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## Cervical Cancer Screening Among Patients with Physical Disability

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### Abstract

**Background:** Pap smear has a central role in cervical cancer screening. Previous studies have found that female patients with disabilities are less likely to receive a Pap smear as recommended by guidelines. The aim of our study was to examine the association between physical disability and Pap smear receipt in Israel.

**Methods:** This cross-sectional study was conducted using the electronic medical records of the second largest health care maintenance organization in Israel. All female patients during 2012–2017 aged 25–65 were identified. The exposure variable was physical disability, and the outcome variable was Pap smear receipt. We used logistic regression to control for covariates.

**Results:** A total of 391,259 patients were eligible for this study, 6,720 (1.7%) with physical disability. 56.7% of patients with disabilities had received Pap smear compared to 63.3% of patients without disabilities, odds ratio (OR) 0.76, 95% confidence interval [CI] 0.72–0.80. When adjusting to sociodemographic and clinical covariates, patients with disabilities were less likely to receive Pap smear, adjusted OR 0.83, 95% CI 0.79–0.88. For all patients, older age, lower socioeconomic status, religious minorities, cardiovascular disease, type-2 diabetes mellitus, hypertension, smoking, and obesity were associated with lower odds of receipt of Pap smear. A history of nongynecologic oncologic disease was associated with increased odds of Pap smear receipt.

**Conclusion:** Our study highlights the disparities between patients with and without physical disability with regard to screening for cervical cancer by receipt of Pap smear. Creating an appropriate practice with adequate access to patients with disability should be a focus for health care providers and policy makers.

**Keywords:** Pap smear, cervical cancer, physical disability, health disparities, preventive medicine

### Introduction

CERVICAL CANCER IS the fourth most common cancer among females worldwide, with an age-standardized incidence rate of 13.1 per 100,000 females globally in 2018.<sup>1</sup> In Israel, however, the incidence of cervical cancer is

among the lowest in the Organization for Economic Co-operation and Development (OECD) countries, with an age-standardized incidence rate of 5.0 and 2.9 per 100,000 Jewish and Arab females, respectively, in 2016.<sup>2</sup> Almost all cases of cervical cancer are attributed to human papilloma virus (HPV) infection.<sup>3</sup>

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**Correction added** on February 14, 2022 after first online publication of January 20, 2022 : The article reflects Open Access, with copyright transferring to the author(s), and a Creative Commons Attribution Noncommercial License (CC-BY-NC) added (<http://creativecommons.org/licenses/by-nc/4.0/>). JOURNAL OF WOMEN'S HEALTH Mary Ann Liebert, Inc. DOI: 10.1089/jwh.2021.0447.

Primary prevention of cervical cancer includes HPV vaccination, and sexual health education, while secondary prevention is achieved by screening methods, such as Pap smear, HPV testing or a combination of both.<sup>4</sup> Screening technologies are rapidly evolving, and guidelines change over time and vary between countries. The 2018 US Preventive Services Task Force (USPSTF) screening guidelines recommend Pap smear testing every 3 years for female patients (for simplicity, will henceforth be referred to as patients) aged 21–29. For patients aged 30–65, the USPSTF recommends Pap smear alone every 3 years, high-risk HPV (hrHPV) testing alone every 5 years, or hrHPV testing in combination with Pap smear every 5 years.<sup>5</sup>

In Israel, since the introduction of the National Health Insurance Law in 1995, Pap smear has been offered free of payment for patients aged 35–54 every 3 years. The health care maintenance organization (HMO) has independently funded Pap smear tests for patients aged 25–34. In practice, all patients aged 25–54, insured by the HMO, were able to perform a Pap smear with no out of pocket expense. Patients aged 55–65 could perform a Pap smear with a deductible fee.

Although there is a clear and compelling evidence that Pap smear screening reduces the incidence and mortality of cervical cancer,<sup>6</sup> many patients do not adhere to recommended guidelines, and cervical cancer screening rate is only around 50%.<sup>7</sup> Several barriers were found to prevent patients from accessing screening services, including low socioeconomic status (SES), cultural beliefs, psychological issues, and intellectual or physical disabilities.<sup>8</sup>

Multiple studies worldwide have demonstrated disparities between patients with and without physical disabilities in receipt of cervical cancer screening.<sup>9,10</sup> Specific barriers that were associated with physically disabled patients include poor SES and the absence of health insurance, physical access difficulties (*e.g.*, transportation, suitable equipment), and physicians' misperceptions regarding the need for cervical cancer screening among these patients.<sup>11,12</sup> New screening approaches that may overcome some of the barriers include self-collected HPV-testing, portable colposcopy or tele-cervicography.<sup>13–15</sup>

To date, no previous study has investigated the participation of patients with disability in screening for cervical cancer in Israel. Israeli population is particularly interesting to study due to its unique ethnic and religious heterogeneity and access to universal health care coverage.

