

Analysis of cervical cancer screening attendance before, during, and after the COVID-19 pandemic: six-year laboratory experience

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Key words: cervical cancer, screening, COVID-19.

Abstract

Introduction: Cervical cancer is one of the most common malignant tumours among women worldwide. Cytology remains the simplest and cheapest method for detecting this cancer. Due to the very low participation of women in cytological screening, the disease is often diagnosed at an advanced stage.

Aim of the research: The aim of the study has been to estimate how the COVID-19 pandemic and related public life restrictions affected cervical cancer screening during the period from March 2018 to February 2024.

Material and methods: The research sample consisted of cytological test results. An analysis was conducted on patient attendance for cytological screening as well as an analysis of positive results during the periods before, during, and after the COVID-19 pandemic.

Results: The COVID-19 pandemic and the associated public restrictions negatively impacted the performance of cytological tests only 'outside the programme'. However, what is particularly noteworthy is that the number of tests performed 'as part of the prevention programme' has increased. Despite the decreasing number of tests performed after the pandemic, we observed a higher percentage share of positive diagnoses (period VI: 2.24%). LSIL diagnoses are starting to prevail, which carries the risk of the development of higher-grade lesions over time.

Conclusions: The pandemic determines the risk of the occurrence of high-grade intraepithelial lesions and cervical cancer. It is necessary to implement changes in cytological screening as soon as possible to increase the rate of cytology tests, not only during such a challenging time as the pandemic but also beyond it.

Introduction

Cervical cancer is one of the most common malignant tumours among women worldwide. It is caused by the HPV virus in sexually active individuals. It is assumed that women who begin menstruating early and start sexual activity at a young age are at an increased risk of developing cervical cancer [1, 2]. Chronic infection with one of 15 high-risk HPV types (hrHPV) contributes to the development of cervical cancer. The related literature reports indicate that over 80% of women acquire an hrHPV infection at least once in their lifetime, with HPV subtype 16 and HPV 18 accounting for 71% of all cases. The remaining subtypes, HPV 31, 33, 45, 52, and 58, are responsible for the remaining 19% of cervical cancer cases [3]. It is estimated that about 90% of HPV infections resolve within the first 2 years, and only a small percentage share of the remaining cases progress to precancerous lesions or cervical cancer [4]. In Poland, 2160 new cases of cervical cancer and 1361 deaths were recorded in 2021 [5]. It occurs significantly more often in less developed countries than in developed

countries, largely due to limited access to screening tests and the high cost of HPV vaccines [6].

Currently, the screening tests for cervical cancer include the following: cytology (conventional or liquid-based cytology), HPV testing, and colposcopy [7]. In Poland, every woman over the age of 25 years should regularly undergo preventive cytological examinations. The Government Programme for Cervical Cancer Prevention includes the following stages: Stage I involves the doctor collecting a sample from the cervix for cytological examination every 36 months for women aged 25 to 59 years, or every 12 months for women aged 25 to 59 years who are at risk (those infected with HIV or infected with high-risk HPV types, taking immunosuppressive drugs). Stage II is diagnostic, meaning a microscopic examination of the sample collected from the cervix every 36 months for women aged 25 to 59 years, or every 12 months for women aged 25 to 59 years who are at risk. The final stage, Stage III, involves advanced diagnostics, including colposcopy and histopathology, which is for patients who have received a referral from their doctor during Stage I [8].

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Cervical cancer prevention aims for earlier diagnosis of precancerous changes in the cervix [9]. Well-organised prevention programmes involving cytological examinations may reduce mortality in women by 70–80% [10]. Choosing a screening test is challenging; ideally, it should be as inexpensive as possible while exhibiting a high sensitivity and specificity for detecting low- and high-grade intraepithelial neoplasia without compromising sensitivity. Generally, most countries strike a balance between sensitivity and specificity through appropriate guidelines for atypical cells [11].

Aim of the research

The aim of the study has been to analyse the participation of women in cervical cytology screening within the framework of the population programme ‘Cervical Cancer Prevention’, as well as those undergoing tests outside the screening programme before, during, and after the COVID-19 pandemic.

