

ASSOCIATION BETWEEN OBESITY AND ABNORMAL PAP SMEAR

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ABSTRACT

Background: Cervical cancer remains a significant public health issue globally, despite advances in screening and vaccination. It is the fourth most common cancer in women worldwide, with substantial morbidity and mortality. The primary cause of cervical cancer is persistent infection with high-risk types of human papillomavirus (HPV), a common sexually transmitted infection. The aim of study is to access whether obesity and sedentary lifestyle are associate with abnormal pap smear and increase the prevalence of cervical cancer.

Method: This cross-sectional study at Al Elwea Maternity Hospital examined 301 sexually active, non-pregnant females with normal and abnormal Pap smear records from December 1, 2023, to April 1, 2024. Data included age, first intercourse, parity, education, smoking, contraception use, duration, physical activity, BMI, and Pap smear outcomes. Exclusions were females with malignancies or insufficient/incomplete records. **Results:** In a study of 301 females, 47.8% were aged 31-45, and 22.6% were over 45. Key findings include significant associations between abnormal Pap smears and factors such as smoking (21.4% of smokers), long-term contraception use (35.1% after 5+ years), early first intercourse (19% <18 years), and high parity (15.5% with >3 children). However, no significant associations were found between Pap smear outcomes and education level, BMI, or age. **Conclusion:** The study indicates significant influences of smoking, physical activity, contraceptive use, and parity on Pap smear outcomes, highlighting the need for public health strategies promoting healthier lifestyles and reproductive choices. Screening recommendations should focus on these risk factors rather than age or BMI.

KEYWORDS: Association, obesity, abnormal, pap, smear.

INTRODUCTION

Cervical cancer remains a significant public health issue globally, despite advances in screening and vaccination. It is the fourth most common cancer in women worldwide, with substantial morbidity and mortality. The primary cause of cervical cancer is persistent infection with high-risk types of human papillomavirus (HPV), a common sexually transmitted infection. However, not all women with HPV infection develop cervical cancer, indicating that other co-factors are crucial in the progression from HPV infection to cancer.^[1,2] Epidemiological studies have identified multiple factors that can influence the risk of developing cervical cancer. These factors include long-term use of oral contraceptives, high parity (number of births), tobacco smoking, immune suppression, poor nutritional status, and co-infections with other pathogens like Chlamydia

trachomatis and herpes simplex virus. These co-factors can modify the host environment, influencing the persistence of HPV infection and its progression to neoplasia.^[3] Understanding the interaction between HPV and these co-factors is crucial for developing targeted prevention and treatment strategies. Additionally, lifestyle and environmental factors such as obesity, physical activity levels, dietary habits, alcohol consumption, and occupational exposures have been studied for their roles in cervical carcinogenesis. Obesity, for instance, is a growing concern globally and is known to be associated with several types of cancer.^[4] The relationship between obesity and cancer risk involves complex mechanisms, including chronic inflammation, altered immune responses, and increased levels of endogenous hormones, which may promote the carcinogenic process.^[5] Although the link between

obesity and cancers such as endometrial, kidney, and colon cancer is well established, the evidence connecting obesity with cervical cancer risk is less clear. Some studies have suggested a potential association between higher body mass index (BMI) and increased risk of cervical cancer, while others have not found such a relationship.^[6,7] The inconsistent findings could be attributed to several factors, including the diversity in study designs, the range of obesity levels studied, and the consideration of various confounders. Moreover, the differences in body composition and fat distribution between populations (e.g., comparisons between Asian and Western women) may also play a role in these divergent findings.^[8,11] The complexity of cervical cancer etiology necessitates a multifaceted approach to research and prevention. By examining both the biological and environmental aspects of cervical cancer risk, researchers can better understand how these factors interact with HPV to influence cancer development. This comprehensive understanding could lead to improved risk stratification and personalized preventive measures, ultimately reducing the burden of cervical cancer globally. The aim of study is to access whether obesity and sedentary lifestyle are associate with abnormal pap smear and increase the prevalence of cervical cancer.

