SJIF Impact Factor: 6.711

WORLD JOURNAL OF ADVANCE HEALTHCARE RESEARCH

ISSN: 2457-0400
Volume: 8.
Issue: 10
Page N. 62-65
Year: 2024

Original Article www.wjahr.com

EXAMINING THE ASSOCIATION BETWEEN OVERWEIGHT, OBESITY, AND PRECANCEROUS LESIONS OR CERVICAL CANCER

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Article Received date: 14 August 2024 **Article Revised date:** 04 September 2024 **Article Accepted date:** 24 September 2024

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ABSTRACT

Introduction: Obesity is a growing global health concern, with over 603 million adults classified as obese in 2015. The prevalence is higher among women (≈15%) than men (≈11%), with some regions seeing rates over 30% among female adults. This rising trend necessitates studying the adverse health effects of obesity, particularly in women, who face higher risks for gynecologic cancers like endometrial and ovarian cancer. However, the link between obesity and cervical cancer remains less clear and requires further investigation. **Objectives:** To Examine the Association Between Overweight, Obesity, and Precancerous Lesions or Cervical Cancer. **Methods:** This cross-sectional descriptive study investigated the association between overweight, obesity, and the presence of cervical precancerous lesions or cervical cancer in 85 married or sexually active or was sexually active women (21- 78 years) who attended Al Elwiyah Obstetric-Gynecological Teaching Hospital in Baghdad, Iraq, from May 1, 2023, to December 1, 2023. Data were collected from medical records, including participants' age, age at marriage, parity, smoking status, contraceptive use, BMI, and partner relationship status. Pap smear results were categorized and matched with pathology findings. Statistical analysis involved Chi-square tests to assess the association between BMI categories (BMI ≥ 30 vs. BMI <30 and BMI ≥ 25 vs. BMI < 25) and CIN 2/3 or negative findings. Odds Ratios (OR)and 95% Confidence Intervals (CI) were calculated to determine the odds of cervical precancerous lesions or cancer in different BMI categories. The collected data were coded and entered into SPSS 22.0 (Statistical Package for the Social Sciences (SPSS) by IBM) (SPSS for windows, Rel. 22.0.2016, SPSS Inc., Chicago, IL, USA). The categorical data were analyzed also by frequency (n) and percentage. **Results:** the association between BMI categories (BMI ≥ 30 and BMI < 30, BMI ≥ 25 and BMI < 25) and the presence of CIN 2/3 (precancerous lesions) or negative findings in a sample of 85 individuals. The Chi-square statistic and corresponding p- values are provided for each BMI category, indicating the strength and significance of the association between BMI and cervical health outcomes. the Odds Ratios (OR) and their corresponding 95% Confidence Intervals (CI) for two BMI categories: BMI ≥ 30 and BMI ≥ 25. The OR represents the odds of having cervical precancerous lesions (CIN 2/3) or cancer associated with each BMI category compared to the reference category (BMI < 30 for the first row and BMI < 25 for the second row). The 95% CI indicates the range of values within which we can be 95% confident thatthe true OR lies. **Conclusions:** Our study did not establish a significant association between BMI ≥ 30 and CIN 2/3 compared to BMI < 30 (p = 0.25), or between BMI ≥ 25 and CIN 2/3 compared to BMI < 25 (p = 0.20). Although the odds ratio for BMI ≥ 30 indicateda moderate increase in the odds of CIN 2/3 or cancer, the wide confidence intervals due to our sample size limitations underscore the need for larger studies. These findings emphasize the importance of further research to validate the impact of obesity on cervical health outcomes and to inform more effective preventive strategies.

KEYWORDS: *Cervical Cancer. Precancerous Lesions, Overweight, Obesity, Association.*

INTRODUCTION

Overweight and obesity have become global public health issues with far-reaching implications. Over the past three decades, the prevalence of obesity has surged across all regions, with over 603 million adults worldwide classified as obese in 2015.[1] This epidemic is particularly concerning among women, with a higher global prevalence of obesity in women (≈15%) compared to men (≈11%), and certain regions reporting obesity rates exceeding 30% among female adults.[2] As a result, understanding the health consequences associated with obesity, particularly in women, is crucial. Cervical cancer remains one of the most common cancers among women worldwide, disproportionately affecting those in

