RESEARCH ARTICLE

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# Missed Opportunities in Cervical Cancer Prevention: Knowledge and Screening Practices Among Women with Hemoglobinopathies in Greece

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## Abstract

**Background:** Women with hemoglobinopathies represent a chronically ill population with frequent healthcare contact, yet limited integration into preventive health programs. Despite the proven effectiveness of HPV vaccination and screening, cervical cancer remains a preventable cause of both morbidity and mortality. **Objective:** To assess the levels of knowledge, awareness, and adherence to cervical cancer prevention and screening practices among women with hemoglobinopathies in Greece. **Methods:** A cross-sectional study was conducted among 202 women with thalassemia or sickle cell disease, attending a tertiary hospital's Hemoglobinopathy Unit in Athens between December 2023 and March 2024. Data were collected using the validated Cervical Cancer Knowledge and Prevention Questionnaire (CCKP-64) and analyzed with SPSS 25, using descriptive and inferential statistics. **Results:** Nearly all participants were aware of cervical cancer (98.5%), the Pap test (99.0%), and the HPV vaccine (96.5%). However, only 6.5% were vaccinated against HPV, while 75.2% underwent annual Pap screening. Higher adherence to screening was associated with younger age ($p = 0.009$), employment status ($p = 0.032$), and higher income ($p = 0.049$). Knowledge regarding risk factors was moderate, with 58.4% recognizing HPV infection as the main cause. The most frequent reason for non-compliance was negligence (14.8%). **Conclusions:** Despite adequate awareness of cervical cancer and good adherence to Pap testing, HPV vaccination rates remain strikingly low among women with hemoglobinopathies. This highlights missed opportunities to integrate HPV vaccination and education into chronic disease management. Tailored preventive strategies and continuous awareness campaigns are essential to achieving the WHO's 2030 cervical cancer elimination goals.

**Keywords:** Cervical cancer- HPV vaccination- prevention- screening; hemoglobinopathies- women's health

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## Introduction

Cervical cancer (CC) remains a major global public health concern despite being one of the few cancers that is largely preventable through effective screening and vaccination programs. According to the World Health Organization (WHO), more than 600,000 new cases and 350,000 deaths occurred worldwide in 2022, with the disease ranking as the fourth most common malignancy among women of reproductive age [1]. Significant disparities persist between countries, primarily driven by differences in socioeconomic status, vaccination coverage, and access to screening and treatment services [2].

Human Papillomavirus (HPV) infection, which is the most common sexually transmitted disease worldwide, has been proven to be the main risk factor for the occurrence of CC. Specifically, persistent infection by types HPV16, HPV18, HPV6, and HPV11 is responsible for 80% of cases of the disease [3, 4]. Other factors that contribute to the occurrence of CC are the weakened immune system (HIV infection), poor diet, smoking, long-term use of contraceptive hormones, and increased risk of infection by the virus [2]. By the early diagnosis of HPV infection, precancerous and cancerous lesions, a large reduction in cases of CC is recorded. If the disease is diagnosed and treated at an early stage, the five-year survival rate reaches 91% [5, 6].

The detection of oncogenic HPV types with newer molecular methods and the implementation of improved screening techniques in cytological examination of the cervical smear (Pap test) have improved the accuracy of diagnosis and have contributed to further reducing

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the incidence of the disease and unnecessary surgical intervention [5]. A major achievement in the primary prevention of the disease was the development of a vaccine against oncogenic types of HPV. Vaccination has now proven to be an effective weapon against the disease [7].

WHO's goal is to eliminate the disease as a public health problem by 2030. All countries are urged to organize appropriate programs for vaccination, early diagnosis, and treatment in the female population [1]. For these programs to be effective, it is necessary to identify the target population groups, determine knowledge, awareness, and attitudes towards the disease, and existing methods of prevention and early diagnosis [8, 9].

