EVALUATION OF PHYSICAL ACTIVITY AND QUALITY OF LIFE AMONG BREAST CANCER SURVIVORS IN PENINSULAR MALAYSIA

by

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DECLARATION

I declare that, the research study presented in this thesis is my original work, and has not been submitted elsewhere in the past as a thesis to any institution of higher learning for the requirement of an award. The thesis to the best of my belief and knowledge does not contain except in places where proper acknowledgement is made, any written or published information by somebody else.

Signature..

Date...

DEDICATION

This thesis is dedicated to:

My late parents (Ahmadu Rufa'i Abdulqadir & Aminatu Muhammadu Bose) for all the toiling you have had to nurture me. Your wonderful prayers and guidance are with me in everything I have done, I am doing and I will do in feature. May your souls continue to rest in Jannat- al-Firdaus.

The entire family of late Ahmadu Rufa'i Abdulqadir for your prayers and concern about and over all my affairs.

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AACR	Australasian Association of Cancer Registries
ACS	American Cancer Society
ACSM	American College of Sports Medicine
AHA	American Heart Association
AICR	American Institute for Cancer Research
AIHW	Australian Institute of Health and Welfare
AJCC	American Joint Cancer Committee
ANOVA	Analysis Of Variance
BF%	body fat percentage
BMI	Body Mass Index
BMR	Basal Metabolic Rate
CDC	Centres for Disease Control and prevention
DHAC	Department of Health and Aged Care
DXA	Dual-Energy X-ray Absorptiometry
ECOG	Eastern Cooperative Oncology Group
ER	Estrogen Receptor
EORTC QLQ	European Organization for Research and Treatment of Cancer Quality of Life Questionnaire
FACT-B	Functional Assessment for Cancer Therapy- Breast
FFM	Fat Free Mass
HER2+	Human Epidermal Growth Factor
HKB	Hospital Kepala Batas
HPM	Health Promotion Model
HPP	Hospital Pulau Pinang
HSAH	Hospital Sultan Abdul Halim
HSB	Hospital Sultanah Bahiyah
HSJ	Hospital Seberang Jaya

HUSM	Hospital Universiti Sains Malaysia
IARC	International Agency for Research on Cancer
IPAQ-SF	International Physical Activity Questionnaire-Short Form
LCIS	Lobular Carcinoma In Situ
LMIC	Low and Middle Income Countries
MET	Metabolic Equivalent
MRI	Magnetic Resonance Imaging
MOH	Ministry of Health
NCCS	National Coalition for Cancer Survivorship
NCR	National Cancer Registry
NICE	National Institute for Health and Care Excellence
OC	Oral Contraceptives
PAR-Q+	Physical Activity Readiness Questionnaire
PR	Progesterone Receptor
RCT	Randomized Controlled trials
RPE	Ratings of Perceived Exertion
TBW	Total Body Water
USA	United States of America
WCRF	World Cancer Research Fund
WHO	World Health Organization

PENIALAIN TERHADAP AKTIVITI FIZIKAL DAN KUALITI KEHIDUPAN DALAM KALANGAN PESAKIT KANSER PAYUDARA YANG MASIH HIDUP DI MALAYSIA

ABSTRAK

Aktiviti fizikal merupakan salah satu pendekatan yang dikenal pasti digunakan untuk memperbaiki proses pemulihan dan meningkatkan kualiti hidup bekas pesakit kanser payudara. Walaupun faedah peningkatan kesihatan aktiviti fizikal ke atas keseluruhan dan kesejahteraan kualiti hidup telah diketahui, namun, tiada kajian pernah dilakukan di kalangan pesakit kanser payudara di Malaysia. Kajian ini meneliti profil dan pola aktiviti fizikal, menyiasat faktor-faktor yang berkaitan dengan penyertaan aktiviti fizikal dan meneroka hubungan antara aktiviti fizikal dan kualiti hidup di kalangan pesakit kanser payudara wanita. Juga, kajian ini menilai kemungkinan dan keberkesanan intervensi fizikal bagi meningkatkan penglibatan dalam aktiviti fizikal, kualiti hidup dan lain-lain bentuk 'penjagaan sokongan'. Dalam fasa pertama, satu kajian rentas telah dilakukan ke atas 334 pesakit kanser payudara yang diperolehi dari 6 hospital terpilih di Semenanjung Malaysia. Pembolehubah yang dinilai termasuklah ciri-ciri sosiodemografi, aktiviti fizikal, kualiti kesihatan yang berkaitan dengan kehidupan dan antropometri. Dalam fasa kedua, bekas pesakit kanser payudara (n=57) telah dipilih untuk menyertai kajian intervensi. Peserta dalam kumpulan kajian ini telah dibahagi secara rambang ke dalam kelompok terapi senaman ketahanan/program rumah (n=20) dan terapi senaman aerobik/kumpulan program rumah (n=20). Regimen penjagaan biasa diteruskan keatas kumpulan kawalan pemerhatian (n=17). Para peserta dinilai pada dasar 12 minggu selepas intervensi dan 12 minggu susulan. Penilaian yang dilakukan

