerator using a guided questionnaire. Before the interviews took place, the research objectives were explained to the respondents and their consents were taken. Prospective participants were identified through the Oncology clinics of the selected hospitals. The Oncologist and/or clinic staff had introduced the study to the patients and then the researcher/research assistant met with the participants individually during clinic visits for recruitment. The prospective participants were properly informed about the nature and purpose of the study. The participants were notified that participation was voluntary and participants may withdraw their participation at any time without any undue disadvantage(s). Also, anonymity and confidentiality of information were assured. The researcher, research assistant or trained enumerators then provided the participants with the informed consent form to append their signature. Thereafter those that agreed to participate in the study and signed the informed consent were given the questionnaire to fill in their response. Accordingly, the questionnaire was filled by the enumerator as the participant responds if she so wished. An average of 15 minutes was required to complete the assessment session. The demographic data form and IPAQ-SF were put together in one document. The researcher and the research assistant were available at the clinic for any question and or clarification that may be required by the participants.

Data Analysis

All data were cleaned and screened for missing and erroneous entry prior to analyses. Computation of the results for physical activity data was executed in line with the guidelines of the IPAQ. Descriptive statistics of mean and standard deviation were used to present the continuous variables such as physical characteristics, and the physical activity estimates of the participants. Descriptive statistics of frequency and percentages was used to describe the categorical data such as sociodemographic variables. Chi square statistics and student's t-test were used appropriately for categorical and numerical variables respectively, to compare the difference in physical characteristics, sociodemographic variables, and reported physical activity estimates.

Logistic regression analyses was employed to identify the factors associated with physical activity participation. First, a univariate logistic regression was applied. This was followed by multivariate logistic regression where the model significance was determined by the Backward Stepwise selection procedure and the preliminary main effect model was processed using enter method. Statistically significant variables with $p < 0.25$ and the variables found to be biologically plausible and clinically parsimonious from the literature were included in the multivariate analysis. This model accounted for matching by factors adjusted for in the literature. Similarly, multicollinearity and interaction terms were checked and a 2-way interaction was applied for the biologically plausible variables. To examine the model adequacy and fitness; Hosmer and Lemeshow test, classification table (overall correctly classified percentage) and area under the receiver operating characteristic (ROC) curve were carried out. The final model with adjusted odds ratio was obtained using multiple logistic regressions. Alpha level of significance was set at 0.05 ($p < 0.05$) throughout the study. All the data analyses were done with SPSS for windows (IBM Inc, version 22.0).

3 RESULTS

Sociodemographic characteristics

In Table 1, the sociodemographic characteristics showed that majority of the respondents were Malays (69.7%), 43-56 years old (56.0%) and married (83.9%). The Table also showed that 62.8% reported \leq RM500 as personal income per month. In all, however, the comparison of the general sociodemographic characteristics of breast cancer survivors with sufficient and insufficient physical activity showed no significant difference except in the educational qualification ($p = 0.035$).

Clinical characteristics

The clinical characteristics of the respondents are presented in Table 2. One hundred and nineteen respondents (43.9%) had breast cancer stage II and 44.6% were within the diagnosis duration 1-5 year's group. Also, overwhelming majority had undergone surgery (92.4%) and were taking chemotherapy (88.8%). Similarly, it was shown that 43.7% of the respondents had at least one comorbid condition and about three quarter (74.1%) had underwent menopause as a result of surgery, chemotherapy or normal onset.

Table 1: Sociodemographic characteristics of the respondents

Variables	Sufficient PA (n=119) n (%)	Insufficient PA (n=183) n (%)	Total n (%)	p-value
Age group (yrs)				0.492 ^a
29-42	17(5.6)	23(7.6)	40(13.2)	
43-56	70(23.2)	99(32.8)	169(56.0)	
>56	32(10.6)	61(20.2)	93(30.8)	
Race				0.962 ^b
Malay	82(68.9)	128(70.0)	210(69.7)	
Chinese	28(23.5)	39(21.3)	67(22.0)	
Indian	8(6.7)	15(8.2)	23(7.6)	
Others	1(0.8)	1(0.6)	2(0.7)	
Education				0.035 ^a
Primary	25(8.3)	48(15.9)	73(24.2)	
Secondary	77(25.5)	97(32.1)	174(57.6)	
Tertiary	15(5.0)	22(7.3)	37(12.3)	
None	2(0.7)	16(5.3)	18(6.0)	
Marital status				0.366 ^b
Single	5(4.2)	2(1.1)	7(2.3)	
Married	99(83.2)	154(84.2)	253(83.9)	
Divorced/Widower	15(12.6)	27(14.8)	42(13.8)	
Employment				0.678 ^a
Employed	40(13.3)	58(19.3)	98(32.6)	
Retired	10(3.3)	21(7.0)	31(10.3)	
Unemployed	69(22.9)	103(34.2)	172(57.1)	
Personal income				0.062 ^b
≤RM500	70(58.8)	120(65.6)	190(62.8)	
RM501-RM999	13(10.9)	14(7.7)	27(8.9)	
RM1000-RM4999	30(25.2)	47(25.7)	77(25.3)	
≥RM5000	5(4.2)	2(1.1)	7(2.6)	
Household income				0.519 ^a
<RM1000	23(8.2)	39(13.3)	62(21.5)	
RM1000-RM4999	29(10.3)	50(17.8)	79(28.1)	
≥RM5000	61(21.7)	79(28.1)	140(49.8)	