While as many as 15% of working-age females (18–64) in Israel are females with disabilities,<sup>16</sup> their likelihood to receive a Pap smear as recommended by screening guidelines is unclear. The aim of our study was to address this question and to examine the association between physical disability and Pap smear receipt in Israel.

## Materials and Methods

### Study design and population

We conducted a cross-sectional study using the HMO electronic medical records. The HMO is the second largest in Israel, covering 2.8 million people nationwide. All female members of the HMO during 2012–2017 aged 25–65 were identified. Women who had a history of hysterectomy or conization, or those who had a diagnosis of cervical cancer or precancerous lesion were excluded from the study. A total of

391,259 women were eligible for analysis. The study was approved by the Institutional Review Board of Assuta Hospital in Tel Aviv (ID 0006-19-BBL).

### Research variables

**Independent variable.** The independent variable was physical disability, determined by the diagnosis of physical disability in the electronic medical records at the beginning of the study. We compiled a list of relevant diagnoses, represented in ICD-9 codes, including types of structural and functional physical impairment, and excluding sensory, intellectual, and mental diagnoses. The list was then reviewed by a family physician, an epidemiologist, and an activist for the rights of women with disabilities in Israel. We cross-referenced the list with common diagnoses that are linked to locomotor impairment or restriction according to the Israeli social security agency.

We later subdivided all women with physical disabilities into three groups: (1) Physical disability of upper extremities only, (2) Physical disability involving the lower extremities, and (3) Physical disability with an unspecified nature of injury. All diagnoses and ICD-9 codes are listed in Supplementary Appendix SA1.

**Dependent variable.** The dependent variable was Pap smear receipt. This dichotomous variable indicated whether a woman received at least one Pap smear test during the 5 years period of the study (2012–2017). Given the 2012 USPSTF recommendations of a 3-year Pap smear testing interval, a 5-year period enables each woman to perform at least one Pap smear during the follow-up period. The study period was designed to conform to the USPSTF guidelines for cervical cancer screening, updated in 2012 and in 2018. Pap smear procedure codes were extracted from medical records to identify women who underwent the testing.

**Covariates.** We collected sociodemographic and medical information for all women in the study. Sociodemographic variables included were age, SES, and sector. *Age* was treated as a categorical variable (25–34, 35–54, and 55–65). *SES* was determined based on place of residence scaled from 1 to 10 (the highest), and was later categorized into low (1–4), intermediate (5–6), or high (7–10). *Sector* was divided to ultraorthodox Jews, Arabs, and all other. Medical variables included were cardiovascular disease (CVD), type-2 diabetes mellitus (t2DM), chronic obstructive pulmonary disease (COPD), hypertension (HTN), osteoporosis, cognitive disorders, fertility problems, obesity, and smoking. Both smoking status and comorbidities were derived from the designated field in the patients' medical records.

### Statistical analysis

We conducted a descriptive analysis of the participants in the study and reported sociodemographic and medical variables using absolute numbers and percentages. Characteristics of the women with physical disabilities were compared with those of women without physical disability to assess the baseline differences between the two groups.

Univariate analysis was performed to compare women who received Pap smear and those who did not. The chi square test was used to investigate associations of categorical variables. A *p*-value of <0.05 was considered statistically significant. Crude

odds ratios (ORs) were based on the univariate analysis. Variables that were statistically significant in the univariate analysis were entered into a logistic regression analysis that assessed adjusted odds ratios (aORs) for associations with disabilities and other covariates. The Statistical Package for Social Sciences (SPSS) software version 27 was used for data analysis.

**Results**

*Participants*

During 2012–2017, 391,259 patients were eligible for this study. Six thousand seven hundred twenty patients (1.7%) had a diagnosis of physical disability. Patients with disability were older ( $p < 0.001$ ), in lower SES ( $p < 0.001$ ), and had significantly higher rates of comorbidities (Table 1). Of the patients, 4.8% with disability encountered an upper body disability ( $n = 326$ ), 47% ( $n = 3,159$ ) had a lower body disability, and 48.1% had disability not specified to any part of the body.