termasuk tahap aktiviti fizikal, kualiti hidup, antropometri dan komposisi tubuh badan. Alat-alat yang digunakan untuk penilaian adalah Soal Selidik Aktiviti Fizikal Antarabangsa, Penilaian Fungsian untuk Terapi Kanser Payudara dan Analyzer Komposisi Badan Digital. Kadar penyertaan aktiviti fizikal didapati sebanyak 39.4%, yang cenderung pada aktiviti berintensiti rendah. Aktiviti fizikal berintensiti sederhana mempunyai korelasi yang signifikan dengan fungsi kesejahteraan (r=0.57, p=0.054), kebimbangan tertentu tentang kanser payudara (r=0.48, p=0.019), indeks hasil percubaan (r=0.71, p=0.035) dan kualiti keseluruhan kehidupan (r=0.49, p=0.002). Aktivity berjalan dikaitkan dengan kesejahteraan fizikal (r=-0,27, p=0.016). Para peserta yang tidak cukup aktif merupakan golongan yang tidak mendapat pendidikan formal, telah didiagnosis kurang daripada satu tahun, telah menjalani pembedahan dan wanita selepas menopaus. Program intervensi menunjukkan 92% pengekalan untuk semua sesi penilaian. Kedua-dua kumpulan intervensi telah menunjukkan peningkatan bagi penyertaan aktiviti fizikal pada sesi susulan (p<0.05). Sementara itu, kualiti hidup adalah serupa pada garis dasar bagi semua kumpulan. Bagaimanapun, kumpulan intervensi telah menunjukkan beberapa penambahbaikan selepas intervensi dan sesi susulan dengan peningkatan yang ketara dalam program terapi senaman aerobik/program di rumah. Dalam aspek antropometri, walaupun kumpulan intervensi menunjukkan peningkatan pembolehubah antropometri, kumpulan terapi senaman ketahanan/kumpulan program rumah mempamerkan peningkatan yang lebih baik dan ketara. Tren penemuan yang sama juga didapati pada perubahan parameter komposisi badan (cth. %lemak dalam badan, jisim otot, jisim lemak dan jisim tanpa lemak). Hasil kajian ini menunjukkan majority bekas pesakit kanser payudara tidak cukup aktif. Ia juga mengesahkan diagnosis awal yang sering dikaitkan dengan aktiviti fizikal yang tidak

mencukupi. Dalam fasa intervensi, dapatan menunujukkan senaman mudah individu boleh dilaksanakan dengan pengekalan yang direkodkan. Kedua-dua latihan intervensi telah terbukti berkesan dalam meningkatkan penyertaan aktiviti fizikal dan juga sebagai penambahbaikan terhadap bentuk-bentuk 'penjagaan sokongan'. Sebuah intervensi peribadi yang boleh diakses secara mudah adalah berkesan dalam menggalakkan tingkah laku gaya hidup sihat di kalangan bekas pesakit kanser payudara.

EVALUATION OF PHYSICAL ACTIVITY AND QUALITY OF LIFE AMONG BREAST CANCER SURVIVORS IN PENINSULAR MALAYSIA

ABSTRACT

Physical activity is one of the identified approaches used to better the recovery and enhance quality of life of breast cancer survivors. Despite established health enhancement benefit of physical activity on the overall quality of life and well-being, studies amongst Malaysian breast cancer survivors are limited. This study examined the physical activity profile and pattern, investigated the associated factors for physical activity participation and explored the relationship between physical activity and quality of life among the breast cancer women. Also, the study assessed feasibility and effectiveness of a physical intervention to improve physical activity participation, quality of life and other 'supportive care end' points. In the first part, a cross-sectional survey was carried out in 334 breast cancer patients recruited from 6 selected hospitals in peninsular Malaysia. Variables assessed included sociodemographic characteristics, physical activity, health-related quality of life and anthropometry. In the second part, breast cancer survivors (n=57) were recruited in an exercise intervention study. Participants in the exercise group were randomized into resistance exercise therapy/home program (n=20) and aerobic exercise therapy/home program group (n=20). The attention control group (n=17) continued with the usual care regimen. Participants were assessed at baseline, 12 weeks post-intervention and 12 weeks follow-up. The assessments included physical activity levels, quality of life, anthropometry and body composition. The tools used for assessments were International Physical Activity Questionnaire, Functional Assessment for Cancer Therapy-Breast and Digital Body Composition Analyzer. The

rate of physical activity participation was found to be 39.4%, and the pattern tends toward low-intensity. Moderate-intensity physical activity had significant correlation with functional well-being (r=0.57, p=0.054), breast cancer specific concern ((r=0.48, p=0.019), trial outcome index (r=0.71, p=0.035) and overall quality of life (0.49, p=0.002). Walking was correlated with physical well-being (r=-0.27, p=0.016). The insufficiently active participants were more likely to have no formal education, diagnosed less than one year, had no surgery and post-menopausal women. The intervention program had 92% retention for all the assessment sessions. Both the intervention groups demonstrated improvements in physical activity participation in the follow-up session (p< 0.05). Meanwhile, quality of life was shown to be the same at baseline across all the groups, however, post-intervention and follow-up it has shown some improvements in the intervention groups. Nevertheless, it was significantly improved in the aerobic exercise therapy/home program. In the case of anthropometry, although the intervention groups had improved anthropometric variables, the resistance exercise therapy/home program group demonstrated significantly better improvement. Similar trend of findings was observed in the changes in body composition parameters (e.g. body fat%, muscle mass, fat mass and fat free mass). The outcomes of this study show majority of the breast cancer survivors are not sufficiently active. It has also, shown that early diagnosis is associated with insufficient physical activity. In the intervention part, the results suggest simple individualized exercise is feasible with the retention recorded. Both the intervention exercises have proven to be effective in enhancing physical activity participation as well as betterment of 'supportive care' end points. A readily accessible personalized exercise intervention is effective in promoting healthy lifestyle behaviour among breast cancer survivors.

