Functional Impairment and Physical Activity Adherence Among Gynecologic Cancer Survivors

A Population-Based Study

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Objective: Adherence to physical activity guidelines after cancer diagnosis improves physical functioning. The purpose of this study was to estimate the prevalence of physical activity in a population-based sample of gynecologic cancer survivors (GCSs) and to examine the association between functional impairment and adherence to physical activity guidelines.
Methods: Using the 2009 Behavioral Risk Factor Surveillance System survey, we identified 5,015 GCSs aged 20 years or older who were 1 year or more after diagnosis. We used multinomial logistic regression with survey weighting to examine the association between functional impairment and adherence to physical activity guidelines (using 3 levels: sedentary, somewhat active, and meeting physical activity guidelines), controlling for demographic and clinical factors.
Results: We found that 55% of GCSs did not adhere to physical activity guidelines and that 38% reported functional impairment. Gynecologic cancer survivors with functional impairment were less likely to meet guidelines (adjusted odds ratio [AOR], 0.34; 95% confidence interval [CI], 0.25–0.47) or to be somewhat active (AOR, 0.43; 95% CI, 0.31–0.59) compared with those without impairment. Having more than high school education (AOR, 1.66; 95% CI, 1.15–2.40), fewer comorbidities (AOR, 0.55; 95% CI, 0.33–0.91), and not being obese (OR, 0.53; 95% CI, 0.36–0.77) were associated with meeting physical activity guidelines compared with being sedentary.
Conclusions: Gynecologic cancer survivors do not meet physical activity guidelines and experience functional impairment, which is associated with lower adherence to physical activity recommendations. Prospective studies are needed to better elucidate the relation between functional impairment and physical activity.

Key Words: Cancer, Physical activity, Impairment, Behavioral risk factor surveillance system, Gynecologic

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This study is a secondary data analysis and uses publicly available data set. The data could be accessed from CDC BRFSS website (http://www.cdc.gov/brfss/annual_data/annual_2009.htm) for purpose of reviewing.

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Studies of cancer survivors report that physical activity ameliorates some of the treatment-related adverse effects, lowers their risk of comorbidity or developing a second type of cancer, and improves their quality of life.[1,2] Such studies assessed their adherence to weekly physical activity guidelines of 150 minutes of moderately intense activity or 60 minutes of vigorously intense activity. A recent review[3] and a meta-analysis[4] of randomized controlled trials of physical activity among cancer survivors indicated that physical activity led to improvements in body composition and in physical and psychological outcomes.[3,4] Despite the benefits of physical activity, only approximately a third of female cancer survivors meet physical activity recommendations.[5–7]

Few studies have examined factors that may be associated with cancer survivors' ability to engage in health-promoting activities that could prevent secondary disabling conditions. Several studies among cancer survivors suggest that comorbidities and obesity may limit survivors' ability to maintain adequate levels of physical activity.[5,8] Prior studies also indicate that cancer survivors have a 2-fold increased risk of functional limitations compared with age-matched peers without cancer.[9–11]

Whereas there has been descriptive research examining physical activity and its correlates among women with a diagnosis of most common cancers,[12–15] there are few studies of gynecologic cancer survivors (GCSs). An understudied group, GCS includes women with a diagnosis of cervical, endometrial, or ovarian cancer and account for 14% of all female cancer survivors in the United States.[16] Studies are needed to determine whether GCSs differ from other cancer survivors in short- and long-term psychosocial issues. Population-based estimates of physical activity and the extent to which functional impairment is associated with physical activity among GCSs remain largely unknown. To address these knowledge gaps, we used cross-sectional data from a national sample to examine adherence to physical activity guidelines and the correlates of adherence to physical activity guidelines among GCS.

METHODS

Source of the Data

This study used data from the 2009 Behavioral Risk Factor Surveillance System (BRFSS) survey,[17] which is administered annually by the Centers for Disease Control and Prevention in all states in the United States.[18] The participants are selected using random-digit dialing methods via the telephone to obtain a representative population-based sample and collect information on disease conditions, health status, and health behaviors. The core questionnaire in this survey included a module on cancer survivorship that consisted of 4 items: cancer diagnosis, cancer history, type of cancer, and age at diagnosis.

Study Sample

The analysis was restricted to women 20 years or older who resided in the United States and who had a diagnosis of cervical, endometrial, or ovarian cancers. The sample was restricted to women had a diagnosis of one type of cancer. The BRFSS does not collect information on treatment duration; therefore, to minimize bias due to a treatment effect on physical activity participation, we restricted our sample to GCSs who were at least 1 year after diagnosis.