During the period of this study, 56.7% of patients with physical disabilities had received Pap smear compared to 63.3% of patients without physical disabilities (OR 0.76, 95% confidence interval [CI] 0.72–0.80).

*Multivariate analysis*

Patients with physical disabilities were less likely to receive Pap smear, aOR 0.83, 95% CI 0.79–0.88 (Table 2). Among the study’s population, sociodemographic variables that were negatively associated with receipt of Pap smear were older age (aOR 0.98, 95% CI 0.97–0.99 for ages 35–54 and aOR 0.33, 95% CI 0.33–0.34 for ages 54–65, compared

to ages 25–34), lower SES (OR 0.58, 95% CI 0.57–0.59 for the lowest SES group and 0.80, 95% CI 0.78–0.81 for the intermediate SES group), and sector (OR 0.51, 95% CI 0.49–0.52 for ultraorthodox Jewish patients and OR 0.63, 95% CI 0.61–0.65 for Arab patients).

For all patients, comorbidities were associated with lower receipt of Pap smear, including CVD (OR 0.84, 95% CI 0.79–0.89), t2DM (OR 0.77, 95% CI 0.74–0.79), HTN (OR 0.94, 95% CI 0.92–0.96), and smoking (OR 0.71, 95% CI 0.69–0.72). A history of any oncologic disease was associated with higher receipt of Pap smear (OR 1.09 95% CI 1.06–1.12).

**Discussion**

*Main results*

We conducted a cross-sectional study to assess the association between physical disability and Pap smear receipt in Israel in a period of five consecutive years. In this nationwide study, 6,720 patients (1.7%) had a diagnosis of physical disability. Patients with disability were older, in lower SES, and had significantly higher rates of comorbidities. Having a physical disability was associated with lower odds to receive a Pap smear, as well as older age, lower SES, cultural minority sector (ultraorthodox and Arab patients), most comorbidities (CVD, t2DM, HTN), and smoking. A history of any oncologic disease was associated with increased odds of receipt of Pap smear.

*Interpretation and comparison to existing literature*

In this study, we have found that patients with physical disability had significantly lower odds to receive a Pap smear

TABLE 1. SOCIODEMOGRAPHIC AND CLINICAL CHARACTERISTICS OF FEMALE PATIENTS AGED 25–65 IN ISRAEL WITH AND WITHOUT DISABILITY, BETWEEN THE YEARS 2012–2017

Variable	Disability (n=6,720)	No disability (n=384,539)	p
Age at baseline, (mean ± SD)	43.4 ± 9.5	41.3 ± 9.4	<0.001
25–35 years, % (n)	24.6 (1,651)	32.3 (124, 080)	
36–53 years, % (n)	57.3 (3,848)	55.5 (213,413)	<0.001
54–60 years, % (n)	18.2 (1,221)	12.2 (47,046)	
Socioeconomic status			
Low (1–4), % (n)	20.2 (1,359)	17.4 (67,001)	
Intermediate (5–6), % (n)	37.3 (2,508)	34.2 (131,673)	<0.001
High (7–10), % (n)	42.5 (2,853)	48.3 (185,865)	
Sector			
Ultraorthodox, % (n)	5.3 (357)	5.8 (22,338)	
Arabs, % (n)	5.5 (369)	4.8 (18,454)	0.009
Else, % (n)	89.2 (5,994)	89.4 (343,747)	
Death, % (n)	3.7 (251)	0.6 (2,472)	<0.001
Cancer, % (n)	9.6 (646)	6 (23,199)	<0.001
CVD, % (n)	10.8 (725)	1.2 (4,423)	<0.001
Diabetes, % (n)	10.8 (729)	5.7 (22,030)	<0.001
Fertility problems, % (n)	7 (468)	7.9 (30,413)	0.004
Obesity			
BMI 25–30, % (n)	27.6 (1,858)	27.2 (104,419)	0.366
BMI ≥30, % (n)	25.3 (1,701)	21 (80,860)	<0.001
COPD, % (n)	2.3 (157)	0.9 (3,480)	<0.001
HTN, % (n)	24.4 (1,642)	14 (53,667)	<0.001
Smoking, % (n)	11.8 (793)	10.8 (41,377)	<0.001
Osteoporosis, % (n)	11 (741)	5.9 (22,836)	<0.001
Cognitive disorder, % (n)	2.1 (139)	0.3 (1,150)	<0.001
Pap smear receipt, % (n)	56.7 (3,808)	63.3 (243,412)	<0.001

BMI, body mass index; COPD, chronic obstructive pulmonary disease; CVD, cardiovascular disease; HTN, hypertension; SD, standard deviation.