Despite global progress, prevention is not uniform across all women, particularly those with chronic health conditions. One such group is women with hemoglobinopathies, who remain engaged in frequent healthcare yet are rarely included in cervical cancer prevention discussions. Women with hemoglobinopathies may present specific biological and healthcare-related vulnerabilities that justify targeted preventive interventions. Chronic transfusions, iron overload, and splenic dysfunction have been associated with altered immune regulation and reduced capacity to clear viral infections [10, 11]. Furthermore, splenectomized or transfusion-dependent patients may exhibit impaired T- and B-cell function and decreased humoral response to vaccination [12, 13]. These immune alterations, together with the increased exposure to healthcare services, position women with hemoglobinopathies as a high-priority yet overlooked group for cancer prevention initiatives [14, 15].

Advances in medical treatment have significantly prolonged survival in this population. However, as patients live longer, they face an increased risk of developing certain malignancies and other comorbidities compared to the general population. These risks are mainly related to their underlying hematological condition, chronic transfusion therapy, and advancing age [14, 16]. Consequently, preventive health strategies—including cancer screening and vaccination, should be systematically integrated into routine hematology care to mitigate long-term morbidity and mortality [17].

In Greece, where organized screening programs are limited and vaccination uptake remains suboptimal, understanding the preventive behavior of women with hemoglobinopathies is of relevance. Identifying gaps in awareness and compliance can inform targeted interventions within hematology and thalassemia centers [18]. Despite increased international focus on cervical cancer prevention, this population remains largely overlooked in research. To our knowledge, the present study is the first in Greece to investigate cervical cancer knowledge, HPV vaccination, and screening practices among women with hemoglobinopathies, addressing a critical evidence gap in preventive care.

Therefore, the present study aims to assess the levels of knowledge, awareness, and adherence to primary and secondary prevention of cervical cancer among women with hemoglobinopathies in Greece, and to explore sociodemographic factors associated with preventive behaviors.

## Materials and Methods

*Study Design and Setting*

This descriptive cross-sectional study was conducted at the Thalassemia and Hemoglobinopathies Unit of Laiko General Hospital in Athens, Greece, a tertiary referral center providing continuous monitoring and treatment to adults with inherited hematologic disorders. The study aimed to evaluate the level of knowledge, awareness, and adherence to cervical cancer prevention and screening practices among women with hemoglobinopathies. Data collection was carried out between December 2023 and March 2024, following the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines for cross-sectional studies [19].

*Study Population and Sampling*

The study population included adult women aged 18 years or older with a confirmed diagnosis of thalassemia (homozygous or intermediate) or sickle cell disease who were regularly followed at the hospital unit. Out of 240 eligible patients, 202 women completed the questionnaire, yielding a response rate of 84.2%, which is considered satisfactory for this clinical population. Eligible participants had to understand Greek and provide written informed consent. Women with cognitive impairment, acute illness, or recent gynecologic malignancy were excluded to maintain homogeneity and data integrity.

An a priori sample size estimation was performed using GPower (version 3.1.9.7) [20]. Assuming a medium effect size ($f = 0.25$), 80% statistical power, and $\alpha = 0.05$ for two-tailed tests, a minimum of 180 participants was required. The final sample of 202 women exceeded this threshold, ensuring adequate statistical power for detecting meaningful associations.

*Research Instrument*

Data were collected using the Cervical Cancer Knowledge and Prevention-64 (CCKP-64) questionnaire, a validated and structured tool originally developed by Jaglarz et al. [21, 22] . The instrument was translated into Greek through a standardized forward–backward translation process and pilot tested in a small group of women with hemoglobinopathies to ensure cultural and linguistic accuracy [23, 24].

The final version contained 64 items organized into six thematic domains: sociodemographic data, general knowledge about cervical cancer, perceived risk factors, primary prevention (including HPV vaccination and lifestyle factors), secondary prevention (Pap test and HPV DNA testing), and sources of information. Most items were categorical or ordinal, while the section on risk factors used a six-point Likert-type scale (0 = no association to 5 = strong association). The CCKP-64 demonstrated strong internal reliability in previous studies (Cronbach's $\alpha > 0.80$), and in this study, internal consistency ranged from $\alpha = 0.78$ to 0.86 across domains [25, 26].