CHAPTER 1

INTRODUCTION

1.1   Background of the study

Cancer that was initially considered as a disease of the wealthy countries is continuously evolving and causing unacceptable concern in the low and middle income countries (LMIC). It is predicted that in the next 2 decades, the burden will rise up to 70% from the present 56%. Also, 2/3 of the yearly mortality secondary to cancer across the globe emanates from the LMICs (Ferlay et al., 2010). Unfortunately, the major risk factors identified could be avoided or modified hence, more than half of the cases and the resulting deaths would have been prevented (Stein & Colditz, 2004)

Breast cancer has been and is still the most common cancer of women across the globe (Ferlay et al., 2010; Jemal et al., 2011); it is forecasted to remain so in the foreseeable future (Maddams, Utley, & Møller, 2012; Mariotto, Yabroff, Shao, Feuer, & Brown, 2011). The disease accounts for 18% of all cancer diagnoses in the Asia-Pacific and ranked first for females in the majority of countries within the region. The burden among Malaysian women is substantial and has become a matter of interest to the public heal (Youlden, Cramb, Yip, & Baade, 2014). This can be proven by the attention given to this 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 (NCR, 2011).

Cancer prevalence being the result of incidence and survival is expected to continue to rise since most of the factors associated with cancer are still rampant and survival rate is continuously improving due to improved diagnosis and treatment (Yu et al., 2014). Mortality due to breast cancer is to an extent rising in the LMICs and still dominates in the Western world (Lancet, 2009) and so there is need for urgent attention in terms of provision of affordable therapies (Holmes et al., 2014).

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 (Parkin, 1998). 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 (Jemal et al., 2011; Youlden et al., 2012). It was reported recently that majority of female breast cancer cases were occurring in the developing countries (Ferlay et al., 2013). While the developed countries retain higher incidence rates, the shift in the global dispersion of cases features continues emergence of breast cancer as a major health concern for women in Asia, Africa and South America (Youlden et al., 2014).

Consequently, this growing incidence and survival trend have led to increasing population of the female breast cancer survivors. As an example, in 2006-2010, the 5-year relative survival rate was 89.4% in Australian women and even higher (over 98%) among patients diagnosed with small tumours (Bech, 2012).

Approximately 12 million survivors of breast cancer are alive in the United States courtesy of timely detection and refined intervention (Schmitz et al., 2010). The yearly rise in the population of women diagnosed with breast cancer in the USA is projected to be 3.11% from 2010 to 2020 (Mariotto et al., 2011). In the past twenty years most of the Asian countries have witnessed dramatic rise in the incidence of breast cancer (Hirabayashi & Zhang, 2009; Medina, Laudico, Mirasol-Lumague, Brenner, & Redaniel, 2010; Sim et al., 2006; Takiar & Srivastav, 2008).

Breast cancer aetiology is heterogeneous (Althuis et al., 2004) and various risk factors have been reported. These risk factors wield their effects independently as a result of the difference of hormones, hormone-receptor status and the breast tissue at a given stage of life of the woman (Razif et al., 2011). Identifying the risk factors of breast cancer may permit better assessment and adequate screening. This will lead to timely detection and application of proper strategies for prevention and management. To aid this, it is imperative therefore, to get acquainted with the risk factors for breast cancer.

Broadly, risk factors implicated for development of breast cancer may be categorized into the modifiable and non-modifiable factors. The non-modifiable factors are age, reproductive variables like breastfeeding and age at menarche, and hereditary susceptibility such as family history. 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" (Pathy et al., 2011).

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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 has been defined as "any bodily movement produced by the contraction of skeletal muscle that increases energy expenditure above a basal level" (Lahart, Metsios, Nevill, & Carmichael, 2015). Physical activity boosts the immune system, and helps prevent diseases such as cardiovascular, type 2 diabetes and obesity. It is a critical component of energy balance, a term used to describe how weight, diet, and physical activity influence health in general. Physical activity can be categorized based on domains as occupational, household, sports/recreational and transportation. Based on the intensity however, it can be majorly classified into vigorous-, moderate- and light-intensity.

Epidemiological studies have gathered in the last 2 decades a lot of proofs on the preventive role played by physical activity in countering breast cancer through downplaying the risk of the disease. In fact, about 72 different studies have been reported to date that gave attention to the causal relationship between physical activity and breast cancer occurrence. Interestingly, majority (3/4) of these researches found physical activity modifies the risk of breast cancer (Friedenreich, Neilson, & Lynch, 2010). Similarly, the protective effects of physical activity are further proven by the link found between increased body weight and being sedentary and breast cancer susceptibility to a reasonable extent (Awatef et al., 2011).

Several studies have been reported on the association between physical activity and the risk of breast cancer, but the findings are generally inconsistent. For instance, while recreational physical activity has shown inverse association (Lynch, Neilson, & Friedenreich, 2010), the association with occupational physical activity have been controversial; studies differ in their report of findings where some showed occupational physical activity at higher levels decreased the risk of breast cancer (Ángeles-Llerenas et al., 2010; Hou et al., 2014; Kobayashi et al., 2013), others found either no significant association or reverse association (Rosato et al., 2013; Si et al., 2015). In a meta-analysis, occupational physical activity has shown a statistically inversely significant association with the risk of breast cancer (Wu, Zhang, & Kang, 2013). These inconsistencies seen may be as a result of differences in the tools of and approaches to physical activity assessment.