^aPearson's Chi square test was applied; ^bFisher's Exact test was applied; PA= Physical Activity

The clinical characteristics of the breast cancer survivors were compared among the groups under study. There was no statistically significant difference found in the group except for surgery (p= 0.025).

Prevalence of physical activity participation

The overall prevalence of physical activity participation is depicted in Table 3. To determine the profile of physical activity participation, the overall physical activity score was categorized in to sufficient and insufficient physical activity. This also allowed for ease of comparison for discussion purpose. One hundred and nineteen (119) representing 39.4% respondents have reported

Table 3: Prevalence of physical activity participation in the last 7days (n=302)

Variables	Sufficient physical activity (≥600 MET-min/week)	Insufficient physical activity (<600 MET-min/week)
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sufficient activity. However, the bulk of the reported physical activity among the participants in all the intensity categories did not attain sufficient amount required. About 98% of the respondents had insufficient vigorous-intensity physical activity. Similarly, only about 14% of the participants in this study reported having sufficient (≥600 MET-min/week) amount of moderate-intensity physical activity. The highest amount of sufficient physical activity was found in the walking category with 61(20.1%) respondents.

Table 2: Clinical characteristics of the respondents

Variables	Sufficient PA (n=119) n (%)	Insufficient PA (n=183) n (%)	Total n (%)	p-value
Cancer stage				0.852 ^a
I	21(7.7)	29(10.7)	50(18.4)	
II	47(17.3)	72(26.6)	119(43.9)	
III	28(10.3)	46(17.0)	74(27.3)	
IV	9(3.3)	19(7.0)	28(10.3)	
Diagnosis duration				0.117 ^a
<1 year	46(15.3)	92(30.7)	138(46.0)	
1-5 years	58(19.3)	76(25.3)	134(44.6)	
>5 years	14(4.7)	14(4.7)	28(9.4)	
Surgery done				0.025 ^a
Yes	115(38.1)	164(54.3)	279(92.4)	
Chemotherapy				0.668 ^b
Received chemo	104(87.4)	164(89.6)	268(88.8)	
Radiotherapy				0.594 ^b
Received radio	61(51.3)	92(50.3)	153(51.0)	
Comorbid condition				0.096 ^a
Present	45(14.9)	87(28.8)	132(43.7)	
Menopausal status				0.380 ^a
Post-menopause	85(28.1)	139(46.0)	224(74.1)	

^aPearson's Chi square test was applied; ^bFisher's Exact test was applied; PA= Physical Activity

Factors associated with physical activity participation

Level of education attained was found to be a significant factor associated with physical activity participation. Respondents without formal education were significantly likely to have insufficient physical activity (Adjusted Odds Ratio [AOR] 5.80; 95%CI: 1.65, 52.15; p=0.017). Others are time since diagnosis <1 year (AOR 1.16; 95%CI: 1.02, 5.36; p=0.039), having had surgery (AOR 0.18; 95%CI: 0.04, 0.79; p=0.023) and post-menopause (AOR 4.50; 95%CI: 2.07, 7.28; p=0.005). Factors associated with physical activity participation are shown in Table 4.

	n (%)	n (%)
Overall (total) PA	119 (39.4)	183 (60.6)
Vigorous-intensity PA	7 (2.3)	297 (97.7)
Moderate-intensity PA	42 (13.8)	262 (86.2)
Walking	61 (20.1)	243 (79.9)

PA= Physical Activity; MET= metabolic equivalent

Table 4: Established final model and summary of univariable and multivariable analyses for the associated factors for physical activity participation (n=302)