METHOD

Cross sectional study of 301 females with history of normal and abnormal pap smear record base, the data collected from record data in al Elwea Maternity

Hospital from period 1st of December 2023 to 1st of April 2024. For each patient’s the information’s collected as following: (Age groups, first intercourse, Parity, Education level, Smoking, Contraception used, Duration of contraception, Physical activity either (Sedentary, Light action, Moderate, Very active).^[12] Also all females take a record of body mass index (BMI)^[13] and pap smear outcome either normal or abnormal.

Inclusion criteria: All females were sexually active and not pregnant and have an intact uterus. While exclusion criteria: any history of malignancy like ovarian and endometrial cancer. We exclude all females have no sufficient record data or incomplete record data.

Statistical analysis done by SPSS 22, frequency and percentage used for categorical data. Chi-square used for assessed association between categorical variables. P-value less or equal to 0.05 is consider significant.

RESULTS

In table 1, 47.8% of females at age group 31-45 years and 22.6% of them more than 45 years old. 61.5% of females age at the first intercourse more than 18 years. Most of females have 1 parity and more. 40.5% of females have primary education, 46.5% of females have no smoking while 44.2% of them have passive smoking. 52.5% of females have no previously used contraception method. 63.1% of females have sedentary lifestyle 9.2% of females have activity.

Table 1: distribution of patients according to study variables.

Variables		Frequency	Percentage
Age groups	18-30	89	29.6
	31-45	144	47.8
	>45	68	22.6
First intercourse	<18	116	38.5
	18	185	61.5
Parity	0	29	9.6
	1-3	143	47.5
	>3	129	42.9
Education level	Illiterate	55	18.3
	Primary	122	40.5
	Secondary	68	22.6
	University	56	18.6
Smoking	Smoker	28	9.3
	Passive	133	44.2
	Non	140	46.5
Contraception	OCP	115	38.2
	No	158	52.5
	Other	18	9.3
Duration of contraception	No	168	55.8
	<1	40	13.3
	1-5	56	18.6
	>5	37	12.3
	Sedentary	190	63.1

Physical activity	<i>Light action</i>	76	25.2
	<i>Moderate</i>	27	9.0
	<i>Very active</i>	8	2.7

As shown in fig 1; 40.53% of females are obese while 38.87% of them are overweight while 20.6% of females are normal BMI. While fig 2 show that only 10.63% of females have abnormal pap smear while 89.37% of them

have normal pap smear. While fig 3 show that 43.75% of females with abnormal pap smear are overweight and 28.13% of them are obese.

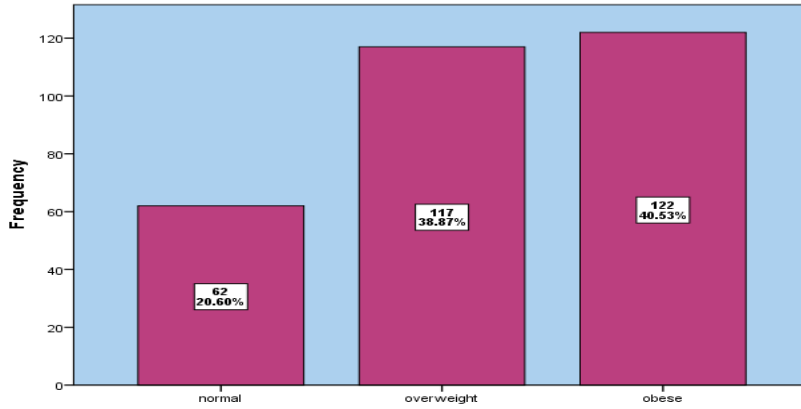


Fig. 1: Distribution of females according to BMI.