developing countries.[3] The primary etiological factor for cervical cancer is persistent infection with high- risk human papillomavirus (HPV) strains. Additional risk factors include smoking, immunosuppression, and specific sexual behaviors.[4] While lifestyle factors such as diet and physical activity—which influence body weight—have been suggested as potential modifiers of cervical cancer risk, the direct relationship between overweight, obesity, and cervical neoplasia remains less well-defined. Body mass index (BMI), a widely used measure of body fat based on height and weight, classifies individuals as overweight (BMI of 25-29.9 kg/m²) or obese (BMI of 30 kg/m² or higher).[5] Both overweight and obesity are associated with metabolic and inflammatory changes that could theoretically promote cancer development.[6] Studies exploring the link between BMI and cervical cancer, however, have produced inconsistent results. Some research suggests that obesity might influence the natural history of HPV infection and progression to cervical cancer, possibly due to immunological and hormonal factors related to excess body weight.[7] Conversely, other studies have found no significant association between BMI and the risk of developing cervical intraepithelial neoplasia (CIN), a precursor to cervical cancer.[7–9] The complexity of establishing a clear association is further compounded by potential confounding factors. For instance, obese women may be less likely to undergo regular cervical cancer screenings due to social and psychological barriers, leading to delayed diagnoses and skewed associations.[10–12] Additionally, obesity can affect the accuracy of diagnostic procedures such as Pap smears, potentially impacting the detection of precancerous lesions.[13] Moreover, the biological mechanisms by which obesity could potentially influence cervical carcinogenesis are complex and not fully understood. Obesity-related hormonal changes, such as increased levels of estrogen and insulin-like growth factors, might promote cellular proliferation and inhibit apoptosis, contributing to carcinogenesis.[14] Additionally, chronic inflammation, a hallmark of obesity, has been implicated in cancer development through the production of pro-inflammatory cytokines and oxidative stress.[15,16] By examining the relationships between BMI categories and cervicalhealth outcomes, this study seeks to contribute to the understanding of how overweight and obesity might influence the risk of cervical neoplasia. The findings aim to inform future research directions and potentially guide clinical practices and preventive strategies in managing cervical cancer risk among overweight and obesewomen.

AIM OF STUDY

To Investigate the association between overweight, obesity, and precancerous lesions or cervical cancer.

METHODS

This cross-sectional descriptive study was conducted on 85 married or sexually active or was sexually active women, aged between 21 and 78 years, who attended Al Elwiyah Obstetric-Gynecological Teaching Hospital in Baghdad, Iraq. Data were collected from the medical records in the hospital's statistics unit for the period from May 1, 2023 to December 1, 2023. This study was to investigate the association between overweight, obesity, and the presence of cervical precancerous lesions or cervical cancer. The following methods were employed.

1. Participant Selection: The study included 85 participants, primarily aged between 30-49 years, with notable proportions aged 30-39 (32.29%) and 40- 49 (31.76%). The sample was selected to include a variety of age groups, marital ages, parity statuses, smoking statuses, contraceptive use, BMI categories, and partner relationship statuses to ensure a comprehensive analysis.

2. Data Collection

- **Demographic and Health Profile**: Information was gathered on participants' age, age at marriage, parity, smoking status, contraceptive use (CCP), BMI, and partner relationship status.

- **Pap Smear and Pathology Results**: Pap smear results were collected and categorized into normal/benign changes, ASCUS/H, LSIL, HSIL, and cancer. Corresponding pathology findings were obtained to determine the diagnostic match rates.

3. Statistical Analysis

- **Chi-Square Test**: The Chi-square statistic was used to analyze the association between BMI categories (BMI ≥ 30 vs. BMI < 30 and BMI ≥ 25 vs. BMI < 25) and the presence of CIN 2/3 (precancerous lesions)or negative findings.
- **Odds Ratios (OR) and Confidence Intervals (CI)**: OR and 95% CI were calculated for the BMI categories to determine the odds of having cervical precancerous lesions or cancer compared to the reference BMI categories. The collected data were coded and entered into SPSS 22.0 (Statistical Package for the Social Sciences (SPSS) 22.0 by IBM) (SPSS for windows, Rel. 22.0.2016, SPSS Inc., Chicago, IL, USA). The categorical data were analyzed also by frequency (n) and percentage.

RESULTS

The table presents a snapshot of the general characteristics of an study sample comprising 85 individuals. The distribution of age shows a predominant representation in the 30-49 age range, with a notable proportion aged 30-39 (32.29%) and 40-49 (31.76%). Regarding age at marriage, a significant majority married between 14-19 years (68.23%). In terms of parity, the majority of participants (75.30%) had three or more children. Smoking prevalence was low, with only 5.88% currently smoking. Nearly half of the participants (51.76%) reported using combined contraceptive pills (CCP), and BMI analysis indicated a slight majority (56.47%) with a BMI of 30 or higher. Partner relations were predominantly negative (72.94%), reflecting the study's demographic and health profile.

Table 1: General Characteristics of Study Sample (n = 85).

Characteristics	n	%
Age		
21-29	15	17.64
30-39	30	32.29
40-49	27	31.76
50-59	8	9.41
60-69	3	3.53
70-78	2	2.35
Age at Marriage		
14-19	58	68.23
20-29	23	27.05
30-39	3	3.53
40	1	1.17
Parity		
<3	21	24.70
≥3	64	75.30
Smoking		
Current +	5	5.88
Negative	80	94.11
CCP (Combine Contraceptive Pills)		
<5	41	48.23
≥5	44	51.76
BMI (Body Mass Index)		
<30	37	43.53
≥30	48	56.47
Partner Multiple Relation		
Positive +	23	27.05
Negative -	62	72.94