Variables	Simple Logistic regression			Multiple Logistic Regression		
	b	COR (95%CI)	p-value	b	AOR (95%CI)	p-value
Education						
Tertiary	0	1		0	1	
Secondary	-0.09	0.91(0.45, 1.86)	0.803	-0.35	0.70(0.30,1.63)	0.413
Primary	0.35	1.42(0.63, 3.20)	0.392	-0.13	0.88(0.34, 2.27)	0.787
None	2.45	11.64(1.40, 96.97)	0.023	1.77	5.80(1.65, 52.15)	0.017
Diag. duration						
>5 years	0	1		0	1	
1-5 years	0.30	1.35(0.60, 3.06)	0.470	-1.70	0.18 (0.02,1.57)	0.121
<1 year	0.66	1.94(1.40, 2.85)	0.014	1.83	1.16(1.02,5.36)	0.039
Surgery						
Yes	-1.20	0.30(0.10, 0.91)	0.033	-1.74	0.18(0.04, 0.79)	0.023
Menopause stat						
Post-menopause	0.23	1.26(1.23,4.75)	0.038	1.50	4.50(2.07,7.28)	0.005

Backward stepwise LR multiple logistic regression was applied; Multicollinearity and interaction term were checked and not found; Hosmer-Lemeshow test (p= 0.531), Pearson Chi-square test (p= 0.543), Classification table (Overall correctly classified percentage (78.1%) and area under Receiver Operating Characteristics (ROC) curve (82.3%) were checked for the fitness of the model and it was found to be fit.; COR= crude odds ratio; AOR= adjusted odds ratio ; b= regression coefficient; Had no surgery was the reference; Pre-menopause was the reference

4 DISCUSSION

The overwhelming benefits of physical activity to breast cancer patients substantiate the need to embark on studies that will unfold various approaches to engage in and maintain regular active lifestyle. Fortunately or rather unfortunately, however, factors specific to breast cancer populations may have influence over the various approaches to encourage physical activity participation. Furthermore, these factors differ across populations due to cultural and environmental diversity. As a consequence, findings from other parts of the globe may not be extrapolated for the Malaysian breast cancer survivors. In addition, although the benefits of being physically active are numerous, majority of breast cancer patients tend to be less active. Hence, investigating the prevalence of physical activity participation amongst Malaysian breast cancer survivors deserve to be accorded high priority, since this information is limited.

The findings from this study offered data on the physical activity participation post-diagnosis of breast cancer in Malaysian women population.

Prevalence of physical activity participation

Participants were categorized based on their physical activity participation into sufficient and insufficient activity. The sufficiently active category included respondents with a minimum 600 MET-minutes per week or more of their accumulated total physical activity in the last seven days. Respondents with total accumulated physical activity less than 600 MET-minutes per week were categorized as insufficiently active. This cut off value was used to present result of a study from the data of the Malaysian National Health and Morbidity Survey [11]. A study have reported 32% prevalence rate of physical activity among breast cancer survivors [15]. The present study found about the same (39%) prevalence of physical activity participation which is also, within the established range from the previous studies.

The result indicated that about two third of the respondents did not achieve the recommended level of physical activity participation. This finding is not similar to that of a study of the prevalence of physical activity among the general adult population in Malaysia [11]. That study reported three quarter of the women to have

been physically active. The disparity may not be unconnected to the peculiar nature of our participants who are breast cancer patients. The disease and its treatment are well known for their negative effects on physical activity. Moreover, participants from 'other' ethnic groups had highest level of physical activity which might contribute to the higher prevalence among the Malaysian healthy adult population. In case of the present study, only 3 participants were from 'other' ethnic groups. The large number of survivors of breast cancer not attaining the required level of physical activity buttress the need to take advantage and make good use of the moment often termed "teachable moment", a period immediately after diagnosis during the course of treatment [16]. Changes in the behavior of breast cancer survivors may be promoted at this period, and their health and well-being improved by participation in exercise training. Breast cancer survivors that are insufficiently active would gain from early intervention because they may have higher chances of accommodating psychological problems associated with their diagnosis for longer duration. Rehabilitation programs for survivors need to give utmost attention to these categories so that change in active lifestyle that lasts for longer period is encouraged.

Participants of the present study were found to be inclined towards light-intensity activity. Even though, the exercise intensity defined in metabolic equivalence (MET) has been identified as a leading factor that significantly determined the exercise benefits [17]. It is also of importance to note that the extent of the effect is higher with high intensity physical activity, yet it has been found that majority of the survivors did not meet the sufficient physical activity in their day to day affairs required to meet public health guidelines [18].