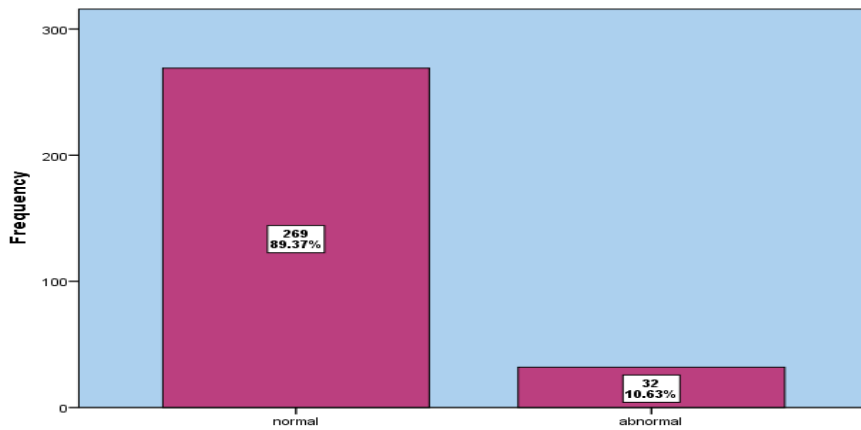


Fig. 2: Distribution of females according to Pap smear results.

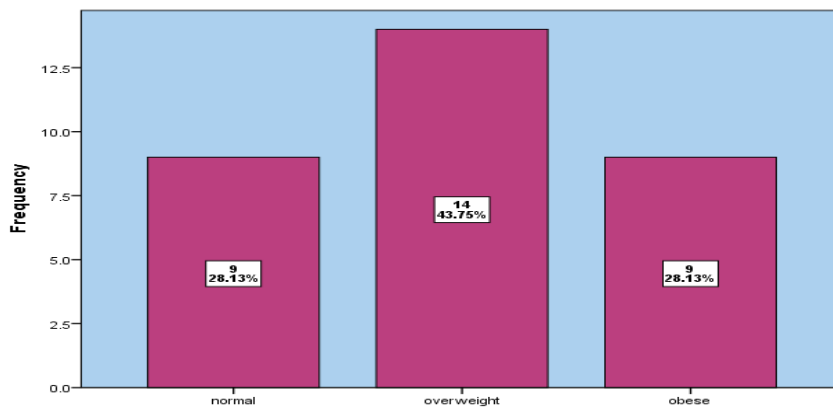


Fig. 3: distribution of females has abnormal Pap smear according to BMI.

As shown in table 2, there is significant association between pap and smoking, 21.4% of females have smoking are associate with abnormal pap smear while 94.3% of females have no smoking are having normal pap smear. Also there is significant association between pap and contraception used, 81.7% of females used contraceptive have normal pap smear and 94.3% of

females no used contraceptive has normal pap smear also. There is significant association between pap and duration of contraceptive used, 100% of females with duration less than one year have normal pap smear, while 35.1% of females have abnormal pap smear after used contraception more than 5 years. No significant association between pap and education level.

Table 2: association between Pap smear and study variables.

		Pap smear			P-value
		Normal	Abnormal	Total	
EducationLevel	Illiterate	51 92.7%	4 7.3%	55 100.0%	0.12
	Primary	104 85.2%	18 14.8%	122 100.0%	
	Secondary	65 95.6%	3 4.4%	68 100.0%	
	University	49 87.5%	7 12.5%	56 100.0%	
Smoking	smoker	22 78.6%	6 21.4%	28 100.0%	0.017
	passive	115 86.5%	18 13.5%	133 100.0%	
	non	132 94.3%	8 5.7%	140 100.0%	
CP	OCP	94 81.7%	21 18.3%	115 100.0%	0.003
	No	149 94.3%	9 5.7%	158 100.0%	
	Other	26 92.9%	2 7.1%	28 100.0%	
Duration	no	159 94.6%	9 5.4%	168 100.0%	0.0001
	<1	40 100.0%	0 0.0%	40 100.0%	
	1-5	46 82.1%	10 17.9%	56 100.0%	
	>5	24 64.9%	13 35.1%	37 100.0%	

P-value ≤ 0.05 (significant).