Meanwhile, physical activity has also been shown to have myriads of beneficial effects following breast cancer diagnosis both during and after treatment. The number of breast cancer is increasing all over the world due to the trio of growing incidence, continuous improvement in diagnostic screening and improved anticancer treatment (Wong et al., 2012). A cancer survivor is defined as "any individual that has been diagnosed with cancer, from the time of discovery and for the balance of life" (NCCS, 2004). This increase in the number of breast cancer survivors is proven by the incidence rise of 0.1% and a 2.2% fall in the annual mortality rates in the past 2 decades. Further, the 5 and 10 years survival rates were placed at 90% and 84% respectively (Howlander et al., 2012). In Malaysia, also, the

survival rate among women with breast cancer has shown considerable development (Taib, Akmal, Mohamed, & Yip, 2011). Using the available data, an estimation of 58% overall 5-year survival rate has been reported based on data from Universiti Malaya Medical Centre. Based on race, Chinese had the highest 5-year survival rate put at 63.2% followed by the Indians with 57.1%. However, Malays had the lowest survival rate with 45.9% (Yip, Taib, & Mohamed, 2006).

However, these survivors are faced with peculiar concerns that arise both from the disease and the unwarranted side effects of the disease treatments. Those concerns include risk of recurrence of the disease, tendency of having other chronic diseases, psychological disturbance, and enduring adverse outcomes on physical functioning and quality of life (Schmitz et al., 2010), defined as "the total delight, contentment and satisfaction with the important aspects of individual's life" (Bicego et al., 2009). Hence, with their unique healthcare demands, this population requires special public health attention.

Regrettably, the health care delivery system in most of the 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. Physical activity helps in the prevention as well as the alleviation of the negative side effects (e.g. fatigue, functional decline, added weight, sleeplessness, and deterioration in quality of life commonly encountered by breast cancer patients during and after treatment. Taking regular physical activity is a good attitude for enhanced health and well-being, and it

has been found to have positive effects on the physical condition, mental state, and quality of life markers.

Despite the myriads health-enhancing dividends of physical activity such as boosting fitness levels, enhancement of physical function, amelioration of fatigue, improvement of emotional wellbeing, reduced chances of the disease recurrence and mortality among others (Ballard-Barbash et al., 2012), fewer breast cancer survivors meet physical activity level as per public health recommendations. In fact, breast cancer survivors not active prior to their diagnosis remained inactive and the active ones mostly do not regain their former activity level. Moreover, physical activity has not been integrated as a part of cancer treatment and rehabilitation.

Customarily, attending clinicians would advise cancer 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 (Schmitz et al., 2010). The potential benefits of Physical activity as a non-pharmacologic intervention on both physiologic and psychological effects of cancer and its treatment are enormous (Dieli-Conwright et al., 2014) and deserve further exploration to the advantage of the growing population of breast cancer survivors.

1.2 Problem statement

The relationships between physical activity and non-communicable diseases such as breast cancer have been well documented. Physically active women have lower risk of having breast cancer and strong evidence have proven the effect of physical inactivity on the risk of developing breast cancer (Lahart et al., 2015). Evidence also shows that physical activity reduces the risk of breast cancer in both pre- and post-menopausal women. Specifically, moderate intensity physical activity for 30 minutes 5 days/week reduces the risk of breast cancer (Giovannucci, Liu, Leitzmann, Stampfer, & Willett, 2005; Segal et al., 2001; Wilmore & Knuttgen, 2003). The risk reduction achieved by physical activity ranges from 20% to 80% (Holmes, Chen, Feskanich, Kroenke, & Colditz, 2005).

It is noteworthy, that the extent of the protective effect is higher with high intensity physical activity. The potential biological mechanism through which physical protects against cancer may be explained by its role in energy balance enhancement, hormone metabolism, insulin regulation, alteration of inflammatory and immune factors and antioxidant defence mechanism (Holmes et al., 2005; Slattery, 2004). However, only recently studies exploring role of physical activity in cancer survivorship and quality of life are being conducted (Ahmed, Thomas, Yee, & Schmitz, 2006; Vallance, Courneya, Plotnikoff, Yasui, & Mackey, 2007).

There are more number of cancer survivors but, the devastating effects of the cancer and cancer treatment-related factors has become a cause for concern among public health experts (Jemal et al., 2011; Wong et al., 2012). Physical activity is a vital health behavior for cancer survivors who often have to bear the long term site effects associated with their treatments. However, more studies to identify and categorize advantages and disadvantages of physical activity are required for cancer survivors to attain desired physical activity levels. This is so because some of the treatment effects even make physical activity participation difficult.

Improved survival rates have brought about focus on survivorship and follow-up of survivors have assisted in identifying the late effects that seems to be closely linked with physical activity benefits. Moreover, use of quality of life and other 'supportive care' endpoints have further supported use of physical activity to manage the symptoms or side effects. Common side effects like fatigue, nausea and diarrhoea have previously make physical activity difficult (Courneya, 2009).

Meanwhile, physical activity intervention amongst breast cancer survivors is continuously gaining attention due to impact shown on physical activity levels and betterment of quality of life. This is seen from the increasing number of researches in this area recorded in clinicaltrials.gov (Dieli-Conwright et al., 2014). Study has indicated that substantial percentages of the survivors do not attain physical activity sufficient enough in their daily activities to meet public health guidelines (Blanchard, Courneya, & Stein, 2008). Physical activity is a complex behavior, and to enhance participation it is critical to emphasize motivation and adherence in the design and

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implementation of any intervention (Wood, 2008). One of the means to achieve this is through an intervention that may consider individual's present physical activity ability. Also, an intervention program that is feasible and affordable may receive wide acceptance from the breast cancer survivors. This would encourage physical activity participation especially among breast cancer survivors who may not have access to the modern facilities due to financial or distance barriers.