Measures

Physical Activity Guidelines

Six items were used to assess physical activity, the main outcome of interest.[18] Respondents reported the duration, frequency, and intensity of moderate to vigorous physical activity in which they engaged per week. Vigorous activities were defined as those causing large increases in breathing or heart rates, and moderate activities were defined as those causing small increases in breathing or heart rate. The physical activity guidelines recommend engaging in either moderate physical activity for 30 or more minutes per day on 5 or more days per week or engaging in vigorous activity for 20 or more minutes per day on 3 or more days per week.[19] Somewhat active defined respondents who reported doing moderate physical activity for less than 30 minutes per day, fewer than 5 days per week, or doing vigorous activity for less than 20 minutes per day, fewer than 3 days per week, but more than 10 minutes per week of activity at either level of intensity. Sedentary activity defined respondents who reported doing no moderate or vigorous intensity physical activity.

Functional Impairment

To define functional impairment, the main predictor, we used the World Health Organization (WHO) International Classification of Functioning, Disability and Health (ICF). The WHO-ICF refers to functional impairment as "limitations due to the illness, as people with a disease may not carry out certain functions in their daily lives".[20] The WHO–ICF captures disease severity across the physical, emotional, and social domains of daily functioning. Similar to a previous study to assess functional impairment, we used responses to 2 survey items: limited ability to be active due to a physical, mental, or emotional problem, and requiring the assistance of special equipment.[21] A response of "yes" to either of these 2 items was considered as having functional impairment.

Demographic and Clinical Characteristics

Self-reported information included age (<45, 45–64 years, or ≥65 years), education (high school degree or less, or education beyond high school), annual household income in US dollars

(<25 K, 25–50 K or >50 K), race/ethnicity (white, African American, Hispanic, or other), marital status (married or other), emotional support, and body mass index (BMI) (see Table 1 for categories). Body mass index was categorized[22] as normal (<25 kg/m^2), overweight (25–29.99 kg/m^2), or obese (≥30 kg/m^2). To assess the number of comorbidities, a range of 0 to 5 based on self-reported conditions of diabetes, coronary heart disease (heart attack, angina, or stroke), arthritis, hypercholesterolemia, or hypertension was used. The time since diagnosis was calculated by subtracting the respondent's age as reported on the survey from her age at the initial cancer diagnosis.

DATA ANALYSIS

SAS survey procedures were used to analyze the complex survey design of the BRFSS, and weighted data were used in all statistical analyses to obtain population estimates.[23,24] Proportions or percentages were used to quantify the differences in characteristics among GCSs who met physical activity recommendations, GCSs who were somewhat active, and GCSs who were sedentary. The odds ratio and 95% confidence interval were calculated using multinominal logistic regression to examine the association between functional impairment and adherence to 3 levels of physical activity guidelines (meeting guidelines, somewhat active, or sedentary), while controlling for demographic, psychosocial, and clinical factors that included age, education, race/ethnicity, marital status, emotional support, time since diagnosis, cancer type, BMI, and comorbidity. In the multivariate model, education was used as an indicator of socioeconomic status because there were 502 (10%) missing observations for income. $P < 0.05$ was considered to be statistically significant.

RESULTS

Sample Characteristics

The sample consisted of 5,015 GCSs. Most were between 45 and 64 years of age (42%), and 76% were white (Table 1). Most had a high school education or less (76%); 41% reported earning less than $25,000 annually. Approximately half (53%) reported being married or living as a couple, and more than 73% reported having emotional support. Sixty-one percent reported a diagnosis of cervical cancer, and 62% were more than 10 years from the date of the cancer diagnosis. Most (65%) were overweight or obese, and 70% reported having at least one other comorbidity in addition to having cancer.

Responses on the 2 questions used to measure functional impairment indicated that overall, 38% of GCSs reported functional impairment. Approximately 33% (n = 1,977) reported facing challenges due to physical, emotional, or mental health problems; and 13% (n = 855) indicated requiring special equipment to carry out their everyday activities; approximately 12% (n = 705) answered "yes" to both questions (data not shown).

Overall, 45% of GCSs met physical activity guidelines, and 40% reported being somewhat active. Adherence to guidelines varied according to the subtype of gynecologic cancer (Fig. 1). Fifty percent of ovarian cancer survivors reported meeting physical activity guidelines, whereas 40% of endometrial and 45% of cervical cancer survivors did so. Functional impairment was inversely associated with adherence to guidelines (Fig. 2).