Material and methods

The research sample consisted of the results of cytological examinations performed in the Cytodiagnosics Laboratory from March 2018 to February 2024 at the Academic Centre for Pathomorphological and Genetic-Molecular Diagnostics (AODP-GM) in Białystok. The analysis included the cytological results of patients participating in the government population programme ‘Cervical Cancer Prevention’, referred to hereafter as ‘within the framework of prevention’, as well as cytological examinations conducted outside the screening programme (tests funded by the National Health Fund [NFZ] and private tests financed by patients), referred to hereafter as ‘outside the programme’. The study took into consideration both conventional cytology results and liquid-based cytology (LBC) results. All cytological smears were evaluated by qualified laboratory diagnosticians and/or pathologists. The smears were assessed according to the Bethesda System 2001 [12].

Bethesda 2001 Terminology in this Study:

- ASC-US – atypical squamous cells of undetermined significance;
- ASC-H – atypical squamous cells – high grade;

- LSIL – low-grade squamous intraepithelial lesion;
- HSIL – high-grade squamous intraepithelial lesion;
- Ca – squamous cell carcinoma cells, adenocarcinoma cells.

In the analysis, only patients with a diagnosis of abnormal cells from the stratified squamous epithelium were included (hereafter used in the text as “positive diagnoses”), because patients with a diagnosis of abnormal cells from the glandular epithelium accounted for a negligible percentage share of all examinations, i.e. 138 diagnoses (0.09%). During the analysed period, we recorded 474 (0.33%) non-diagnostic smears, of which 461 (0.38%) were for tests performed ‘outside the programme’ and 13 (0.05%) were ‘within the framework of prevention’. This indicates that as many as 99.67% of examinations were diagnostically correct, suggesting the high quality of the process of collecting and analysing biological material.

Statistical analysis was carried out using the in-laboratory program PatARCH (MedLAN, Poland) for registration of examinations, and entry of diagnostic diagnoses and graphs were performed using Microsoft Excel.

In conducting a comparative analysis, we distinguished six annual periods (Table 1).

Results

A total of 142,903 smears from patients undergoing cytological examinations from March 2018 to February 2024 were analysed. The attendance of patients for cytological examinations ‘within the screening programme’ and ‘outside the programme’ during the periods before, during, and after the pandemic was analysed. The highest attendance of patients undergoing cytological examinations was observed in period II (before the pandemic) – 28,350 patients. Among those, the highest attendance of patients undergoing examinations ‘outside the programme’ was also observed in period II (before the pandemic) – 25,470 patients. However, among patients undergoing examinations only ‘within the screening programme’, the highest attendance was recorded in period IV (during the pandemic) – 5075 patients (Tables 2–4).

Analysis of positive results was performed for patients participating ‘within the screening programme’ and those undergoing examinations ‘outside the pro-

Table 1. Annual periods under analysis

Period	Date	Name of period
I	Mar. 2018-Feb. 2019	Before the Sars-Cov-2 Pandemic
II	Mar. 2019-Feb. 2020	Before the Sars-Cov-2 Pandemic
III	Mar. 2020-Feb. 2021	During the Sars-Cov-2 Pandemic
IV	Mar. 2021-Feb. 2022	During the Sars-Cov-2 Pandemic
V	Mar. 2022-Feb. 2023	After the Sars-Cov-2 Pandemic
VI	Mar. 2023-Feb. 2024	After the Sars-Cov-2 Pandemic

Table 2. The total number of patients participating in cytology and the percentage share of abnormal test results among the patients involved in the study 'as part of prevention' and 'outside the programme' at the Cytodiagnostic Laboratory AODP and G-M from March 2018 to February 2024

Period	Date	Total number of patients	Number of positive diagnoses	Percentage share of positive diagnoses (%)	ASCUS (%)	LSIL (%)	ASC-H (%)	HSIL (%)	Ca (%)
I	Mar. 2018–Feb. 2019	26574	558	2.10	242 (43.37)	232 (41.58)	42 (7.53)	42 (7.53)	0 (0.00)
II	Mar. 2019–Feb. 2020	28350	697	2.46	307 (44.05)	297 (42.61)	51 (7.32)	42 (6.03)	0 (0.00)
III	Mar. 2020–Feb. 2021	19418	679	3.50	305 (44.92)	295 (43.45)	46 (6.77)	33 (4.86)	0 (0.00)
IV	Mar. 2021–Feb. 2022	23591	1107	4.69	518 (46.79)	508 (45.89)	56 (5.06)	24 (2.17)	1 (0.09)
V	Mar. 2022–Feb. 2023	23568	835	3.54	390 (46.71)	380 (45.51)	44 (5.27)	21 (2.51)	0 (0.00)
VI	Mar. 2023–Feb. 2024	21402	695	3.25	329 (47.34)	291 (41.87)	45 (6.47)	30 (4.32)	0 (0.00)
	Total	142903	4571	3.20	2091 (45.74)	2003 (43.82)	284 (6.21)	195 (4.27)	1 (0.02)