Even though emerging literature is showing translocation of breast cancer incidence towards the LMICs, available data on physical activity and the risk of breast cancer are rare. In Malaysia for instance, only one study recently assessed the role of lifetime physical activity in breast cancer occurrence (Shahar, Salleh, Ghazali, Koon, & Mohamed, 2010), however the study focused on a particular area in Malaysia. Moreover, the study did not account for the association after stratifying for menopausal status. Obtainable information on the relationship between health behaviours such as physical activity and health-related quality of life amongst breast cancer survivors have been inconsistent and Anokye, Trueman, Green, Pavey, and Taylor (2012) observed most researches focussed on physical activity intervention instead.

Furthermore, these studies were done elsewhere; in Malaysia where breast cancer incidence is rising information about this critical public health issue is hard to come by. In addition, factors associated with physical activity participation among this ever increasing population have not been explored. Although as observed by some authors, intervention studies are taking lead in the field of physical activity,

majority of the studies emanate from the developed countries. These findings may not be extrapolated for breast cancer survivors in Malaysia. More so, it is difficult to identify an exercise intervention that offered individualized exercise program.

An intervention that will address issues related to motivation and adherence needs to look at the complex nature of physical activity behaviour. Therefore, as a means of health promotion, an efficient and effective intervention tailored towards individual preference will deliver promising outcome. To the best knowledge of this researcher, there is no other study that embarks on comprehensive evaluation of physical activity among breast cancer women in Malaysia. In addition, the adoption of a multi-centre approach in this study will provide wide and deep appreciation of physical activity and breast cancer.

1.3   Significance of the study

Physical inactivity has been identified as a major risk factor for developing non-communicable diseases and 80% of deaths from non-communicable diseases take place in the low and middle income countries (WHO 2012; WHO 2010). About 21%-25% breast and colon cancers were estimated to occur due to lack of physical activity (WHO 2009), which also accounts for approximately 3.2 million lives lost worldwide (WHO 2011).

All over the globe, the prevalence of physical activity varies widely; in women it ranges from 28% to 96.2% (Guthold, Ono, Strong, Chatterji, & Morabia, 2008). 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 (Teh et al., 2014). However, the focus has been the general population thereby, not giving attention to the cancer population which is continuously expanding.   Thus determining the physical activity profile and patterns of physical activity amongst Malaysian breast cancer survivors may give an avenue for developing strategies that may encourage more participation in physical activity and/or maintain physical activity levels where necessary.

Being diagnosed with breast cancer, the disease itself and the treatment-related adverse effects all contribute to the devastating effects on ones physical and mental state. This would have impact on the physical activity levels and subsequent participation in PA. 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 (Mason et al., 2013). Similarly, fatigue which is common during chemotherapy tends to make physical activity uneasy for breast cancer patients. Above factors may also have influence on the quality of life of the breast cancer patients (Ibrahim, Dahlui, Aina, & Al-Sadat, 2012; Pathy et al., 2011); however, there has been inconsistency in findings.

Earlier study has reported temporary decrease in health-related quality of life outcomes during treatment that afterwards returns to baseline level (Norman et al., 2009). Another study showed no unfavourable effect of treatment over health-related quality of life in long-term survivors (Peuckmann et al., 2007). Therefore exploring these factors among Malaysian breast cancer patients would enable a platform for creating awareness in this population on one hand. On the other hand, it would offer a green light for additional appraisal, improvement and execution of public health schemes.

Evidences have shown connection between being physically active and improved quality of life among breast cancer survivors (Alfano et al., 2007; McNeely et al., 2006; Ogunleye & Holmes, 2009). Nonetheless, findings reported on the relationship between physical activity and health-related quality of life is universally limited. In addition, these studies were mostly conducted in the industrialized countries. Assessing the relationship between physical activity and health-related quality of life may have several implications; informed decisions could be made about the best way of allotment of the scarce resources.

Identifying the influence of physical activity over health-related quality of life could help in devising public health procedures that promote active physical activity participation (Chai et al., 2010). Similarly, discovering the disparities in the correlates of physical activity and health-related quality of life offers the health facility that attends to breast cancer patients a track for precise care. Also it helps

simplify physical activity intervention among the breast cancer population that may be targeted at health-related quality of life improvement (Paxton et al., 2012)

The population of breast cancer survivors is proliferating courtesy of efforts in the enhancement of detection and various treatment alternatives. Conversely, the cancer and its treatments have been accompanied by serious detrimental repercussions that last for a very long time (Wong et al., 2012). This implies that although rate of survival progresses, the impingement by the associated effects on both survival and quality of life requires attention. Physical activity is a non-pharmacological intervention employed in dealing with the physiological and psychological dilemmas accompanying the disease and its treatments (Friedenreich, 2001).

In this study, for the first time light-resistance dumbbell was used to provide personalized exercise intervention with the aim to promote physical activity participation and better physical activity levels of Malaysian breast cancer survivors. Whether or not, physical activity participation amongst breast cancer survivors may be promoted with light-resistance dumbbell a less sophisticated tool has not been explored. The use of light-resistance dumbbell and offering individualized exercise intervention aided in debunking the thought that exercise has to do with sophistication and costly equipments.