*Data Collection Procedure*

Participants were approached during their scheduled hospital appointments and informed about the purpose and

procedures of the study. After providing written informed consent, they completed the anonymous questionnaire either in paper form during their visit or electronically via a secure online platform, depending on their preference. The questionnaire was completed independently by participants, with researcher assistance provided only if clarification was requested. The completion time was approximately 15–20 minutes. Participation was entirely voluntary, no compensation was provided, and all responses were anonymous. Data were collected in a private setting to minimize social desirability bias and to encourage open and honest responses.

*Statistical Analysis*

Data were analyzed using IBM SPSS Statistics for Windows, Version 25.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics, including means, standard deviations, frequencies, and percentages, were used to summarize sociodemographic characteristics and knowledge levels. Associations between categorical variables, such as age, education, occupation, and income, and adherence to annual Pap testing were examined using the Chi-square ($\chi^2$) test. When expected frequencies were small, Fisher's exact test was applied. Continuous variables were categorized based on clinically meaningful thresholds (e.g., age ≤50 vs. >50 years). Missing data were minimal and were excluded from analyses using listwise deletion; no statistical imputation was applied. The level of statistical significance was set at $p < 0.05$.

To explore independent predictors of preventive behavior, binary logistic regression models were developed to assess factors associated with annual Pap testing and HPV vaccination status, adjusting for key sociodemographic variables such as age, education, income, occupation, and type of hemoglobinopathy. A logistic regression model for HPV vaccination was not performed due to the very small number of vaccinated participants, which did not permit robust statistical estimation.

*Ethical Considerations*

The study protocol was approved by the Scientific and Ethics Committee of Laiko General Hospital (Approval No. 751/11.12.2023). All participants received oral and written information about the study and signed informed consent before participation. Data confidentiality and anonymity were maintained according to the principles of the Declaration of Helsinki and the European Union General Data Protection Regulation (GDPR 2016/679). Participation was voluntary, and participants were informed of their right to withdraw at any stage without consequence.

## Results

A total of 202 women with hemoglobinopathies participated (response rate 84.2%). The mean age was 49.4 ± 11.1 years (range: 19–69). Slightly more than half (55%) had sickle cell disease, and 45% had thalassemia. Over half were university graduates (55.4%), and the majority were married (58.4%) with a mean of 1.1 ± 0.9 children (Table 1). Approximately 52.2% reported at least one cesarean section, 35.2% had a history of miscarriage or abortion, and 9.3% had attempted IVF. Most were non-smokers (74.6%), while 32.7% reported passive smoking exposure.

Almost all participants (98.5%) had heard of cervical cancer, and 99% were aware of the Pap test. However, misconceptions were common: 45.3% considered cervical cancer potentially incurable, and 39.3% did not recognize its viral etiology. Only 60.7% correctly identified HPV infection as the primary cause (Table 2). About 15% had personal or family experience with the disease, and 29.1% perceived themselves at low risk of future development.

As shown in Table 3, participants perceived HPV infection (M = 3.35 ± 1.55), a history of sexually

Table 1. Sociodemographic and Clinical Characteristics of the Participants (N = 202)

| Characteristic | N (%) |
|---|---|
| Age (years) | 49.4 ± 11.1 (range 19–69) |
| ≤ 50 years | 93 (48.7) |
| ≥ 51 years | 98 (51.3) |
| Educational level | |
| Primary | 24 (11.9) |
| Secondary | 66 (32.7) |
| Tertiary | 78 (38.6) |
| Postgraduate | 34 (16.8) |
| Occupation | |
| Civil servant | 44 (21.8) |
| Private employee | 44 (21.8) |
| Freelancer | 16 (7.9) |
| Unemployed | 8 (4.0) |
| Retired | 61 (30.2) |
| Household | 26 (12.9) |
| Student | 3 (1.5) |
| Monthly family income (€) | |
| ≤ 500 | 22 (10.9) |
| 501–700 | 28 (13.9) |
| 701–1,000 | 44 (21.9) |
| 1,001–1,500 | 47 (23.4) |
| > 1,500 | 60 (29.9) |
| Marital status | |
| Married | 118 (58.4) |
| Cohabiting | 11 (5.4) |
| Divorced/Separated | 28 (13.9) |
| Single | 45 (22.3) |
| Mean number of children | 1.1 ± 0.9 |
| Smoking | Yes 51 (25.4), No 150 (74.6) |
| Passive smoking exposure | 66 (32.7) |
| Type of hemoglobinopathy | Sickle cell disease 110 (55.0), Thalassemia 90 (45.0) |

Note: Values are presented as mean ± SD or N (%). CC, cervical cancer; HPV, human papillomavirus. Missing responses were excluded from percentage calculations.