Table 3. The total number of patients participating in cytology and the percentage share of abnormal test results among patients involved in the study 'outside the programme' at the Cytodiagnostic Laboratory AODP and G-M from March 2018 to February 2024

Period	Date	Total number of patients	Number of positive diagnoses	Percentage share of positive diagnoses (%)	ASCUS (%)	LSIL (%)	ASC-H (%)	HSIL (%)	Ca (%)
I	Mar. 2018–Feb. 2019	22233	505	2.27	209 (41.39)	218 (43.17)	39 (7.72)	39 (7.72)	0 (0.00)
II	Mar. 2019–Feb. 2020	25470	655	2.57	279 (42.59)	289 (44.12)	49 (7.48)	38 (5.80)	0 (0.00)
III	Mar. 2020–Feb. 2021	16115	617	3.83	269 (43.60)	279 (45.22)	39 (6.32)	30 (4.86)	0 (0.00)
IV	Mar. 2021–Feb. 2022	18516	1024	5.54	457 (44.58)	497 (48.49)	50 (4.88)	20 (1.95)	1 (0.10)
V	Mar. 2022–Feb. 2023	19361	789	4.07	354 (44.87)	375 (47.53)	41 (5.20)	19 (2.41)	0 (0.00)
VI	Mar. 2023–Feb. 2024	18600	632	3.40	300 (47.47)	264 (41.77)	40 (6.33)	28 (4.43)	0 (0.00)
	Total	120295	4223	3.51	1868 (44.23)	1922 (45.51)	258 (6.11)	174 (4.12)	1 (0.02)

Table 4. The total number of patients participating in cytology and the percentage share of abnormal test results among patients involved in the study 'within the framework of prevention' at the Cytodiagnostic Laboratory AODP and G-M from March 2018 to February 2024

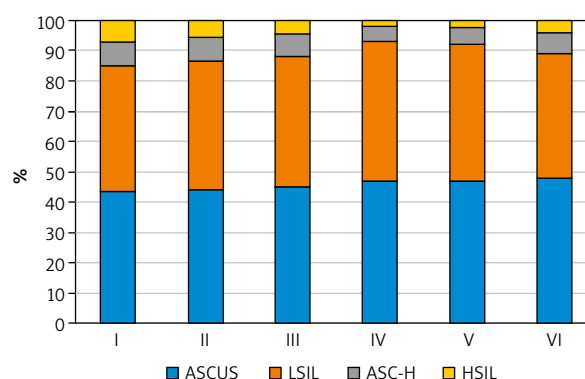
Period	Date	Total number of patients	Number of positive diagnoses	Percentage share of positive diagnoses (%)	ASCUS (%)	LSIL (%)	ASC-H (%)	HSIL (%)	Ca (%)
I	Mar. 2018–Feb. 2019	4341	53	1.22	33 (62.26)	14 (26.41)	3 (5.66)	3 (5.66)	0 (0.00)
II	Mar. 2019–Feb. 2020	2880	42	1.46	28 (66.67)	8 (19.05)	2 (4.76)	4 (9.52)	0 (0.00)
III	Mar. 2020–Feb. 2021	3303	62	1.88	36 (58.06)	16 (25.81)	7 (11.29)	3 (4.84)	0 (0.00)
IV	Mar. 2021–Feb. 2022	5075	82	1.62	61 (74.39)	11 (13.41)	6 (7.32)	4 (4.88)	0 (0.00)
V	Mar. 2022–Feb. 2023	4207	46	1.09	36 (78.26)	5 (10.87)	3 (6.52)	2 (4.35)	0 (0.00)
VI	Mar. 2023–Feb. 2024	2802	63	2.25	29 (46.03)	27 (42.86)	5 (7.94)	2 (3.17)	0 (0.00)
Total		22608	348	1.53	223 (64.08)	81 (23.28)	26 (7.47)	18 (5.17)	0 (0.00)

gramme' in the periods before, during, and after the pandemic.

