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Cervical Cytology Findings and Microorganisms Among Sudanese Women at Soba Teaching Hospital: Implications for Screening and Awareness

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Cervical cancer
awareness.

Abstract

Background: Cervical cancer is the second most common cancer in Sudanese women after breast cancer. Pap smear screening is an effective diagnostic procedure for early detection. This study aimed to identify cytomorphological patterns in Pap smears from Sudanese females attending the Cervical Cancer Prevention and Research Unit (CCPRU) at Soba Teaching Hospital (STH) in Khartoum, Sudan. **Methods:** This study was a descriptive, cross-sectional, laboratory-based study conducted at CCPRU, STH, Khartoum, Sudan, from December 2020 to June 2021. The study included 118 Sudanese females, age and reproductive status varied. Pap smears were processed using the Pap stain method (Bancroft, 1990). Demographic and clinical data were collected from patient records. Cytological findings were reported based on the Bethesda System 2013. For statistical analysis, SPSS version 23.0 was used. **Results:** The majority (71.2%) of participants were aged 15-45 years. Cytological diagnoses included NILM (69.5%), HSIL (13.5%), LSIL (12.7%), ASCUS (2.5%), SCC (0.9%), and adenocarcinoma (0.9%). Microorganisms included bacterial vaginosis (21 cases), Actinomyces (3 cases), cellular changes consistent with HPV (14 cases), candida (7 cases), cellular changes consistent with HSV (6 cases) and Trichomonas vaginalis (1 case). The association between cytological findings with the age group and the clinical symptoms proved to be statistically insignificant, while it is significant when related to the cytological characteristics according to the Bethesda system. **Conclusion:** Cervical cytology is vital for detecting precancerous and cancerous lesions in Sudanese women. The majority of participants were aged 15-45 years, and HSIL was the most common

lesion. Establishing regular screening programs and raising awareness about cervical cancer are recommended

1. Introduction:

Cancer is the leading cause of death worldwide, with cervical cancer ranking as the second most common cancer among women (Husain et al., 2022). Globally, nearly 500,000 women are diagnosed with cervical cancer annually, resulting in over 300,000 deaths (Waggoner, 2003). About 88% of the cases are in developing countries (WHO, 2008). Cervical cancer accounts for over 370,000 new cases yearly, nearly 10% of all cancers (Hassan and Khir Elseed, 2009). Racial and ethnic disparities in cervical cancer incidence and survival have been documented (Spencer et al., 2023; Cohen et al., 2023), with Black women in the US facing a 30% higher risk of developing cervical cancer and a 60% higher risk of dying from cervical cancer compared to non-Hispanic white women (Spencer et al., 2023). In Sudan, cervical cancer ranks as the second most common cancer among women (Husain et al., 2011). Human Papillomavirus (HPV), particularly high-risk subtypes, stand as the primary cause of cervical cancer (Waggoner, 2003). This cancer affects women across various age groups, with a prevalence of approximately 20% among sexually active young women (Khan et al., 2007). Pap

smear screening is a valuable diagnostic tool for mitigating the oncogenic potential of HPV (Khan et al., 2007).

This study seeks to explore the cytomorphological patterns of cervical smears and their association with microorganisms in Sudanese females attending the Cervical Cancer Prevention Research Unit (CCPRU) at Soba Teaching Hospital (STH) in Khartoum State, Sudan.

2. Methods:

A descriptive cross-sectional laboratory-based study was conducted at CCPRU, STH, Khartoum State, Sudan, which provides maternity health services and cervical cancer screening. The study included 118 Sudanese females, spanning from December 2020 to June 2021. Participants were married and fertile females of varying ages who consented to participate, while infertile or unmarried individuals were excluded, along with those who declined participation or exhibited inadequate information or specimen inadequacy.

Cervical smears were processed using the Pap stain method (Bancroft, 1990), and demographic and clinical data, including age, clinical symptoms, and last menstrual

cycle, were collected from patient history records at Soba Teaching Hospital. Smears were microscopically examined, and findings were reported according to the Bethesda System 2013. Data analysis was performed using IBM SPSS Statistics version 23.0, employing descriptive and inferential statistics, including Fisher's exact test.

Exclusion criteria: infertile women were excluded.