Choosing the right time for intervention is very vital, hence early intervention may be useful as breast cancer survivors may have more interest in intervention plan. The follow up period would help evaluate long-term adherence to the exercise. This is important as the intervention is intended at arousal of switching from sedentary to physically active behaviour. Overall, the outcome of this study added information to the existing pool of knowledge in this emerging field of exercise therapy among BCS.

1.4 Research Questions

The following are the research questions this study have addressed

1. What is the physical activity profile, pattern and the associated factors of physical activity participation in Malaysian breast cancer survivors?

2. What is the relationship between physical activity and health-related quality of life of Malaysian breast cancer survivors?

3. Is physical activity intervention feasible and effective in promoting physical activity participation and improving anthropometrics and body composition among Malaysian breast cancer survivors?

1.5   Objectives of the study

1.5.1   General objective

The general objective of this study was to evaluate the physical activity and health-related quality of life of breast cancer survivors in Peninsular Malaysia.

1.5.2   Specific objectives Part I

Specifically, the objectives of this part were to;

1. Determine the physical activity profile and pattern of Malaysian breast cancer survivors.

2. Examine the relationship between physical activity and health-related quality of life of Malaysian breast cancer survivors.

3. Identify the factors associated with physical activity participation in Malaysian breast cancer survivors.

1.5.3   Specific objectives Part II

Specifically, the objectives of part II were to;

1. Assess the effects of a physical activity intervention in promoting physical activity participation among Malaysian breast cancer survivors.

2. Find the effects of physical activity intervention on health-related quality of life among Malaysian breast cancer survivors.

3. Establish the efficacy of physical activity intervention on anthropometric variables and body composition of the breast cancer survivors.

1.6 Hypotheses of the study

The following null hypotheses were tested in this study;

1. Physical activity was not associated with the patient-, disease- and treatment-related factors among breast cancer women in Malaysia.

2. Physical activity was not correlated with health-related quality of life among breast cancer women in Malaysia.

3. Light-resistance dumbbell exercise was not more effective in improving physical activity participation, health-related quality of life, anthropometry and body composition.

1.7 Conceptual framework

A conceptual framework is an inscribed or visible output which "explains, either graphically or in narrative form, the main thing to be studied...the key factors, concepts or variables...and presumes relationship among them" (Miles & Huberman, 1994). This will enable the researcher to comfortably establish practicable study questions, build proper approach to the methodology of the study and defend or substantiate his/her study (Maxwell, 2012). There are many conceptual frameworks that have been evolved to study health behaviours such as physical activity and

nutrition. In this research the Health Promotion Model (HPM) also, called Pender's model was adapted with some modifications. The health promotion model has been used in physical activity and literature has shown the model to have explained certain physical activity behaviours (Pender, 1996; Elberson, Daniels & Miller, 2001).

Health promotion model was developed in 1982 and revised in 1987 by a renowned nurse, Nola J. Pender. The author viewed health promotion as consisting of a set of practices conceived to upgrade overall well-being and self-actualization across all strata; individual, family, community and the society at large (Pender, 1987). Health promotion model gives attention to preventive, disease-centred, behavioural, and lifestyle oriented aspects of health education (Whitehead, 2009).