Out of all the cytological smear tests, 4,571 (3.20%) results concerned abnormal cervical intraepithelial changes during the study period, out of which 2,091 diagnoses were ASC-US (45.74%), 2,003 were LSIL (43.82%), 284 were ASC-H (6.21%), 195 were HSIL (4.27%), and 1 was Ca (0.02%). The highest number of positive diagnoses – 1,107 (4.69%) – was recorded in period IV (during the pandemic). The results showed that the largest group among all positive changes consisted of ASC-US - 2,091 (45.74%), and the highest percentage share of ASC-US results was noted in period IV (during the pandemic) – 518 (46.79%). It is also evident that in Period IV (during the pandemic), the number of LSIL diagnoses was similar, at 508 (45.89%). The highest percentage share of ASC-H was recorded before the pandemic (in period I – 7.53% and in period II – 7.32%), as well as HSIL changes (in period I – 7.53% and in period II – 6.03%) (Table 2, Figure 1).

In the cytological tests conducted 'outside the programme', a total of 120,295 tests were performed. In that group, 4223 (3.51%) results were positive. Among those, 1868 (44.23%) diagnoses were ASC-US, 1922 were LSIL (45.51%), 258 (6.11%) were ASC-H, 174 were HSIL (4.12%), and 1 was Ca (0.02%). The highest number of changes was recorded in period IV (during the pandemic), totalling 1024 (5.54%). The largest group consisted of LSIL changes, at 1922 (45.51%), with the most recorded in period IV (during the pandemic), i.e. 497 (48.49%). In period VI, the highest share of ASC-US diagnoses was noted, i.e. 300 (47.47%). The diagnosis of ASC-H was most frequent in the period before the pandemic (in period I: 7.72% and in period II: 7.48%). HSIL changes were most commonly diagnosed in period I: 39 (7.72%). Only once (0.10%) during period IV (the pandemic period) was a Ca-type change recorded (Table 3, Figure 2).

In the framework of preventive examinations, a total of 22,608 cytologies were performed. Among

**Figure 1.** The total number of patients participating in cytology 'within the framework of prevention' and 'outside the programme' at the Cytodiagnostic Laboratory AODP and G-M from March 2018 to February 2024

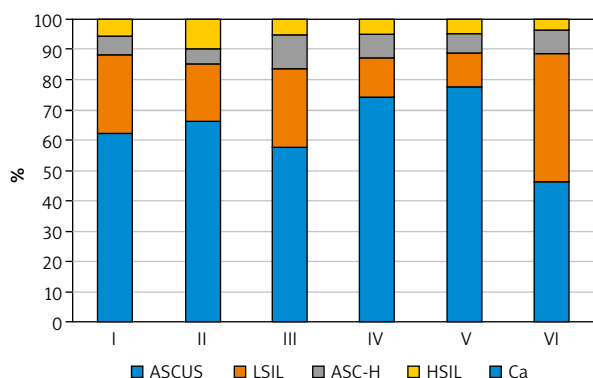


Figure 2. The percentage share of abnormal test results among patients participating in the 'within the framework of prevention' study at the Cytodiagnostic Laboratory AODP and G-M from March 2018 to February 2024

all the tests, the highest patient attendance was recorded in period IV (during the pandemic) with 5075, but the highest percentage share of positive diagnoses occurred post pandemic (period VI – 2.25%). The positive cytologies 'in the framework of prevention' included the following: 223 cases of ASC-US (64.08%), 81 LSIL (23.28%), 26 ASC-H (7.47%), 18 HSIL (5.17%), and 0 Ca (0%). The highest percentage share of ASC-US diagnoses was recorded in post-pandemic period V, i.e. 36 (78.26%). The study observed that the percentage share of LSIL changes significantly increased post-pandemic in period VI, at 27 (42.86%). For ASC-H changes, the highest diagnosis occurred during the pandemic (period III – 11.29%), while HSIL changes were more frequently diagnosed before the pandemic (in period II – 9.52%) (Table 4, Figure 3).