Table 2. General Knowledge about Cervical Cancer

| Question | Yes N (%) | No N (%) |
|---|---|---|
| Heard of cervical cancer | 199 (98.5) | 3 (1.5) |
| Is cervical cancer incurable? | 91 (45.3) | 110 (54.7) |
| Can it be related to an infection? | 122 (60.7) | 79 (39.3) |
| Is there an effective preventive method? | 174 (86.6) | 27 (13.4) |
| Personal/family experience with disease? | 30 (14.9) | 172 (85.1) |
| Could it affect you in the future? | 141 (70.9) | 58 (29.1) |

Note: Bold responses indicate correct awareness of cervical cancer etiology and preventive methods. Missing responses were excluded from percentage calculations.

Table 3. Perceived Association of Risk Factors with Cervical Cancer Occurrence (Likert 0–5)

| Risk Factor | Mean (SD) |
|---|---|
| HPV infection | 3.35 (1.55) |
| History of sexually transmitted infections | 3.04 (1.69) |
| Genetic predisposition | 3.02 (1.70) |
| HIV infection | 2.70 (1.61) |
| Multiple sexual partners | 2.83 (1.72) |
| Smoking | 2.28 (1.56) |
| Hormonal contraception | 2.11 (1.53) |
| Miscarriages/abortions | 2.14 (1.53) |
| Early initiation of sexual activity | 1.96 (1.68) |
| Alcohol abuse | 1.65 (1.51) |
| Large number of pregnancies | 1.68 (1.48) |
| Early menarche | 1.20 (1.28) |
| Use of public pools | 1.55 (1.31) |
| Breastfeeding | 0.76 (1.25) |

Note: Higher mean values indicate stronger perceived associations between the factor and cervical cancer risk. Missing responses were excluded from percentage calculations.

transmitted infections (M = 3.04 ± 1.69), and genetic predisposition (M = 3.02 ± 1.70) as the strongest risk factors. Lifestyle factors such as smoking and hormonal contraception were rated moderately associated, whereas early menarche and breastfeeding were perceived as least relevant.

Regarding primary prevention, most women reported engaging in protective lifestyle behaviors, including avoiding highly processed foods (79.6%) and ensuring adequate sleep (67.8%). Awareness of the HPV vaccine was nearly universal (96.5%), yet vaccination uptake was low (6.5%). Moreover, 36.3% did not know if the vaccine was provided free of charge, and 12% were unsure of its availability in Greece. Although 72.5% believed that the vaccine did not offer absolute protection, only 43.1% correctly identified the recommended vaccination age (9–13 years) (Table 4).

Figure 1 illustrates the discrepancy between high awareness and lower adherence to preventive behaviors. Although almost all participants were aware of the Pap test and HPV vaccination, only 75.2% reported annual Pap testing and 6.5% were vaccinated against HPV, highlighting a pronounced awareness–behavior gap.

Knowledge regarding secondary prevention varied (Table 5). The most recognized warning signs were postmenopausal bleeding (52.0%) and abnormal bleeding during or between periods (50.5%), whereas genital itching (16.9%) and painful menstruation (20.3%) were infrequently linked to cervical cancer. Awareness of the Pap test was nearly universal (99%), and 77.2% correctly identified it as an effective method of early detection. The majority (94.1%) believed it should be performed annually, and 75.2% reported annual testing adherence, while 7% rarely or never underwent screening.

Among the 32 women who did not perform the Pap test regularly, negligence (93.8%) was the predominant reason, followed by shame (18.7%), financial barriers (9.4%), and fear of pain (6.3%). Only 22.3% had ever undergone an HPV DNA test, and 18.8% had been advised to do so by their gynecologist.