Factors Associated With Meeting Physical Activity Guidelines Compared With Being Sedentary

Functional impairment was inversely associated with meeting physical activity guidelines (Table 2, column 2). Gynecologic cancer survivors also were significantly less likely to meet physical activity guidelines if they were obese or had more than 2 comorbidities. In addition, younger age (20–44 years), having more than a high school education, and having emotional support remained positively associated with meeting physical activity guidelines, although the odds ratios attenuated slightly compared with the unadjusted models. Race/ethnicity and time since diagnosis were not significant in either the unadjusted or adjusted analyses.

Factors Associated With Being Somewhat Active Compared With Being Sedentary

In the unadjusted model, being somewhat active had a statistically significantly positive association with younger age, having more than a high school education, being Hispanic, and being married (Table 2, column 3). Ovarian cancer survivors were less likely than cervical cancer survivors to be somewhat active, as were those reporting "other" race/ethnicity. Reporting more than 2 comorbidities and functional impairment also were inversely associated with being somewhat active compared with being sedentary. In the adjusted analysis, only older age (≥65 years), "other race", and reporting functional impairment were inversely associated with being somewhat active (Table 2, column 4).

DISCUSSION

Physical activity has been shown to help ameliorate treatment-related adverse effects and increase survival among cancer survivors,[25–27] yet we found that less than half (45%) of GCSs reported meeting physical activity guidelines. This estimate is lower than the published estimate of 58% of women without cancer from the same age group.[28] An Australian study of GSCs who were sampled from a cancer registry database used a similar definition to measure physical activity and found that 36% of the respondents, who were surveyed by mail, met physical activity guidelines, 40% were somewhat active, and 23% were sedentary.[2] Our higher estimate for meeting these guidelines is likely due to the younger age of our study population, since participation in physical activity generally decreases with age.

The correlates for meeting physical activity guidelines among GCSs were similar to correlates reported for the general population and for survivors diagnosed with other types of cancer, including younger age, greater educational attainment, emotional support, and not being obese.[29–31] In our sample, with the exception of age and functional impairment, the correlates associated with meeting physical activity guidelines differed from those associated with being somewhat active. Women aged 65 or older were more likely to be sedentary

TABLE 1. Gynecologic cancer survivors' sample characteristics using Behavioral Risk Factor Surveillance System survey, 2009

Category	Sample Frequency	Weighted Population Estimates	Percentage
Age, yrs			
20–44	1,054	660,831	36.3
45–64	2,304	768,765	42.3
≥ 65	1,657	388,956	21.4
Education			
≤ High school	3,828	1,389,168	76.4
> High school	1,187	429,383	23.6
Income, USD			
<25,000	1,952	668,676	40.9
25,000–50,000	1,286	419,297	25.6
>50,000	1,275	557,755	33.5
Race/Ethnicity			
White	4,184	1385,701	76.2
African American	275	147,836	8.1
Hispanic	242	177,746	9.8
Other	314	107,267	5.9
Marital status			
Married	2,205	957,555	52.6
Other	2,810	860,996	47.3
Emotional support			
Always/Usually	3,714	1,321,148	72.6
Sometimes/Rarely/Never	1,301	497,404	27.4
Cancer type			
Cervical	2,812	1,110,032	61.0
Endometrial	1,281	387,121	21.3
Ovarian	922	321,399	17.7
Time since diagnosis, yrs			
1–2	394	164,221	9.0
2–5	459	201,125	11.1
5–10	723	333,624	18.3
>10	3,439	1,119,582	61.6
BMI			
Normal	1,774	638,159	35.1
Overweight	1,530	562,698	30.9
Obese	1,711	617,695	34.0
Comorbidity			
0	1,071	549,702	30.2
1–2	2,561	868,195	47.7
>2	1,383	400,655	22.0
Functional impairment			
No	2,888	1,127,423	62.0
Yes	2,127	691,128	38.0

(Continued on next page)

TABLE 1. *(Continued)*

Category	Sample Frequency	Weighted Population Estimates	Percentage
Physical activity			
Met recommendation	2,146	814,273	44.8
Somewhat active	1,951	718,209	39.5
Sedentary	918	286,069	15.7

compared with younger women (age 20–44 years), both for meeting the guidelines and for being somewhat active. Likewise, functional impairment was inversely associated with both measures of physical activity, a finding similar to a study of uterine cancer survivors.[32]

More than one third (38%) of GCSs indicated that they had functional impairment compared with 22% among women in the general population.[21] The higher prevalence of functional impairment among GCS compared with their counterparts in the general population could be due to a higher burden of obesity, comorbidity, and treatment-related adverse effects that may persist for many years after initial cancer treatment.[33,34] Recent research by Hammer et al[32] found that 53% of uterine cancer survivors from a university cancer center experienced physical and functional impairment. This estimate is considerably higher than ours and could be due in part to differences in the definitions and measures of impairment.[32]