Discussion

SARS-CoV-2 causes coronavirus disease (COVID-19), which was first diagnosed in Wuhan at the end of 2019 [13]. The infection spread very rapidly, and on 11 March 2020, the World Health Organisation declared a pandemic [14]. The COVID-19 pandemic caused a massive crisis in the entire medical sector. Despite the continuous operation of pathological and cytological laboratories due to the numerous safety procedures implemented during the pandemic, preventive screenings and cervical cancer diagnostics suffered significantly [15, 16]. That situation was influenced by limited access to healthcare facilities, logistical challenges, and patients avoiding visits due to fear of infection [17], as well as the suspension of many prevention programmes [18]. Many cytopathology laboratories have reorganised their work, introducing new standard biosafety protocols to reduce risks and cope with the deficit of healthcare personnel. It is also observed that many laboratories are now using new mobile phone apps and online platforms to maintain educational programmes [19]. Based on our data ob-

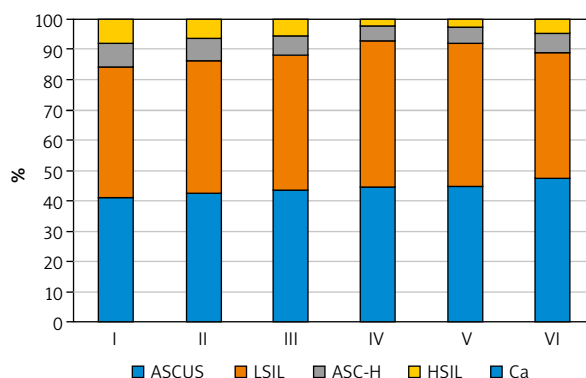


Figure 3. The percentage share of abnormal test results among patients participating in the 'outside the programme' study at the Cytodiagnostic Laboratory AODP and G-M from March 2018 to February 2024

tained from the analysis of cervical cancer screening tests performed by women 'within the framework of prevention' and 'outside the programme' from March 2018 to March 2024, a comparative analysis was conducted on the attendance of patients for cytological examinations before the pandemic, during the pandemic, and after the pandemic.

The lowest number of tests performed 'within the framework of prevention' and 'outside the programme' occurred during period III, which marks the onset of the pandemic. In the following months, the number of cytological tests increased but in the post-pandemic period (period VI), it did not reach the levels observed before that event. The highest percentage share of positive diagnoses was during period IV (during the pandemic), followed by a decline in period VI (after the pandemic).

Secondary prevention of cervical cancer in Poland indicates a high declared rate of cytological tests conducted outside the ministerial Cervical Cancer Prevention Programme. The reduction in the number of screening tests performed 'outside the programme' during the pandemic was probably due to the closure of healthcare facilities and the postponement of screening services for cancer, as well as restrictions on interpersonal contacts in line with public health officials' recommendations due to fears of contracting COVID-19. Although there is a growing rate of tests post-pandemic, the neglect in cervical cancer prevention may lead to the diagnosis of more advanced lesions in the years following the pandemic. This finding is supported by international research coordinated by the University of Federico II in Naples, which involved 41 laboratories from 23 countries, thoroughly describing the impact of the SARS-CoV-2 virus worldwide. Data from this study have confirmed a global reduction in all cytological tests during the COVID-19 lockdown as compared to the same period in 2019 [20, 21]. Another study examining the impact of the COVID-19 pandemic on various as-

pects of cytology practice in the Asia-Pacific region, involving 167 laboratories across 24 countries, similarly to our research, found that measures limiting access to healthcare services implemented at the onset of the pandemic significantly affected laboratory operations and reduced the number of cytological tests performed. Approximately a half of the participants reported the implementation of new biosafety protocols (54.5%) and changes in laboratory facilities (47.3%). The results of this extensive study highlight the need for global standardisation of biosafety protocols and cytology practices to ensure consistent and effective responses in future health crises [22].

In light of the situation surrounding the spread of the SARS-CoV-2 virus and the dynamic increase in COVID-19 cases, the protection and safety of patients has become the highest and absolute priority in the medical service. Our research indicates that the actions taken by the Ministry of Health in Poland during the pandemic to counteract the development of secondary cervical changes have been successful. We observe a 25% increase in cytological tests conducted 'within the framework of prevention' in the second half of the pandemic as compared to the post-pandemic period (period VI). That rise may be attributed to the improved access to gynaecologists performing 'preventive screenings'.