Bivariate analyses indicated that younger age (≤50 years; p = 0.009), employment status (p = 0.032), and higher monthly income (p = 0.049) were significantly

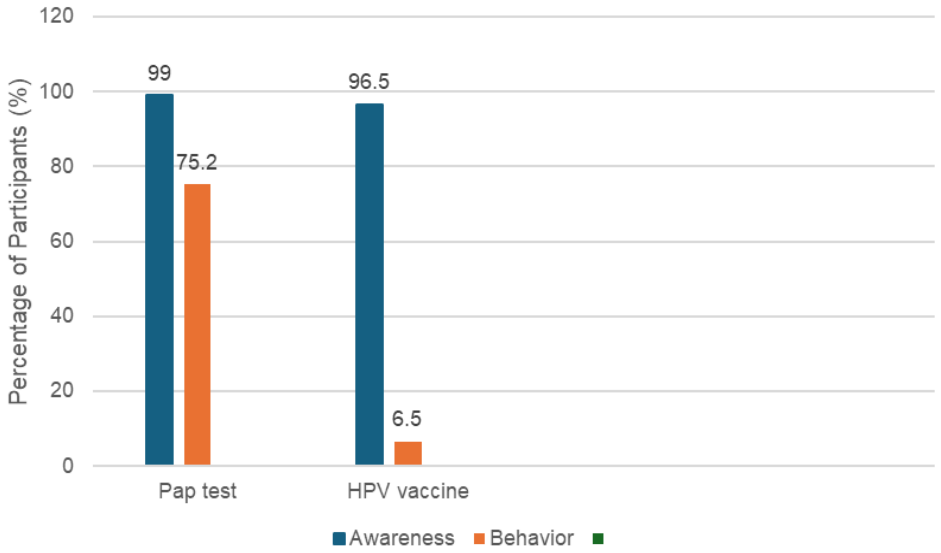


Figure 1. Awareness-Behavior Gap in Cervical Cancer Prevention among women with Hemoglobinopathies

Table 4. Primary Prevention Practices and HPV Vaccination Awareness

| Item | Yes N (%) | No N (%) | Don't know N (%) |
|---|---|---|---|
| Diet rich in antioxidants | 131 (64.9) | 17 (8.4) | 54 (26.7) |
| Regular physical exercise | 131 (64.9) | 34 (16.8) | 37 (18.3) |
| Adequate and relaxing sleep | 137 (67.8) | 34 (16.8) | 31 (15.3) |
| Avoid highly processed foods | 160 (79.6) | 22 (10.9) | 19 (9.5) |
| Heard of HPV vaccine | 195 (96.5) | 7 (3.5) | - |
| Know vaccine available in Greece | 177 (88.1) | 9 (4.5) | 15 (7.5) |
| Know if vaccine is free of charge | 128 (63.7) | 21 (10.4) | 52 (25.9) |
| Believe vaccine offers 100% protection | 45 (22.5) | 110 (55.0) | 45 (22.5) |
| Have been vaccinated | 13 (6.5) | 185 (92.0) | 3 (1.5) |
| Correct vaccination age (9–13 years) | 87 (43.1) | - | - |

Note: Data reflect awareness and preventive behaviors related to lifestyle and HPV vaccination. Missing responses were excluded from percentage calculations

Table 5. Secondary Prevention Knowledge and Screening Behavior

| Variable / Symptom | Yes N (%) | No N (%) | Don't know N (%) |
|---|---|---|---|
| Bleeding after menopause | 105 (52.0) | 22 (10.9) | 75 (37.1) |
| Heavy bleeding during or between periods | 102 (50.5) | 36 (17.8) | 64 (31.7) |
| Foul-smelling discharge | 76 (37.6) | 45 (22.3) | 81 (40.1) |
| Bleeding after intercourse | 91 (45.0) | 23 (11.4) | 88 (43.6) |
| Itching in genital area | 34 (16.9) | 69 (34.3) | 98 (48.8) |
| Painful menstruation | 41 (20.3) | 88 (43.6) | 73 (36.1) |
| Awareness of Pap test | 198 (99.0) | 2 (1.0) | - |
| Annual Pap testing | 152 (75.2) | - | - |
| Main reasons for non-adherence (n = 32) | | | |
| Negligence | 30 (93.8) | | |
| Shame | 6 (18.7) | | |
| Financial barriers | 3 (9.4) | | |
| Fear of pain | 2 (6.3) | | |
| HPV DNA test ever done | 45 (22.3) | - | - |
| Gynecologist recommendation | 38 (18.8) | - | - |