As shown in table 3, there is significant association between pap and physical activity, 100% of females with moderate to active physical activity are have normal pap

smear. There is no significant association between pap and age of females.

Table 3: association between Pap smear and study variables.

		Pap smear			P-value
		Normal	Abnormal	Total	
Age Groups (years)	18-30	81 91.0%	8 9.0%	89 100.0%	0.6
	31-45	126 87.5%	18 12.5%	144 100.0%	
	>45	62 91.2%	6 8.8%	68 100.0%	
Physical Activity	sedentary	162 85.3%	28 14.7%	190 100.0%	0.02
	light action	72 94.7%	4 5.3%	76 100.0%	
	moderate	27	0	27	

	very active	100.0%	0.0%	100.0%	
		8	0	8	
		100.0%	0.0%	100.0%	

As shown in table 4, there is significant association between pap and first age of intercourse, 19% of females with first age of intercourse less than 18 years are have abnormal pap smear while only 5.4% of females with first age of intercourse ≥ 18 years are having abnormal

pap smear. There is significant association between pap and parity, 15.5% of females with parity more than 3 have abnormal pap smear and 7.7% of females with parity 1- 3 have abnormal pap smear. There is no significant association between pap and BMI.

Table 4: association between Pap smear and study variables.

		Pap smear			P-value
		Normal	Abnormal	Total	
Firstage Intercourse (years)	<18	94	22	116	0.0001
		81.0%	19.0%	100.0%	
	≥ 18	175	10	185	
		94.6%	5.4%	100.0%	
Parity	0	28	1	29	0.047
		96.6%	3.4%	100.0%	
	1-3	132	11	143	
		92.3%	7.7%	100.0%	
	>3	109	20	129	
		84.5%	15.5%	100.0%	
BMI	Normal	53	9	62	0.3
		85.5%	14.5%	100.0%	
	Overweight	103	14	117	
		88.0%	12.0%	100.0%	
	Obese	113	9	122	
		92.6%	7.4%	100.0%	

DISCUSSION

Although the link between obesity and cervical cancer has been investigated in several research, the findings are scant and unreliable.^[11] The International Agency for Research on Cancer's expert working group reached the opinion that "the data is too inadequate to enable any judgement on the relationship between BMI and the risk of cervical cancer".^[14] The second report of the American Institute for Cancer Research/World Cancer Research Fund likewise indicated that there were insufficient data from competent research on the association between body fatness and the risk of cervical cancer to draw reliable conclusions.^[15] The provided data highlights various demographic, lifestyle, and health-related factors in relation to the prevalence of abnormal and normal Pap smear results among females. Understanding these associations is critical for targeting preventive measures and interventions in cervical cancer screening programs.

Association between Age, Smoking, and Pap Smear Results

Firstly, the data suggests no significant association between age and Pap smear results, indicating that age may not be a critical factor in the prevalence of cervical abnormalities detected by Pap smears in this sample. However, the relationship between smoking habits and Pap smear outcomes is noteworthy. It is evident that smoking is significantly associated with abnormal Pap

smear results; 21.4% of females who smoke have abnormal results, compared to a much lower prevalence among non-smokers (94.3% normal results). This finding aligns with existing research suggesting that tobacco use can be a co-factor in the etiology of cervical cancer, possibly due to the carcinogens in tobacco smoke affecting the cervical epithelium.^[16]

Impact of Contraceptive Use

The data reveals significant associations between contraceptive use, its duration, and Pap smear results. A notable 94.3% of females who have not used contraceptives have normal Pap smears, suggesting that non-use of contraceptives could be associated with a lower risk of cervical abnormalities. Moreover, a prolonged duration of contraceptive use, particularly more than five years, is associated with higher rates of abnormal Pap smears (35.1% abnormal). These observations could reflect hormonal influences on the cervical environment, which may increase susceptibility to persistent human papillomavirus (HPV) infections, a known risk factor for cervical cancer.^[17]

Physical Activity and Educational Level

Interestingly, there is a significant association between physical activity levels and normal Pap smear results. All females with moderate to high physical activity levels had normal results, highlighting the potential protective role of physical activity against cervical abnormalities.