Additionally, in the studies conducted by the University of Federico II in Naples, an increase in the incidence of cancers diagnosed through cervical cytology was observed. That rise was probably due to prioritising particularly suspicious or symptomatic changes during the screening process [19, 20]. In contrast, most laboratories in the Asia-Pacific region did not confirm any increase in that incidence rate [21]. At the same time, our research indicates a higher percentage share of positive diagnoses after the pandemic (period VI – 2.24%), despite a decreasing number of tests performed. Diagnoses of LSIL are beginning to dominate, which carries the risk of developing higher-grade lesions in the future. Therefore, from this perspective, there is an urgent need for changes in cervical cancer screening practices, because the number of tests conducted post-pandemic is not significantly higher and is, in fact, lower.

Both during and after the pandemic, it would have been advisable to introduce a self-sampling procedure, allowing patients to sample from the cervix and vagina in a home setting. That would have enabled many women to have undergone cytological screening, not only during the COVID-19 pandemic but also for those who avoided testing due to the barrier of reluctance to visit a gynaecological office. This is also, among other things, pointed out by cervical cancer screening experts in their recommendations for the transition between different screening methods for cervical cancer in Taiwan (i.e. suggestions for testing procedures, standards, accreditation, monitoring, promotion, and implementation) [23].

Conclusions

The pandemic determines the risk of developing cervical intraepithelial lesions and cervical cancer due to the cessation of participation in screening tests. It is essential to implement urgent changes to the extent of cytological screening, to increase the rate of cytological examinations not only during challenging periods like the pandemic but also outside of it.

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Ethical approval

Not applicable.

Conflict of interest

The authors declare no conflict of interest.

References

1. Johnson CA, James D, Marzan A, Armaos M. Cervical cancer: an overview of pathophysiology and management. *Semin Oncol Nurs.* 2019; 35: 166-174.
2. Schiffman M, Castle PE, Jeronimo J, Rodriguez AC, Wacholder S. Human papillomavirus and cervical cancer. *Lancet.* 2007; 370(9590): 890-907.
3. Cuzick J, Clavel C, Petry KU, Meijer CJ, Hoyer H, Ratnam S, Szarewski A, Birembaut P, Kulasingam S, Sasieni P, Iftner T. Overview of the European and North American studies on HPV testing in primary cervical cancer screening. *Int J Cancer.* 2006; 119(5): 1095-1101.
4. Moscicki AB, Shiboski S, Hills NK, Powell KJ, Jay N, Hanson EN, Miller S, Canjura-Clayton KL, Farhat S, Broering JM, Darragh TM. Regression of low-grade squamous intra-epithelial lesions in young women. *Lancet.* 2004; 364(9446): 1678-1683.
5. Didkowska JA, Wojciechowska U, Barańska K, Miklewska M, Michałek I, Olasek P. Nowotwory złośliwe w Polsce w 2021 roku. *Cancer in Poland in 2021. Krajowy Rejestr Nowotworów, Warszawa 2023.*
6. Derbie A, Mekonnen D, Nibret E, Misgan E, Maier M, Woldeamanuel Y, Abebe T. Cervical cancer in Ethiopia: a review of the literature. *Cancer Causes Control.* 2023; 34(1): 1-11.
7. Lees BF, Erickson BK, Huh WK. Cervical cancer screening: evidence behind the guidelines. *Am J Obstet Gynecol.* 2016; 214(4): 438-443.
8. pacjent.gov.pl [Internet] Warsaw: Government Programme for Cervical Cancer Prevention; c2024 [cited 2024 Nov 4]. Available from: <https://pacjent.gov.pl/program-profilaktyczny/profilaktyka-raka-szyjki-macicy>
9. Wentzensen N, Schiffman M. Filling a gap in cervical cancer screening programmes. *Lancet Oncol.* 2014; 15(3): 249-251.
10. Allahqoli L, Dehdari T, Rahmani A, Fallahi A, Gharacheh M, Hajinasab N, Salehiniya H, Alkatout I. Delayed cervical cancer diagnosis: a systematic review. *Eur Rev Med Pharmacol Sci.* 2022; 26(22): 8467-8480.
11. Wright TC Jr. Natural history of HPV infections. *J Fam Pract.* 2009; 58 (9 Suppl HPV): S3-S7.