Also noted in the present study, most of the participants did not achieve the sufficient physical activity participation and the light-intensity predominated. However, the health benefits of exercise vary depending on the intensity of the exercise. Vigorous-intensity exercise offers greater benefits than low- or moderate-intensity exercise [19]. The light-intensity activity being predominant may be explained by the fact that, unlike the more strenuous activity, it can be done much frequently and for longer period during the week, thereby making huge effect on the total physical activity. On the other hand, vigorous-and/or moderate-intensity activity may be difficult

to maintain for longer duration by these participants. This would have impact on the physical activity levels and subsequent physical activity participation. For instance, it has been shown that about 4 out of 5 breast cancer survivors are not meeting required physical activity levels 10 years after diagnosis [20]. The lack of sufficient amount of moderate- to vigorous-intensity physical activity may not be surprising. The time since diagnosis varied widely in this study ranging from a few months to more than 10 years, however, majority of the respondents were five years and below. It has been reported that with increased duration since diagnosis, time spent doing physical activity tends to remain stable [21], otherwise it even decline after diagnosis [22].

Nevertheless, changes in physical activity that may occur would have demonstrated decline in the pre-diagnosis value to treatment period that may raise post-treatment [22]. In fact, majority of survivors of the breast cancer fail to regain their activity level after diagnosis if they were active before diagnosis [9]. Similarly, it has been reported that an estimated four out of five women diagnosed with breast cancer for the previous 10 years, failed to achieve the recommended physical activity level [20]. In the present study data is only available on post-diagnosis since the study design did not cover pre-diagnosis. Furthermore, it is difficult to explicitly compare the present results to other studies due to differences in methodology.

Factors associated with physical activity participation

Study on the predictors of physical activity participation among cancer survivors has expanded as the result of continued recognition of the benefits of physical activity in this population [23]. Identifying the determinant factors with potential influence over physical activity participation in the breast cancer population is important. This is because it will help in exposing the vulnerable women who might require inclusion of physical activity in their rehabilitation plan.

In the univariable analysis, age and educational attainment were found to be significant sociodemographic factors associated with physical activity participation. Meanwhile, breast cancer stage, duration since diagnosis, surgery and menopausal status were the significant clinical characteristic factors of physical activity in the univariable analysis. However, when these characteristics associated with physical

activity participation were tested in the multivariable analysis, educational attainment, diagnosis duration, surgery and menopausal status were retained in the model as the main factors predicting physical activity participation.

Breast cancer women who had no formal education were more likely to have insufficient physical activity. Experts' hypotheses revealed that people with low level of education may likely have sufficient physical activity since they mostly engage in a laborious work [24]. In tandem with this hypothesis, studies from LMICs have reported inverse association between level of educational attainment and physical activity participation [24]. Contrastingly, significant positive correlation between higher educational status and sufficient physical activity participation was found in the developed nations [25]. A good reason for this is persons with higher level of education tend to be better informed about the beneficial effects of physical activity to general health and well-being [24]. In Malaysia, since all efforts are being made persistently to attain the status of industrialized nation by the year 2020, it can be expected that with the rate at which level of literacy is growing, physical activity participation will also improve [11]. It is therefore reasonable to argue that breast cancer women with no formal education had insufficient physical activity; especially that no palpable difference was observed between breast cancer women and the women in general population when it comes to examining the predictors of physical activity participation.

Duration of diagnosis appeared to be associated with insufficient physical activity among the breast cancer survivors studied [15]. In their study, Irwin and colleagues reported breast cancer survivors to have statistically significant insufficient activity within the first year post diagnosis. In concordance, the established final model indicated that breast cancer women with less than one year of diagnosis duration were more likely to be insufficiently active, compared to their counterparts with more than one year duration of diagnosis. This result concurred with the finding reported from another study whereby levels of physical activity diminished considerably after diagnosis which may be linked with the decrease in pre-diagnosis level of physical activity [22]. This decrease in physical activity sometimes may be observed from six months to as high as 18 months after diagnosis. One explanation of the insufficient physical activity during the early diagnosis period

could be that immediately after diagnosis of the disease there may be a shock and the fear of the unknown regarding the future. Another reason and especially with the younger breast cancer survivors is that other concerns accompanying the disclosure of this information such as sexuality, parenting issues, loss of career, and depressive symptoms [26, 27]. All of these could lead to decline in physical activity participation. Again, as mentioned earlier on, early physical activity intervention will be immensely advantageous to this group of breast cancer patients, because they have brighter opportunity of assimilating the psychological concerns accompanying the diagnosis for even longer period. Notwithstanding, right time for the intervention is as good as the intervention.