associated with annual Pap testing. In logistic regression analysis, younger women were more than twice as likely to perform annual screening (OR = 2.45, 95% CI: 1.15–5.23, p = 0.021). Women with higher income (>€1,500/month) also demonstrated greater adherence (OR = 3.12, 95% CI: 1.05–9.23, p = 0.039). No significant associations were observed between education level or type of hemoglobinopathy and screening or preventive practices.

Health professionals were the primary source of information (72.3%), followed by the internet (37.1%) and television (27.2%). Interestingly, women who reported receiving information directly from healthcare providers demonstrated significantly higher rates of both Pap testing and HPV awareness ($p < 0.05$).

## Discussion

This study provides novel insight into the knowledge, attitudes, and preventive behaviors regarding cervical cancer among women with hemoglobinopathies in Greece. a chronically ill population that is in frequent contact with healthcare services but remains largely underrepresented in preventive health research. Despite the participants' regular engagement with hospital care, significant gaps persist between awareness and action, revealing a paradox of high knowledge but low vaccination uptake.

The high level of awareness of cervical cancer (98.5%) and Pap testing (99%) found in this study is consistent with data from the general Greek population [27, 28] and other European cohorts [26]. However, the low HPV vaccination rate (6.5%) highlights a critical public health gap. This finding mirrors earlier evidence of vaccine hesitancy in Greece [29, 30] and internationally [31, 32], suggesting that information deficits, concerns about vaccine safety, and limited physician recommendation continue to impede immunization progress. Given that the mean age of participants was nearly 50 years, some under-vaccination may reflect missed eligibility during the early rollout of the vaccine in Greece. Nonetheless, these data underscore the need for catch-up vaccination campaigns and opportunistic immunization within hematology clinics.

Knowledge about risk factors was moderate, with

only 60.7% identifying HPV as the primary cause. This echoes the partial understanding reported in other Greek studies [27, 28, 29, 30] and suggests that even women with chronic illnesses are not adequately exposed to structured health education. Similar patterns of overestimating genetic or lifestyle factors while underrecognizing HPV as causal have been observed internationally [33, 34]. These misperceptions weaken engagement with primary prevention strategies and highlight the need for integrated patient education within chronic disease programs.

Encouragingly, 75.2% of participants reported annual Pap screening, a higher rate than previously reported among Greek women [27, 28]. This may be explained by the frequent healthcare interactions required for hemoglobinopathy management, the high proportion of well-educated participants, and the urban hospital setting. Nevertheless, screening remains self-initiated rather than systematically organized. Negligence was the dominant reason for non-adherence (93.8%), followed by shame and financial barriers recurrently reported in Greek and international literature [27, 28, 35]. This finding underscores the persistence of psychosocial and cultural determinants influencing screening behavior, despite good access to healthcare.

Notably, fewer than one in four women had undergone an HPV DNA test, and only 18.8% reported physician recommendation. These figures contrast sharply with international guidelines advocating for HPV DNA testing as the preferred method for cervical screening [6, 36]. This gap points to a need for professional re-education and updated national protocols, ensuring that women followed in chronic care units are offered evidence-based screening options.

The statistical analysis revealed that younger age, employment, and higher income were significantly associated with annual Pap testing. These associations align with previous studies linking socioeconomic advantage to better preventive behaviors [14, 37, 38]. Importantly, younger women demonstrated more proactive attitudes toward screening, possibly due to greater exposure to digital health information and public campaigns. Conversely, older participants, who represent a clinically vulnerable group due to age and comorbidities, remain less adherent, underlining the need for age-tailored interventions and clinician-driven screening reminders.