3. Results:

A descriptive cross-sectional study was conducted on 118 Sudanese female patients who attended the clinic for follow-up or screening in Soba Teaching Hospital, Khartoum State, Sudan. A questionnaire was designed to collect data concerning demographic and clinical information and other data required in the study. Table 1 shows the age distribution of the participants where 71.2 were at the range of 15-45 years and the rest were more than 45 years old. In 66.1% of the participants, no clinical symptom was detected, while bleeding, irregular cycles, polyps, and vaginal discharge were the only recorded symptoms or lesions in the rest of the participants (Table 2). Cytological characteristics detected were normal

cellular elements, non-neoplastic findings, microorganisms and their cellular changes, mild dysplasia, and moderate to severe dysplasia (Table 3, Figure 1). Microorganisms detected were *Actinomyces* spp., *Candida* spp. (Figure 2) and *Trichomonas vaginalis*. Bacterial infection, cellular changes consistent with HPV and cellular changes consistent with HSV were also detected (Table 4). Table 5 shows diagnosis according to the Bethesda system; the participants were diagnosed with negative for intra-epithelial lesion or malignancy NILM (69.5%), high-grade squamous intra-epithelial lesion HSIL (13.5%), low-grade squamous intra-epithelial lesion LSIL (12.7%), atypical squamous cells of undetermined significance ASCUS (2.5%), squamous cell carcinoma SCC (0.9%) and Adenocarcinoma (0.9%). Figure 3 shows SCC. Adenocarcinoma is shown in Figures 4 and 5, while Figure 6 and Figure 7 show HSIL and LSIL, respectively. Table 6, Table 7 and Table 8 show the association between cytological findings with age group, clinical symptoms which proved to be insignificant, and with the characteristics according to Bethesda system, which found to be significant, respectively.

Table 1: Age distribution among the study participants attending CCPRU, Soba Teaching Hospital, Sudan, during the study period.

Variable	Frequency	%
15-45	84	71.2
> 45	34	28.8
Total	118	100%

Table 2: Clinical symptoms among Sudanese fertile Women attending CCPRU, Soba Teaching Hospital, Sudan, during the study period.

Variable	Frequency	%
No symptoms	78	66.1
Bleeding	19	16.1
Irregular cycle	6	05.1
Polyps	3	02.5
Vaginal discharge	12	10.2
Total	118	100%

Table 3: Cytological findings of Pap smears among Sudanese fertile women attending CCPRU, Soba Teaching Hospital.

Variable	Frequency	%
Normal cellular elements	34	28.8
Non neoplastic findings	6	5.1
Microorganisms and/or their cellular changes	46	39
Mild dysplasia	17	14.4
Moderate to severe dysplasia	15	12.7
Total	118	100.0

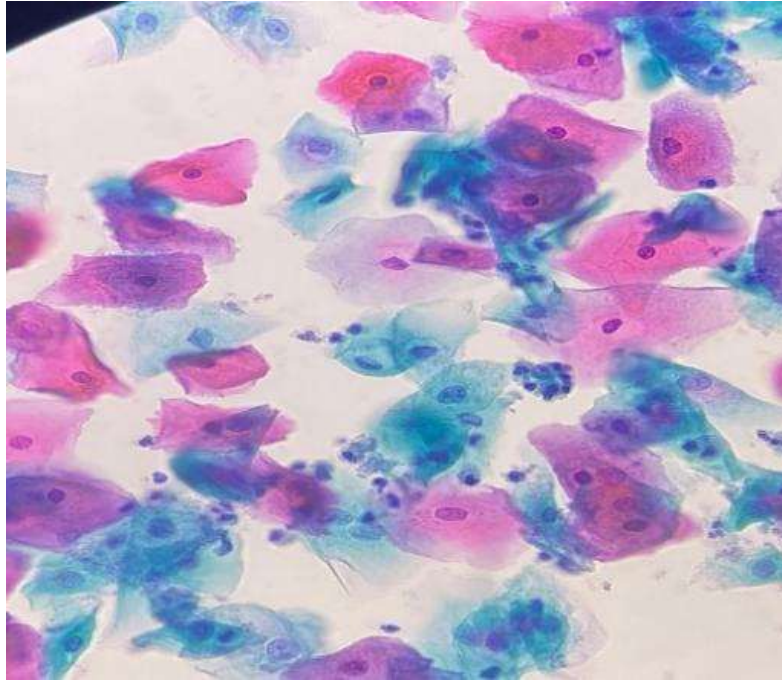


Fig. 1. Normal epithelial cells from cervix of Sudanese fertile woman: Pap smear (40X)