12. Solomon D, Davey D, Kurman R, Moriarty A, O'Connor D, Prey M, Raab S, Sherman M, Wilbur D, Wright Jr T, Young N; Forum Group Members; Bethesda 2001 Workshop. The 2001 Bethesda System: terminology for reporting results of cervical cytology. *JAMA*. 2002; 287: 2114-2119.
13. Zhu N, Zhang D, Wang W, Li X, Yang B, Song J, Zhao X, Huang B, Shi W, Lu R, Niu P, Zhan F, Ma X, Wang D, Xu W, Wu G, Gao GF, Tan W; China Novel Coronavirus Investigating and Research Team. A Novel Coronavirus from Patients with Pneumonia in China, 2019. *N Engl J Med*. 2020; 382(8): 727-733.
14. www.who.int [Interenet] Genewa: Virtual Press Conference on COVID-19 (2020); c2020 [cited 2024 Nov 5]. Available at: https://www.who.int/docs/default-source/coronaviruse/transcripts/who-audio-emergencies-coronavirus-press-conference-full-and-final-11mar2020.pdf?sfvrsn=cb432bb3_2
15. Chen CC, Chi CY. Biosafety in the preparation and processing of cytology specimens with potential coronavirus (COVID-19) infection: Perspectives from Taiwan. *Cancer Cytopathol*. 2020; 128(5): 309-316.
16. www.who.int [Interenet] Genewa: Laboratory biosafety guidance related to the novel coronavirus (2019-nCoV); c2020[cited 2024 Nov 9]. Available at: https://www.who.int/docs/default-source/coronaviruse/laboratory-biosafety-novel-coronavirus-version-1-1.pdf?sfvrsn=912a9847_2
17. Vanni G, Materazzo M, Pellicciaro M, Ingallinella S, Rho M, Santori F, Cotesta M, Caspi J, Makarova A, Pistolese CA, Buonomo OC. Breast cancer and COVID-19: the effect of fear on patients' decision-making process. *In Vivo*. 2020; 34 (3 Suppl): 1651-1659.
18. de Pelsemaeker MC, Guiot Y, Vanderveken J, Galant C, Van Bockstal MR. The impact of the COVID-19 pandemic and the associated belgian governmental measures on cancer screening, surgical pathology and cytopathology. *Pathobiology*. 2021; 88(1): 46-55.
19. Huang CY, Chen CC. The COVID-19 pandemic has impeded cytopathology practices and hindered cancer screening and management. *Cytopathology*. 2023; 34(5): 406-416.
20. Vigliar E, Cepurnaite R, Alcaraz-Mateos E, Ali SZ, Balloch ZW, Bellevisine C, Bongiovanni M, Botsun P, Bruzzone D, Bubendorf L, Büttner R, Canberk S, Capitanio A, Casadio C, Cazacu E, Cochand-Priollet B, D'Amuri A, Eloy C, Engels M, Fadda G, Fontanini G, Fulciniti F, Hofman P, Iaccarino A, Ieni A, Jiang XS, Kakudo K, Kern I, Kholova I, Liu C, Lobo A, Lozano MD, Malapelle U, Maleki Z, Michelow P, Musayev J, Özgün G, Oznur M, Peiró Marqués FM, Pisapia P, Poller D, Pyzlak M, Robinson B, Rossi ED, Roy-Chowdhuri S, Saieg M, Savic Prince S, Schmitt FC, Seguí Iváñez FJ, Štoos-Veić T, Sulaieva O, Sweeney BJ, Tuccari G, van Velthuysen ML, VanderLaan PA, Vielh P, Viola P, Vororham R, Weynand B, Zeppa P, Faquin WC, Bishop Pitman M, Troncone G. Global impact of the COVID-19 pandemic on cytopathology practice: Results from an international survey of laboratories in 23 countries. *Cancer Cytopathol*. 2020; 128(12): 885-894.
21. Iaccarino A, Pisapia P, Vigliar E, Vielh P, Troncone G. Juggling the COVID-19 pandemic: a cytopathology point of view. *Cytopathology*. 2021; 32(3): 299-303.
22. Wang YH, Bychkov A, Chakrabarti I, Jain D, Liu Z, He S. Impact of the COVID-19 pandemic on cytology practice: an international survey in the Asia-Pacific region. *Cancer Cytopathol*. 2020; 128(12): 895-904.
23. Chen CC, Lai CH, Chang CL, Cheng WF, Pwu RF, Tsai J, Wang PH, Whang-Peng J, Lai GM. Managing the transition in cervical screening methods for Taiwan: Policy recommendations and perspectives. *J Formos Med Assoc*. 2023; 122(11): 1213-1218.

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