TABLE 2. CHARACTERISTICS OF FEMALE PATIENTS AGED 25–65 IN ISRAEL, WHO DID AND DID NOT RECEIVE PAP SMEAR BETWEEN THE YEARS 2012–2017

Variable	Receive Pap smear n=247,220 (63.2%)	Did not receive Pap smear n=144,039 (36.8%)	Crude OR (95% CI)	Adjusted OR (95% CI)
Disability, % (n)	1.5 (3,808)	2 (2,912)	0.76 (0.72–0.80)	0.83 (0.79–0.88)
No disability	98.5 (243,412)	98 (141,127)	Reference	Reference
Upper body disability, % (n)	0.1 (198)	0.1 (128)	0.90 (0.72–1.12)	
Lower body disability, % (n)	0.7 (1,638)	1.1 (1,521)	0.62 (0.58–0.67)	
Other disability, % (n)	0.8 (1,972)	0.9 (1,263)	0.90 (0.84–0.97)	
Age at baseline, (mean ± SD)	40.2 ± 8.7	43.2 ± 10.2	0.97 (0.97–0.97)	
25–35 years, % (n)	34.4 (85,078)	28.2 (40,653)	Reference	Reference
36–53 years, % (n)	57.8 (143,015)	51.5 (74,246)	0.92 (0.91–0.93)	0.98 (0.97–0.99)
54–60 years, % (n)	7.7 (19,127)	20.2 (29,140)	0.31 (0.31–0.32)	0.33 (0.33–0.34)
Socioeconomic status				
Low (1–4), % (n)	13.5 (33,486)	24.2 (34,874)	0.43 (0.42–0.43)	0.58 (0.57–0.59)
Intermediate (5–6), % (n)	33.6 (83,174)	35.4 (51,007)	0.73 (0.72–0.74)	0.80 (0.78–0.81)
High (7–10), % (n)	52.8 (130,560)	40.4 (58,158)	Reference	Reference
Sector				
Ultraorthodox, % (n)	4 (9,802)	9 (12,893)	0.40 (0.39–0.41)	0.51 (0.49–0.52)
Arabs, % (n)	3.6 (8,854)	6.9 (9,969)	0.47 (0.46–0.48)	0.63 (0.61–0.65)
Else, % (n)	92.5 (228,564)	84.1 (121,177)	Reference	Reference
Cancer, % (n)	6 (14,747)	6.3 (9,098)	0.94 (0.92–0.97)	1.09 (1.06–1.12)
CVD, % (n)	1 (2,432)	1.9 (2,716)	0.52 (0.49–0.55)	0.84 (0.79–0.89)
t2DM, % (n)	4.4 (10,858)	8.3 (11,901)	0.51 (0.50–0.52)	0.77 (0.74–0.79)
Obesity, BMI ≥30, % (n)	19.1 (47,215)	24.5 (35,346)	0.73 (0.71–0.74)	0.88 (0.87–0.90)
HTN, % (n)	11.9 (29,418)	18 (25,891)	0.62 (0.60–0.63)	0.94 (0.92–0.96)
Smoking, % (n)	9.8 (24,133)	12.5 (18,037)	0.71 (0.70–0.72)	0.71 (0.69–0.72)
Cognitive disorder, % (n)	0.3 (662)	0.4 (627)	0.61 (0.55–0.68)	1.00 (0.89–1.12)

CI, confidence interval; OR, odds ratio; t2DM, type 2 diabetes mellitus.

test. Our results are broadly in-line with previously published studies that have demonstrated similar disparities.<sup>9–11</sup> In general, patients with disabilities were found to be less likely to receive cancer screening, including mammography, Pap smear, and stool tests.<sup>9,11,17–20</sup> In addition, patients with disabilities have higher incidence of cervical and breast cancer compared to patients without disability.<sup>17</sup>

We have found 1.7% of patients with physical disability. This is contrary to an estimation of 15% of people in this age group who have any type of disability.<sup>16</sup> The discrepancy can be explained partially by the fact that we have chosen to focus specifically on patients with physical disabilities. Also, the process in which we formulated our list of diagnoses resulted in a narrower definition of disability compared to other methods. Under documentation of disability diagnosis in the medical records is also likely.