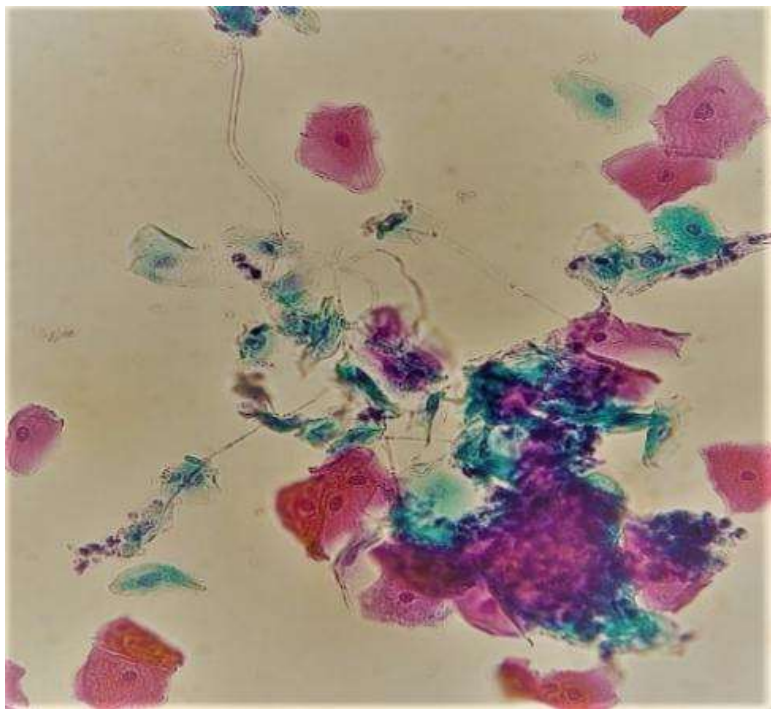


Fig. 2. Presence of Candida in cervical smears of Sudanese fertile woman: Pap smear (40X)

Table 4: Microorganisms detected in cytological smears among Sudanese fertile women attending CCPRU, Soba Teaching Hospital.

Variable	Frequency	%
Actinomyces spp.	3	5.8
Candida spp.	7	13.5
<i>Trichomonas vaginalis</i>	1	01.9
Bacterial infection	21	40.3
Cellular changes consistent with HPV	14	26.9
Cellular changes consistent with HSV	6	11.6
Total	52	100%

Table 5: Diagnosis according to Bethesda system among Sudanese fertile women attending CCPRU, Soba Teaching Hospital.

Variable	Frequency	%
NILM	82	69.5
HSIL	16	13.5
LSIL	15	12.7
ASCUS	3	02.5
SCC	1	0.9
Adenocarcinoma	1	0.9
Total	118	100%

NILM: Negative for Intra-epithelial Lesion or Malignancy, HSIL: High-Grade Squamous Intraepithelial Lesion, LSIL: Low-Grade Squamous Intraepithelial Lesion, ASCUS: Atypical Squamous Cells of Undetermined Significance, SCC: Squamous Cell Carcinoma.

Table 6: Association between cytological findings according to Bethesda system with age groups of Sudanese fertile women attending CCPRU, Soba Teaching Hospital.

Variable		Cytological findings according to Bethesda system						Total	P value
		NILM	LSIL	HSIL	ASCUS	Adenocarcinoma	SCC		
Age group	15-45	56	11	12	3	1	1	84	0.909
	> 45	26	4	4	0	0	0	34	
Total		82	15	16	3	1	1	118	

Table 7: Association between cytological findings according to Bethesda system with clinical symptoms among Sudanese fertile women attending CCPRU, Soba Teaching Hospital.

Variable		Cytological findings according to Bethesda system						Total	P value
		NILM	LSIL	HSIL	ASCUS	Adeno	SCC		
Clinical symptoms	No symptoms	54	11	9	3	0	1	78	0.233
	Bleeding	14	0	4	0	1	0	19	
	Irregular cycle	4	0	2	0	0	0	6	
	Polyps	2	0	1	0	0	0	3	
	Vaginal discharge	8	4	0	0	0	0	12	
Total		82	15	16	3	1	1	118	

Table 8: Association between cytological characteristics and cytological findings according to Bethesda system among Sudanese fertile women attending CCPRU, Soba Teaching Hospital.