Although treatment of breast cancer is vital and contributes to improved rate of survival, the adverse negative consequences associated with it affect the patients' ability to keep fit and active. For instance, fatigue, the adverse treatment effect common to chemotherapy and/or radiotherapy contributes to reduction in physical activity participation [28]. Unfortunately, chemotherapy and radiotherapy were not found to be associated with physical activity participation. To confirm further and due to the possibility of the women who underwent mastectomy to have both chemo- and radiotherapy as against one or no therapy, a group who had both the treatments was added. However, this also did not give any significant association.

This study found women who had no surgery were more likely to have insufficient physical activity compared with their counterpart who had surgery. The association between surgery and insufficient physical activity participation was found in the univariable analysis and was retained in the final established model of the multivariable analysis. This is an indication that the variable is a strong and independent determinant of physical activity participation in breast cancer survivors. Going further, to assess the type of surgery did not yield any significance among the various surgeries that included lumpectomy, partial and total mastectomy. However, type of surgery done on breast cancer patient has been found to have serious effect on psychological function; example lumpectomy has been associated with decreased psychological well-being [29]. Nevertheless, other variables such as the number of lymph nodes excised and the

size of the tumor that may influence the association between treatment type and physical activity participation were not assessed due to lack or scanty of available data. Also, type of the disease such as lobular carcinoma, ductal carcinoma in situ and so on that has been found to be associated with physical activity participation were not tested as a result of lack of available information. Understanding the disease and treatment correlates of physical activity is important due to the likely impact on physical health and well-being which may be reduced. Hence, breast cancer patients in this category need to be engaged with regular physical activity.

Menopausal status was yet another variable that showed significant association with physical activity participation. Women who have undergone menopause tended to be insufficiently active than the pre-menopause women. Although there are no other studies for comparison, it is plausible that post-menopausal women reconciling complications due to chemotherapy induced premature or even sudden menopause such as declined sexual functioning [30, 31], anxiety and depression [32] as well as emotional distress [33], find it rather strenuous to achieve sufficient level of physical activity participation in comparison to pre-menopausal women. By implication, most often physical activity diminishes. Moreover, among breast cancer survivors older age which is associated with attaining menopause has been commonly related to decrease physical activity participation in the literature [15]. Similarly, among the general population, physical activity behavior has been identified with age [11]. Therefore, designing a physical activity intervention that will cater for menopausal status can help address the lack of sufficient physical activity participation in this group of breast cancer survivors.

5 STRENGTHS OF THE STUDY

The study has several strengths to be acknowledged. One of the strengths of the study was high participation rate. Overall, 399 patients were given the study survey questionnaires, of which 334 (84%) were duly completed and returned. The response rate is all together high when compared to other studies among cancer survivors [34]. With the recruitment of a large sample from various hospitals in different states, the results are probably a representative of the breast cancer survivors in Malaysia. Also, the large sample size increased statistical power of the

study. Secondly, the broadly defined survivorship made it possible to include women of wider variations. This gave opportunity to explore various phases of the survivorship. The finding contributed to the literature on breast cancer survivorship through identifying the physical activity profile of this population. Also, understanding the pattern of their physical activity is another avenue to allow for integration of appropriate exercise at a point in time to maximize health promotion. In addition this study, identified determinants which will further enable the understanding of physical activity in an accumulated condition.

CONCLUSION

In conclusion, only about 39% of the breast cancer survivors surveyed in this study had sufficient level of physical activity participation. This uncovers the deficit in physical activity in the breast cancer population, hence the need for all hands to be on deck in order to ensure more survivors become physically active. The larger portion with insufficient physical activity deserves to be given serious attention so as to encourage them become more active. This can be achieved through proper policy design and development as well as utilization of decisive ways of promoting healthy lifestyle, which advocates physical activity participation among the breast cancer survivors' population in Malaysia. The physical activity participation showed more inclination towards the low-intensity which may not provide the much desired benefit expected from physical activity.

Breast cancer survivors need to be inspired and supported to achieve participation in higher intensity activities such as moderate- and vigorous-intensity exercises. Breast cancer survivors who are diagnosed shortly, had no formal education, had no surgery and underwent menopause were found to have insufficient physical activity participation in the present study. Thus it befits that particular concern is given to these vulnerable groups in promoting their physical activity behavior. The results here display the fact that breast cancer survivors with formal education and those without belong to different groups; each with its unique needs and so benefits in a unique way from engaging in physical activity as part of the process of recovery from the breast cancer. In all, the main benefit for both the groups is one that ensures all encompassing better health and well-being. This underscore the fact that

breast cancer survivors' participation in some kind of physical activity after diagnosis is a great deal superior over sedentary lifestyle. Essentially, irrespective of the level of physical activity of breast cancer survivor before diagnosis, it is good to begin with a bit of exercise with the hope of becoming physically active in the long run.

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