Patients with physical disability were older, in lower statuses, and had significantly higher rates of comorbidities, including CVD, t2DM, COPD, HTN, osteoporosis, and cognitive disorders. This finding is similar to the profile of patients with disability described in a previous study.<sup>21</sup> Like Huang et al.,<sup>22</sup> we found that factors associated with lower Pap smear receipt were older age, living in areas of higher urbanization, lower income, lower education level, being unmarried, having been diagnosed with diabetes, not having been diagnosed with cancer, and living with severe disability levels.

Rivera and Short found that patients with disabilities were less likely to receive Pap smear.<sup>23</sup> Interestingly, they found these patients to be more likely to receive a recommendation from their health care provider to perform the test. The rea-

sons for nonreceipt were similar for patients with and without disability. Other studies have found that the severity of disability is also associated with lower rates of Pap Smear receipt.<sup>9,24</sup>

Merten et al. and Ramjan et al. elaborated on several barriers to cancer screening for patients with mobility limitations and physical disabilities identifying individual factors such as anxiety, depression, and the absence of health insurance; interpersonal factors such as spousal support and poor communication with health providers; and environmental factors such as transportation and physical barriers.<sup>11,12</sup> Among people with disabilities, physical barriers were found to be the most prominent. Wu et al. showed in their research that most patients with physical disability who lived in the community had reported low level of awareness to the significance of cervical cancer screening.<sup>25</sup>

In our study, in a multivariate logistic regression analysis we found that older age, low and intermediate SES, and being part of a minority group (ultraorthodox and Arab patients) were associated with lower receipt of Pap smear. A study on the uptake of Pap smear in Israel between 2006 and 2008 also revealed that a low SES is negatively associated with screening uptake,<sup>26</sup> despite the low cost of Pap smear in Israel. Between 2014 and 2018, screening for cervical cancer in Israel among low SES patients was twice lower than among patients in the highest SES group.<sup>27,28</sup>

In addition to sociodemographic factors, clinical factors were also found related to Pap smear receipt. CVD, t2DM, HTN, obesity, and smoking were all associated with lower receipt of Pap smear. A study from the United States' Center for Disease Control and Prevention found that patients with

t2DM were less likely to receive Pap smear than patients without t2DM.<sup>29</sup> Obesity was negatively associated with Pap smear receipt in other studies,<sup>30–32</sup> with more severe obesity associated with decreasing odds of Pap smear uptake.<sup>30,33,34</sup> Sanford et al. showed that current smokers were less likely to have undergone a Pap smear test compared to never smokers.<sup>35</sup>

We found that a history of nongynecologic oncologic disease was associated with higher receipt of Pap smear. This is contrary to two big studies that found that cancer survivors were not more likely to receive cervical cancer screening.<sup>36,37</sup>

#### *Strengths and limitations*

The strengths of this study are the big sample size and its nationwide coverage of patients from across Israel. The dataset is based on the electronic files of all patients in the HMO. All HMOs in Israel have fully computerized health care systems, and therefore sociodemographic data were available for all participants.

Limitations include a potential information bias, since our classification relied on the accuracy of the patients' medical records and list of diagnoses, and thus was influenced by the physicians' documentation of disability. Another limitation is a potential overestimation of OR, as Pap smear receipt is a highly prevalent outcome.

#### *Implications for practice and policy*

Identifying health disparities is an essential step in designing an inclusive health care policy. While it is important to map the specific barriers that contribute to health gaps, some existing solutions, such as self-collected Pap smear or HPV testing, can already be implemented. Practitioners' awareness can facilitate a focused and sensitive discussion with patients about health, preventive medicine, and overcoming specific barriers. Managing patients with disability may be challenging for physicians in the community. Creating an appropriate practice with adequate access to patients with disabilities,<sup>38</sup> combined with systems that ensure quality of care, may facilitate adherence to cancer screening and other health recommendations.

#### **Conclusions**

Our study highlights the discrepancy between patients with and without physical disability with regard to screening for cervical cancer by receipt of Pap smear. In addition to their physical disability, patients in this group were older, in lower SES, and with significantly higher rates of comorbidities, which puts them in additional risk to receive lower screening for cervical cancer. Aiming a spotlight at the lower odds of patients with disability to receive cervical cancer screening can facilitate bridging over existing health care gaps.

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#### **Authors' Contributions**

L.B.: conceptualization, methodology, writing, review, and editing; A.B.: statistical analysis, review, and editing; K.R.: writing, review, and editing; L.A.: writing, review, and editing.

#### **Author Disclosure Statement**

L.B., A.B., K.R., and L.A. work in Maccabi Healthcare Services.

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#### **Supplementary Material**

Supplementary Appendix SA1

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