Variable		Cytological findings according to Bethesda system						Total	P value
		NILM	LSIL	HSIL	ASCUS	Adeno	SCC		
Cytological characteristics	Negative	34	0	0	0	0	0	34	0.000
	Non-specific inflammation	6	0	0	0	0	0	6	
	Microorganism	42	1	2	0	1	0	46	
	Mild dysplasia	0	14	0	3	0	0	17	
	Moderate to severe dysplasia	0	0	14	0	0	1	15	
Total		82	15	16	3	1	1	118	

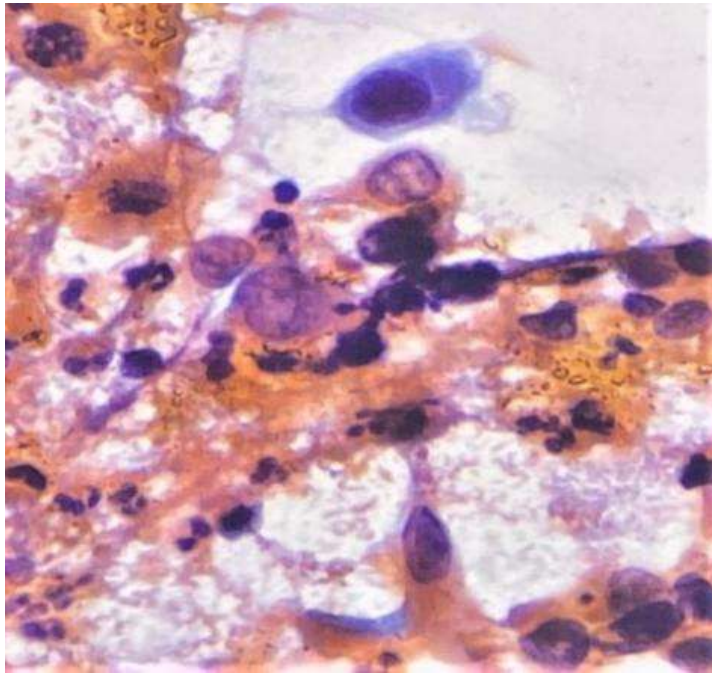


Figure 3. Squamous cell carcinoma from cervix of Sudanese fertile woman: Pap smear (40X)

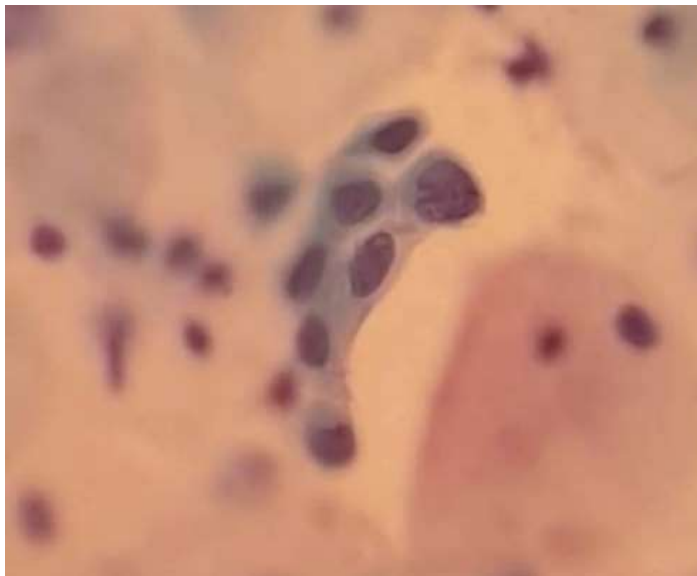


Fig. 4. Adenocarcinoma from cervix of Sudanese fertile woman: Pap smear (40X)

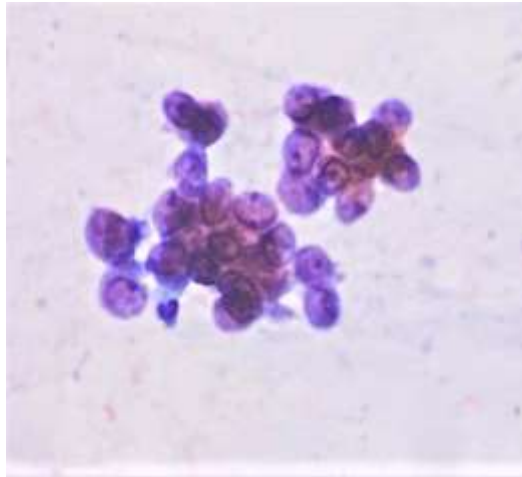


Fig. 5. Adenocarcinoma from cervix of Sudanese fertile woman: Pap smear (40X)