Pender's model is made up of 2 phases; the decision making and action phase. The decision making phase consists of individual perceptions and modifying factors. There are five modifying factors that include demographic characteristics, biologic characteristics, interpersonal influences, situational factors and behavioral factors (Wood, 2008). For the purpose of this study three modifying factors were included in the framework. The first factor included was the demographic variable that comprises age, ethnicity/race, education, income etc. Biologic characteristics is taken for the second factor and introduced as disease variables and the third factor chosen was situational factors referred to in this case as the treatment variables. The disease variable comprises stage of the disease and duration since diagnosis whereas the treatment variable comprises of type of surgery, chemotherapy, radiotherapy etc.
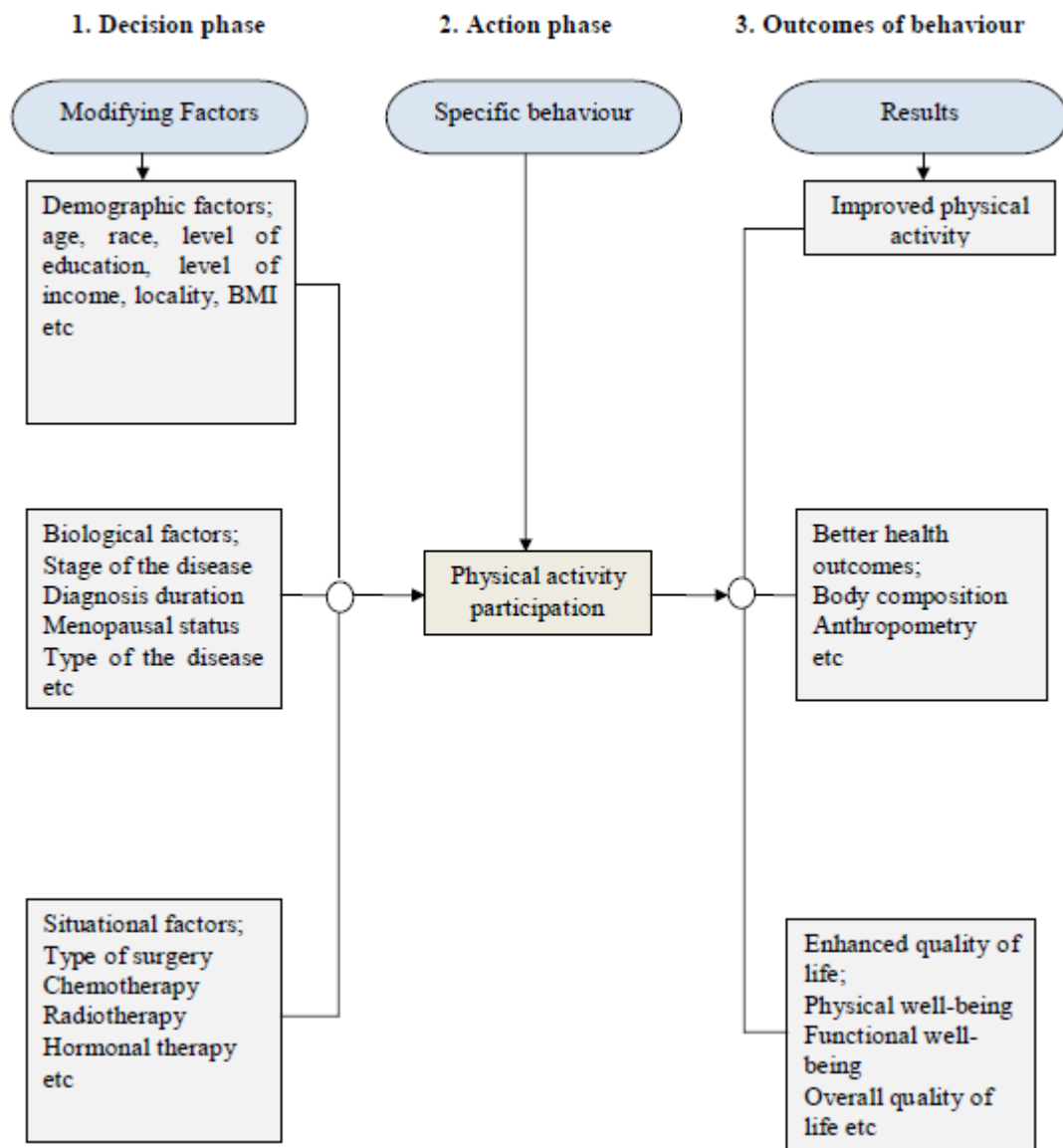
In the action phase, this study introduces the health promotion behaviour (i.e. physical activity) which is central to the theme of the study. Physical activity is a complex behavior that is influenced by various factors (Wood, 2008), and engaging in physical activity is a good health behavior that positively enhances the quality of life of cancer survivors. Studies among breast cancer survivors have shown that physical activity is associated with better health-related quality of life (McNeely et al., 2006; Milne, Gordon, Guilfoyle, Wallman, & Courneya, 2007). An individual's intention to/not to perform a given behavior is the main determinant of that behavior (Lowe, Watanabe, Baracos, & Courneya, 2012).

Physical activity being a complex behavior, several factors has influence over it. In the case of breast cancer survivors the factors may be classified in three aspects (Charlier et al., 2012; Devoogdt et al., 2010): patient-related, disease-related and treatment-related aspects. These factors are characteristics expressed differently by different individuals. This conceptual framework is presented in figure 1.1.

Attempt has been made to make the structure of the concept in this study simple, clear and straightforward. The model is intended to figure out the interactions between three components that may make or mar physical activity participation as health promotion behaviour amongst breast cancer survivors. The components are the modifying factors which make up individual characteristics of the breast cancer patients. The second component is the specific behaviour, i.e. physical activity participation which is essential to healthy well-being. The third component is the outcome of that behaviour that is improved quality of life. On the other hand, the

factors may as well have direct negative effects on the health-related quality of life of the breast cancer survivors.

1. Decision phase   **2. Action phase**   **3. Outcomes of behaviour**

Modifying Factors

Specific behaviour

Results

Demographic factors; age, race, level of education, level of income, locality, BMI etc

Biological factors; Stage of the disease Diagnosis duration Menopausal status Type of the disease etc

Situational factors; Type of surgery Chemotherapy Radiotherapy Hormonal therapy etc

Physical activity participation

Improved physical activity

Better health outcomes; Body composition Anthropometry etc

Enhanced quality of life; Physical well-being Functional well-being Overall quality of life etc

Figure 1.1: Conceptual framework of the study

CHAPTER 2

LITERATURE REVIEW

2.1   Breast cancer

Breast cancer is continually the most persistent malignant tumour among women all over the world (Bhoo-Pathy et al., 2013; Jemal et al., 2011; Youlden et al., 2014). The disease mostly occurs due to abnormal chromosome or a sequence of changes in the genes which may result in cancer cells development (Warshawsky & Landolph Jr, 2005). It spreads through the circulatory (blood and lymphatic) system to distant places which if it reaches the axillary lymph nodes is characterized by diminished survival rates. Unfortunately, some of these cancers metastasize without showing a sign of lump in the breast. However, with improved screening facilities such as mammography services and early diagnosis as well as improved treatment options, 1-2% better outcome has been recorded for women with the disease (Kaelin, Coltrera, Gardiner, & Prouty, 2007).

The global trend of breast cancer varies between regions and countries, and approximately 24% (404,000) of cases were diagnosed in the Asian-Pacific region which translated to incidence rate of 30 per 100,000 women. The trend also varied across this region, with an estimated incidence rate of 65 per 100,000 women in Singapore, and 38 per 100,000 women in Malaysia (Youlden et al., 2014). Reports in the past two decades have shown moderate to rapid increase in breast cancer incidence in most of the South-East Asian countries (Jung et al., 2014; Shin et al.,

2010). Nonetheless, new improvements have been reported in the survival rate of female breast cancer patients in Malaysia (Taib et al., 2011).