These findings suggest that GCSs are different from other cancer survivors in several ways and may have unique needs and challenges regarding physical activity interventions. This group may benefit from individualized exercise plans that would account for functional impairment, BMI, and other comorbidity and their preferences or needs. Some recent studies have examined the feasibility and efficacy of physical activity in this population, and their related preferences. These studies indicate that exercise programs among GCSs seem to be feasible and efficacious in managing treatment-related adverse effects.[35–37] A study conducted among Canadian ovarian cancer survivors indicated preferences for home-based (49%) physical activity programs to be initiated after treatment.[37] Walking was reported as a preferred mode of activity by more than 63% of women in that sample. Participation in higher levels of physical activity or in walking was associated with reduced lymphedema.[35] Another qualitative study that was conducted among GCSs who were involved in a home-based physical activity efficacy trial[36] found that participants experienced several benefits, including psychological well-being, physical fitness, and improved functioning. Our findings also are consistent with a previous report that positively associated the availability of emotional support with physical activity. Emotional support from friends and family positively influenced survivors' ability to cope with ongoing distress and provided motivation to engage in physical activity.[31]

This study has a number of strengths. The study provided population-based prevalence estimates of adherence to physical activity guidelines among GCSs. We were able to examine a number of demographic and medical characteristics, in particular, BMI, comorbidities, and functional impairment, which allowed us to examine the independent effect of functional impairment on the level of physical activity. We were able to include long-term survivors who were more than 10 years from their cancer diagnosis, which is an underrepresented population in research studies.

There are, however, several limitations to our study. This survey was administered over landlines; therefore, people using only cellular phones or who were without a landline telephone were not represented in the sample. Telephone surveys may underrepresent people with low income, living in rural areas, having less than a high school education, and those in poor health.[38] However, the BRFSS survey covers 87% to 98% of the US population. The BRFSS allows for poststratification weighting to adjust for some of these differences in the study methodology.[39]

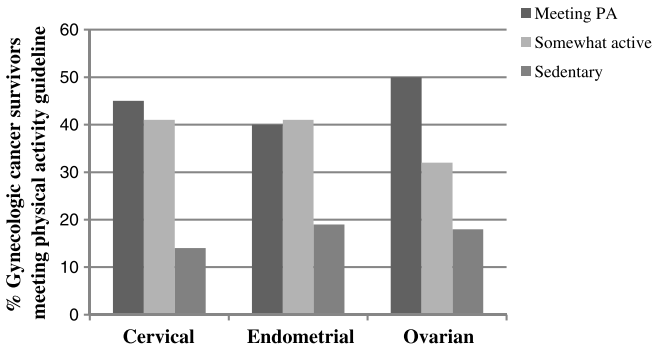

FIGURE 1. Adherence to physical activity (PA) guidelines among GCSs, according to type of cancer: cervical, endometrial, or ovarian cancer.

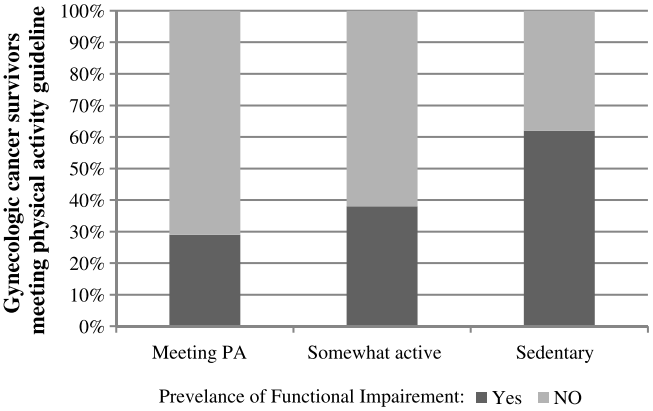

FIGURE 2. Functional impairment across physical activity levels among GCSs.