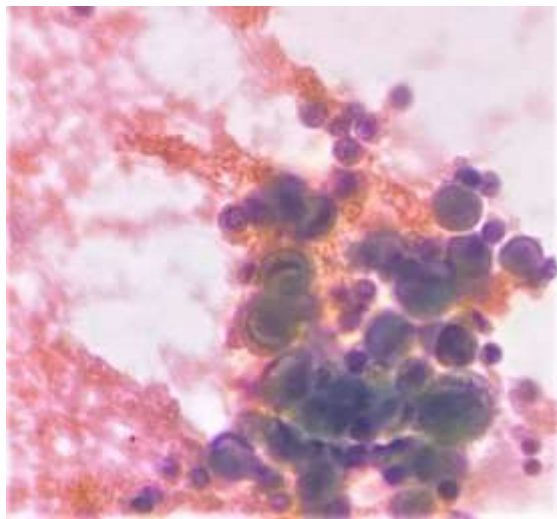


Fig. 6. HSIL from cervix of Sudanese fertile woman: Pap smear (40X)

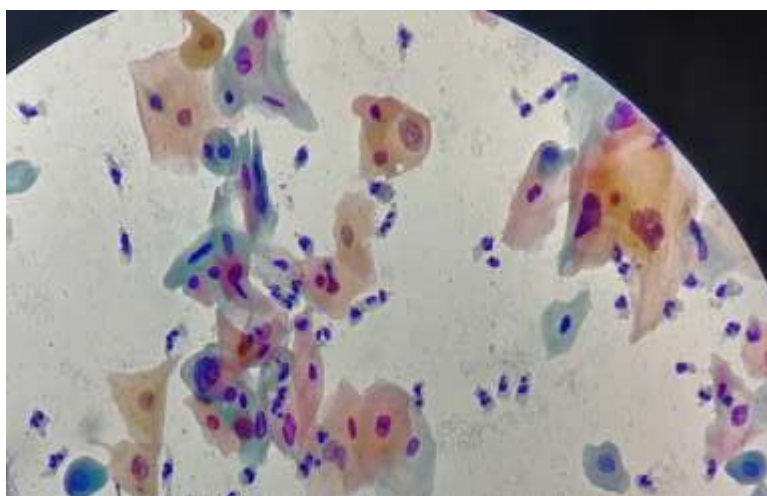


Figure 7. LSIL from cervix of fertile Sudanese fertile woman: Pap smear (40X)

4. Discussion"

This descriptive cross-sectional laboratory-based study was conducted in Soba Teaching Hospital, Khartoum State, Sudan. This study was conducted on 118 Sudanese fertile women patients who attended the clinic for follow-up or screening.

Cervical cancer is a significant health concern for Sudanese women, with the majority of participants in this study falling within the age group of 15-45 years. This age distribution aligns with research indicating a higher prevalence of cervical cancer and precancerous lesions among younger age groups (Sachan et al., 2018).

HPV, a leading cause of cervical cancer, was detected in 26.9% of participant samples, highlighting the importance of HPV screening alongside cytological examination for more accurate detection (Elhasan et al., 2019). Accurate prevalence of HPV requires molecular detection using PCR, as cervical cancer screening based on cytology may have limited accuracy (Sørbye et al., 2017).

Similar to what reported by (Moneira Mansour et al., 2013), microorganism associations, including *Actinomyces* spp., *Candida* spp., and *Trichomonas vaginalis*, were observed in this study, underscoring the need for comprehensive cervical health assessments.

Squamous cell carcinoma (SCC) is the most common malignant tumour of the cervix, comprising 70-80% of cervical malignancies. Most SCC cases occur in less developed countries without effective screening systems (Waggoner, 2003). Cervical Adenocarcinoma (ADC) has been increasing in its prevalence worldwide. It comprises nearly 20-25% of all cervical malignancies in developed countries. (Takeuchi, 2016). The low percentages of SCC and adenocarcinoma in this study may be attributed to the age of participants, as cervical cancer predominantly affects older age groups (Husain et al., 2011). Nevertheless, cervical cytology remains a crucial tool for detecting precancerous and cancerous lesions, especially in resource-constrained settings with limited access to more advanced diagnostic methods.