In most of the Asian countries, increased incidence rate was attributed to changes in the reproductive factors such as late at first childbirth, environmental exposure to carcinogens, unhealthy dietary habit and physical inactivity. Therefore it can be anticipated that this trend would persist especially with adoption of the so called "modern westernization", and thus it is possible that majority of breast cancer cases would be of Asian descent within a relatively short time (Pathy et al., 2011).

2.2   Breast cancer in Malaysia

Cancer has continued to be a disease of serious concern for healthcare experts. In Malaysia, the news is not different as cancer has ranked the fourth leading cause for the clinically confirmed deaths in the Malaysian population. The report of the National Cancer Registry in 2003, which was the first comprehensive register of cancer incidence have found breast cancer as the frequent cancer diagnosis among Malaysian women population (Lim & Halimah, 2003). The indicated that breast cancer comprised 31% of all cancers in the female and commonest among the age brackets 40-49 years. Female breast cancer have also, been reported by the Penang Cancer Registry as the most common cancer in women with a record 30.9% of all female cancers put together.

The frequency of the disease by race has shown it to be highly common in the Chinese, followed by the Indians and then the Malays in that order (Bina, Devaraj, Aishah, Rokiah, & Nor Asikin, 2005). The incidence rate showed 52.8 per 100,000 population of the female and the reported prevalence rate was said to be 1 in 19 women. The age group was 20 years and more, although most common in 40-49 years. In comparison with the prevalence by age, this is found to be quite younger than the reported age 50-59 years in the western countries. The wide variation has been attributed to stage of the disease at diagnosis. While in the western nation about 75% women report their disease at the early stage, in Malaysia those who reported at early stage are 15.4% only (Lim & Halimah, 2003). Figure 2.1 below present the ten most frequent cancers in the female population as reported by the National Cancer Registry, Malaysia.
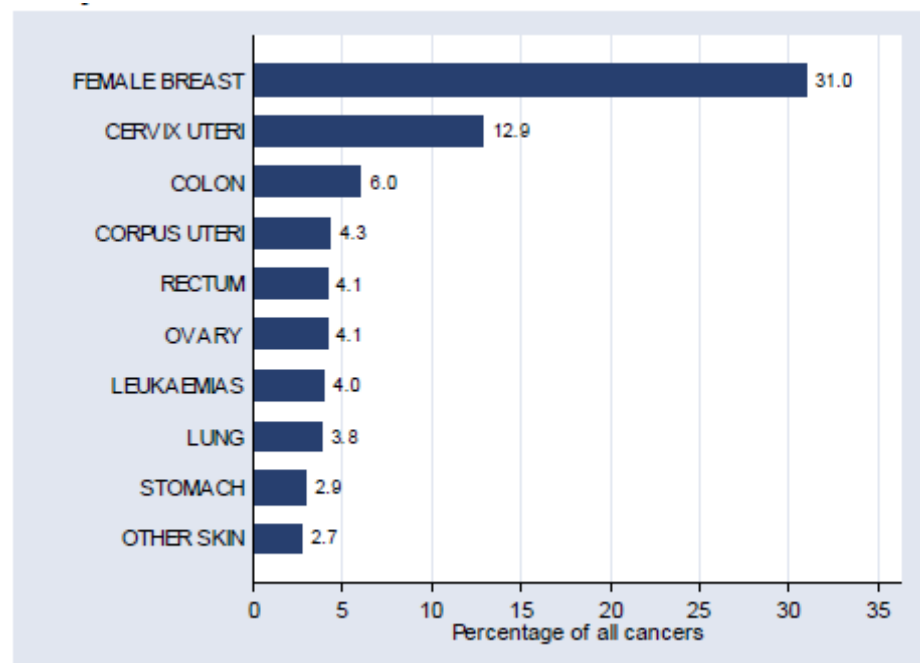
Figure 2.1: Ten most frequent cancers in females in Malaysia (Adapted from NCR)

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2.3   Risk factors for breast cancer

Breast cancer commonly develops post-menopause, but tends to be quite discomforting when it develop at pre-menopause. This is because it appears to be hyper aggressive with largely unknown cause. Also, distinct risk factors will exclusively exert their effects because in a similar fashion the breast tissue, hormones and hormone-receptor status differs with the stage of life (Razif et al., 2011). Even though heap of proofs has shown the heterogeneity of breast cancer causes, studies have reported inconsistent results (Althuis et al., 2004).

Several factors linked to the development of breast cancer have been reported. Basically, these factors are classified as **modifiable** and **non-modifiable** risk factors. The non-modifiable factors are age, reproductive variables, and hereditary susceptibility. The modifiable factors include behavioral/lifestyle parameters such as cigarette smoking, alcohol consumption, poor dietary habit and physical inactivity.

Besides being female, *age* is the most important non-modifiable risk factor with 70% of breast cancer occurring in women aged ≥40 years (American Cancer Society [ACS], 2008). Epidemiological data and study analyses have shown that reproductive factors such as age at menarche, age at first birth, breastfeeding history, menopausal status, and use of oral contraceptives (OCs) were associated with the risk of breast cancer (McPherson, Steel, & Dixon, 1994; Yang et al., 2011). The Expert Report of the World Cancer Research Fund/American Institute for Cancer Research