TABLE 2. Multinominal logistic regression models for 2 levels of physical activity by demographic and clinical factors among gynecologic cancer survivors

Category	Crude OR Sedentary Activity vs. Meet Guidelines	AOR (95% CI) Sedentary Activity vs. Meet Guidelines	Crude OR Sedentary Activity vs. Somewhat Active	AOR (95% CI) Sedentary Activity vs. Somewhat Active
Age, years				
20–44	Reference	Reference	Reference	Reference
45–64	0.55*	0.68 (0.44–1.04)	0.61*	0.66 (0.43–1.02)
≥65	0.30†	0.38 (0.24–0.60)†	0.37†	0.43 (0.27–0.68)‡
Education				
≤High school	Reference	Reference	Reference	Reference
>High school	2.17†	1.66 (1.15–2.40)‡	1.46*	1.26 (0.88–1.80)
Race/Ethnicity				
White	Reference	Reference	Reference	Reference
African American	0.68	0.66 (0.35–1.22)	0.64	0.57 (0.30–1.07)
Hispanic	1.33	1.19 (0.55–2.56)	2.15*	1.72 (0.84–3.52)
Other	0.78	0.80 (0.42–1.53)	0.52*	0.49 (0.26–0.93)*
Marital status				
Other	Reference	Reference	Reference	Reference
Married	1.68‡	1.18 (0.87–1.60)	1.44*	1.14 (0.84–1.55)
Emotional support				
Never	Reference	Reference	Reference	Reference
Always	1.66*	1.47 (1.06–2.03)*1	1.15	1.05 (0.78–1.44)
Cancer type				
Cervical	Reference	Reference	Reference	Reference
Endometrial	0.68*	1.00 (0.71–1.43)	0.76	1.01 (0.71–1.42)
Ovarian	0.87	1.00 (0.66–1.52)	0.62*	0.75 (0.50–1.10)
Time since diagnosis				
1–2	Reference	Reference	Reference	Reference
2–5	1.31	1.46 (0.68–3.11)	0.77	0.81 (0.39–1.68)
5–10	1.28	1.23 (0.66–2.30)	1.53	1.35 (0.73–2.50)
>10	0.94	1.34 (0.80–2.26)	0.97	1.21 (0.72–2.04)
BMI				
Normal weight	Reference	Reference	Reference	Reference
Overweight	0.60*	0.78 (0.54–1.14)	0.95	1.06 (0.73–1.55)
Obese	0.37†	0.53 (0.36–0.77)‡	0.99	1.20 (0.83–1.72)
Comorbidity				
None	Reference	Reference	Reference	Reference
1–2 comorbidities	0.47‡	0.74 (0.47–1.18)	0.76	1.02 (0.64–1.62)
>2 comorbidities	0.20†	0.55 (0.33–0.91)*	0.39†	0.76 (0.46–1.24)
Functionally impaired				
No	Reference	Reference	Reference	Reference
Yes	0.25†	0.34 (0.25–0.47)†	0.38†	0.43 (0.31–0.59)†

*$P < 0.05$.
†$P < 0.0001$.
‡$P < 0.001$.
AOR, adjusted odds ratio; confidence interval (CI); crude OR, unadjusted odds ratio.

The information collected on physical activity was self-reported and may be subject to recall bias. Previous studies indicate that the BRFSS physical activity instrument demonstrated high validity and reliability for classifying adults into the recommended levels of physical activity,[40] and the data from the BRFSS are comparable to national estimates from the National Health Interview Survey.[41] The survey excludes a small portion of institutionalized adults, and so elderly GCSs (estimated to be 5%) who reside in nursing homes are not represented.[41] Additionally, data on specific cancer treatment or treatment duration, preexisting comorbid conditions, and physical activity habits before diagnosis were not available; and these factors may affect GCSs' ability to engage in physical activity after diagnosis. Our study is a cross-sectional study, which precludes our ability to determine temporal relationships. Specifically, we cannot determine whether functional impairment results in a lack of physical activity or vice versa. This study included women with a diagnosis of cervical, ovarian, and uterine cancer and may underrepresent women with other gynecological cancers in our sample. This may limit the generalizability of this study finding to this group, as the women we assessed may vary in their physical activity adherence level compared to other GCS.

CONCLUSIONS

To our knowledge, this study is one of the few to describe physical activity levels among a population-based sample of GCS and to examine functional impairment as a potential barrier to meeting physical activity guidelines. The BRFSS survey data used in this study indicate that more than half the women in this population are not meeting the recommended physical activity guidelines, and a large number of GCSs face a significant burden of functional impairment. Women in this sample who reported having any functional impairment also reported a less active lifestyle. A future study should focus on specific cancer types within the broad gynecological cancer domain and include information on the type of cancer treatment received and duration of treatment to examine its influence on physical activity adherence. A clinical trial should be designed to examine physical activity preferences and barriers to guideline adherence among gynecologic cancer survivors, an area which is understudied. Future research should use a prospective design to assess specific functional impairments that may impede the ability of GCSs to engage in physical activity. Ultimately, research in this area will help healthcare providers assess physical challenges faced by GCSs and will identify strategies to assist GCSs in meeting physical activity guidelines.

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