Although participants frequently interact with health professionals, the study revealed that healthcare providers are not consistently leveraging this contact to promote HPV vaccination and screening. At a systemic level, the absence of organized national recall systems, limited implementation of HPV DNA testing, and variable provider counseling contribute to inconsistent prevention uptake. Provider-level barriers may include time constraints, lack of routine prompts during clinical encounters, and insufficient prioritization of preventive discussions in the context of chronic disease management. Evidence from other chronic disease settings confirms that repeated medical visits do not necessarily translate into better preventive care unless supported by structured communication and institutional protocols [11, 14, 39]. Therefore, hematology and thalassemia units represent a missed opportunity for implementing WHO's "90–70–90" cervical cancer elimination strategy (1). Simple measures, such as offering on-site vaccination, embedding HPV counseling into annual follow-up visits, or implementing electronic reminders, could substantially increase prevention coverage in this high-risk group.

From a public health perspective, these findings expose both systemic and behavioral barriers. Systemic challenges include the absence of a national organized screening program in Greece and inconsistent follow-up pathways [18, 19, 40]. Behavioral obstacles, such as negligence or misconceptions, indicate persistent health literacy gaps even among educated populations. Overall, the findings point toward the need for more structured and nationwide prevention policies that ensure equal access to vaccination and screening for vulnerable populations.

This study contributes original evidence that women with hemoglobinopathies though frequently in contact with the healthcare system remain under protected against preventable malignancies. The results align with recent calls for incorporating preventive health strategies into chronic disease management frameworks. Implementing structured education programs and opportunistic HPV vaccination within hematology services could serve as a model for other chronic conditions requiring continuous care.

*Strengths and Limitations*

To our knowledge, this is the first study in Greece and internationally focusing on cervical cancer prevention behaviors among women with hemoglobinopathies. Its strength lies in its targeted population, validated instrument (CCKP-64), and high response rate (84.2%).

This study has certain limitations. Its cross-sectional design precludes causal inference, and all data were self-reported, which may introduce recall or social desirability bias. Participants were recruited from a single tertiary hospital and had relatively high educational levels, potentially limiting generalizability to women with lower socioeconomic status or those followed in peripheral centers. Nevertheless, the study's high response rate and use of a validated instrument strengthen its internal validity.

*Implications for Practice and Policy*

Integrating cervical cancer prevention into chronic care pathways represents an achievable and cost-effective public health goal. Systematic HPV vaccination offers the most immediate benefit, while combining HPV DNA testing with Pap cytology can further optimize early detection. Embedding preventive counseling within hematology services and training health professionals in motivational communication can leverage existing patient contact to meet WHO's 2030 elimination targets.

In conclusion, despite excellent awareness of cervical cancer and high adherence to Pap testing, HPV vaccination coverage remains alarmingly low among women with hemoglobinopathies in Greece. These findings highlight the urgent need for comprehensive, interdisciplinary prevention programs that transform routine chronic care encounters into opportunities for health promotion.

Bridging this gap is essential not only for this vulnerable population but also for advancing national efforts toward cervical cancer elimination.

## Author Contribution Statement

Vasiliki Papagiannakou : Conceptualization; Methodology; Investigation; Writing – Original Draft. Evangelos C. Fradelos: Validation; Writing – Review & Editing; Resources. Ioanna Dimitriadou: Project Administration; Writing – Review & Editing. Maria Saridi: Data Curation; Formal Analysis; Visualization. Eustratia Mourtou: Validation; Writing – Review & Editing; Resources. Pavlos Sarafis: Formal Analysis; Visualization; Methodology. Aikaterini Toska: Supervision; Funding Acquisition; Writing – Review & Editing

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*Ethics and Integrity Statements*
*Data Availability Statement*

The data that support the findings of this study are available on request from the corresponding author.

*Ethics Approval Statement*

The study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki. Ethical approval was obtained from the Scientific and Ethics Committee of Laiko General Hospital (Approval No. 751/11.12.2023).

*ICMJE Authorship Statement*

All authors meet the authorship criteria as defined by the International Committee of Medical Journal Editors (ICMJE). Each author made substantial contributions to the conception, design, data collection, analysis, and/or interpretation 2023).

*Patient Consent Statement*

All participants were fully informed about the purpose and procedures of the study and provided written informed consent prior to participation.

*Authorship Statements*

of the study; participated in drafting or critically revising the manuscript; and approved the final version for submission.

*Conflict of Interest Disclosure*

The authors declare no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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