Cytological examination of Pap smear in females using Pap stain can be instrumental in sensitivity and specificity. Moreover, it carries more advantages regarding screening and detecting precancerous lesions, in which the treatment is more accessible, less expensive and affordable. Given the limited availability of regular cervical screening programs in Sudan, there is a pressing need to establish and promote awareness about cervical cancer screening. Health education campaigns focusing on cervical cancer and sexually transmitted diseases are essential to improve screening

rates among Sudanese women, particularly given the reported lack of accurate knowledge about these topics (Almobarak *et al.*, 2016).

The predominant clinical symptoms were bleeding (16.1%) followed by vaginal discharge (10.2%), 66.1% were asymptomatic. These findings disagree with Michelle *et al.* (2005), who found that vaginal discharge was the most common complaint, occurring in 36.96% of the women and Sachan *et al.* (2018), who reported that vaginal discharge was the most common complaint, occurring in 36.96% of the women. An irregular menstrual cycle was the complaint of 12.78% and abdominal pain of 25.63% of women, while only 15.15% were asymptomatic (Sachan *et al.*, 2018).

In the current study, among the 118 study participants, 82 (69.5%) of the cytological diagnosis of Pap smears according to the Bethesda system were NILM, followed by 16 (13.6%) HSIL, 15 (12.7%) LSIL, 3 (2.5%) ASCUS, 1 (0.8%) adenocarcinoma and 1 (0.8%) SCC. These findings agree with the findings that have been found in the study made by Sachan *et al.* (2018) in which atypical squamous cells of undetermined significance (ASCUS), low-grade squamous intraepithelial lesion (LSIL), and high-grade squamous intraepithelial lesion (HSIL) were detected.

Microorganisms and cellular changes were detected in 39% of the smears of the Sudanese women who participated in this study. Almost a similar percentage was detected in the study of Sachan *et al.* (2018).

In this study, the overall abnormal cytology was 31%, higher than that Ali *et al.* (2019) revealed in a study made in Addis Ababa, Ethiopia, in which the overall HPV burden and abnormal cytology were 13.1%. In our study, HSIL was the most prevailing finding of the abnormal cytology, followed by LSIL, ASUS and Adenocarcinoma. Whereas in Ali *et al.* (2019), LSIL was the highest, followed by ASCUS and HSILs.

No significant association between cytological findings, neither with clinical symptoms nor with age group, is detected among the Sudanese females who participated in this study. This finding contradicts Ali *et al.* (2019), who found an association between age and cervical cytology abnormalities.

Cervical cytology is playing an important preliminary role in detecting precancerous and cancerous lesions. In Sudan, the Federal Ministry of Health has not implemented cervical cancer screening programs up to writing this document, although it has been prioritized in its WHO-supported National Cancer Control Program (Husain *et al.*, 2011). Establishing a regular screening of cervical cancer

program is highly recommended. Awareness of various diagnostic procedures, such as Pap smear screening, proves to be an effective way of eradicating the oncogenic potential of HPV (Khan *et al.*, 2007), and as recommended by Hassan and Khir Elseed (2009), Pap testing intervention programs for less acculturated Sudanese women should be developed, implemented, and evaluated. This screening test should be evaluated considering the cost of the test compared to more accurate methods such as PCR for HPV. Health education about cervical cancer and sexually transmitted diseases is crucial to improve cervical screening for Sudanese women (Almobarak *et al.*, 2016; Husain *et al.*, 2022) that less than half of them expected to have accurate knowledge about cervical cancer screening, cervical cancer and HPV (Almobarak *et al.*, 2016).

5. Conclusion:

In conclusion, this study sheds light on the critical issue of cervical cytology findings and the presence of microorganisms among Sudanese women attending Soba Teaching Hospital, Khartoum State. Cervical cancer remains a significant concern, particularly among women aged 15-45, aligning with global trends indicating a higher prevalence of cervical abnormalities in younger age groups.

This study highlights the cervical abnormalities among Sudanese women, emphasizing the significance of HPV screening alongside cytological examination. Microorganism associations underscore the need for comprehensive cervical health assessments. While SCC and adenocarcinoma percentages were relatively low due to the age of participants, cervical cytology remains vital in resource-constrained settings. Promoting awareness and implementing screening programs are crucial steps to combat cervical cancer in Sudan, given the limited access to regular screening and the reported lack of accurate knowledge about cervical health and related diseases.

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