This could be attributed to the general health benefits of physical activity, including improved immune function, which may help clear HPV infections more effectively. On the other hand, education level did not show a significant correlation with Pap smear outcomes, suggesting that educational attainment alone does not directly influence the risk of cervical abnormalities in this population. The association between physical activity levels and normal Pap smear results are quite insightful and align with findings from several studies in the field. The potential protective role of physical activity in preventing cervical abnormalities can be attributed to multiple factors, such as enhanced immune function and overall better health, which could indeed help in more effective clearance of HPV (Human Papillomavirus) infections. This virus is known to be a primary cause of cervical cancer. **Physical Activity and HPV Clearance:** Some studies have suggested that physical activity might play a role in the faster clearance of HPV infections, which are closely linked to the development of cervical cancer. Regular physical activity boosts the immune system and could help the body clear infections more effectively.^[18,19] **Lack of Association Between Education Level and Pap Smear Outcomes:** The correlation between education level and Pap smear results is less clear in the research. While higher educational levels generally correlate with better access to healthcare and more health literacy, which could lead to earlier and more frequent screening, the actual educational attainment does not directly influence the biological process of HPV infection clearance or the development of cervical abnormalities.^[20] Some studies expand beyond physical activity and examine other lifestyle factors such as diet, smoking, and sexual health behaviors. These studies generally find that a healthier lifestyle correlates with better outcomes in Pap smear tests, which is consistent with the idea that overall health impacts immune function and disease resistance.^[21,22]

The associations noted between age at first sexual intercourse, parity, and Pap smear results are consistent with established research in the field of reproductive health and epidemiology. Each of these factors has been studied extensively for their potential impacts on the risk of developing cervical abnormalities. Here's how the observations align with findings from similar studies.

Age at First Sexual Intercourse: Several studies have identified an early age at first sexual intercourse as a risk factor for HPV infection, which is the primary cause of cervical cancer. Engaging in sexual activity at a younger age increases the duration of potential exposure to HPV, as in current study, and younger individuals may also have a less mature cervical epithelium, which is more susceptible to viral infections. Research has consistently shown that women who begin sexual activity before the age of 18 are at a higher risk of developing cervical dysplasia and cervical cancer later in life.^[23]

Parity: The relationship between parity (number of childbirths) and Pap smear outcomes is also supported by the literature. Higher parity has been associated with an increased risk of cervical cancer. Possible explanations for this association include hormonal changes and immunological alterations during pregnancy, which may influence the progression of HPV infection to cervical cancer. The exact mechanisms are still being studied, but the correlation observed is well-documented.^[24]

Body Mass Index (BMI): The lack of a significant correlation between BMI and Pap smear outcomes in current study aligns with mixed results from other studies. Some research suggests that high BMI might be associated with an increased risk of cervical cancer, potentially due to systemic inflammation or hormonal imbalances. However, other studies, have found no direct correlation. This suggests that the impact of BMI might be more complex and influenced by other factors such as genetics, lifestyle, and co-morbid conditions like diabetes or hypertension.^[25]

CONCLUSION

The data presented suggests that lifestyle factors, such as smoking and physical activity, along with reproductive health choices like contraceptive use and parity, significantly influence Pap smear outcomes. These findings should guide public health strategies in promoting healthier lifestyles and reproductive choices among females, alongside targeted educational programs about the risks associated with early sexual activity and smoking. Additionally, the lack of significant association with age and BMI suggests that screening recommendations should primarily focus on other identified risk factors.

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