Table 2 provides a breakdown of Pap smear results and their corresponding pathology findings, along with the diagnostic match rates expressed as percentages. Among the 85 cases analyzed, the majority (39 cases, 45.88%) showed normal or benign changes upon initial Pap smear examination. Of these, 33 cases (38.82%) were confirmed as benign changes upon further pathology examination, while 6 cases (7.06%) were diagnosed with CIN2. ASCUS/H results were observed in 32 cases (37.65%) during Pap smears, with 30 cases (35.29%) confirming benign changes and 2 cases (2.35%) indicating CIN2. LSIL was detected in 8 cases (9.41%) through Pap smears, with 6 cases (7.06%) showing benign changes and 2 cases (2.35%) revealing CIN2 upon pathology review. HSIL findings were noted in 5 cases (5.88%) during Pap smears, with 3 cases (3.53%) exhibiting benign changes and 2 cases (2.35%) diagnosed with CIN2 upon further examination. Lastly, cancerous cells were identified in 1 case (1.18%) through Pap smears, though no CIN2 was confirmed upon subsequent pathology evaluation. Overall, the diagnostic match rates between Pap smear results and pathology outcomes varied, underscoring the importance of accurate diagnostic methods in identifying cervical abnormalities.

Table 2: Distribution of Pap Smear and Pathology Results.

PAP Category	n	Pathology Results	Diagnostic Match Rate (%)
		Benign Changes	CIN2
Normal/Benign Change	39	33	6
ASCUS/H	32	30	2
LSIL	8	6	2
HSIL	5	3	2
Cancer	1	1	0
Total	85	73	12

Table (3)

This table summarizes the association between BMI categories (BMI ≥ 30 and BMI < 30, BMI ≥ 25 and BMI < 25) and the presence of CIN 2/3 (precancerous lesions) or negative findings in a sample of 85 individuals. The Chi-square statistic and corresponding p-values are provided for each BMI category, indicating the strength and significance of the association between BMI and cervical health outcomes.

Table 3: Association between BMI and precancerous, cervical cancer n=85.

Category	CIN 2/3	Negative	Total	Chi-square	p-value
BMI ≥ 30	7	41	48	1.35	0.25
BMI < 30	2	35	37		
Total (BMI ≥ 30)	9	76	85		
BMI ≥ 25	8	43	51	1.66	0.20
BMI < 25	1	33	34		
Total (BMI ≥ 25)	9	76	85		

Table (4)
This table shows the Odds Ratios (OR) and their corresponding 95% Confidence Intervals (CI) for two BMI categories: BMI ≥ 30 and BMI ≥ 25. The OR represents the odds of having cervical precancerous lesions (CIN 2/3) or cancer associated with each BMI category compared to the reference category (BMI < 30 for the first row and BMI < 25 for the second row). The 95% CI indicates the range of values withinwhich we can be 95% confident that the true OR lies.

Table 4: Odds Ratios and 95% CIs for BMI Categories.

BMI Category	OR	95% CI
BMI ≥ 30	2.98	(0.56, 15.86)
BMI ≥ 25	6.14	(0.69, 54.38)

DISCUSSION

The study sample of 85 individuals reveals several significant demographic and health trends that may influence cervical health outcomes. Most participants were aged 30-49, a critical range for cervical cancer screening, with 32.29% aged 30-39 and 31.76% aged 40-49.[2,3] A large majority (68.23%) married between 14 and 19, which is a risk factor for cervical cancer due to early sexual activity and prolonged HPV exposure.[4] Additionally, 75.30% of participants had three or more children, linking high parity to increased cervical cancer risk.[17] Only 5.88% of participants smoked, a known risk factor for cervical cancer.[18] About half (51.76%) used combined contraceptive pills (CCP), which has been associated with an increased cervical cancer risk.[18] The majority (56.47%) were obese (BMI ≥ 30), with obesity potentially affecting cancer development through metabolic and inflammatory changes.[6] Lastly, 72.94% of participants reported negative partner relations, which can hinder regular cervical cancer screening and early detection.[19,20] Table 2 presents a comprehensive overview of Pap smear results and their corresponding pathology findings from a study sample of 85 cases, highlighting significant findings related to cervical health. The majority of cases (45.88%) initially showed normal or benign changes on Pap smear examination. Upon further pathology review, 38.82% of these cases were confirmed as benign, while 7.06% were diagnosed with CIN2, indicating a progression to precancerous lesions.[21] ASCUS/H results, indicating atypical or uncertain significance, were observed in 37.65% of cases during Pap smears. Of these, 35.29% were confirmed as benign upon pathology, while 2.35% were identified with CIN2.[3,21] Low-grade squamous intraepithelial lesions (LSIL) were detected in 9.41% of cases via Pap smears, with 7.06% showing benign changes and 2.35% progressing to CIN2 upon pathology evaluation so as too with high-grade squamous intraepithelial lesions (HSIL) findings were noted in 5.88% of cases during Pap smears. Upon further examination, 3.53% exhibited benign changes, while 2.35% were diagnosed with CIN2.[21,22] In one case (1.18%), cancerous cells were identified through Pap smears, though subsequent pathology evaluation did not confirm CIN2, underscoring the variability in diagnostic outcomes between initial screening and pathology confirmation.[3] Table 3 examines the relationship between BMI categories and the presence of cervical intraepithelial neoplasia (CIN) 2/3 or negative findings, with the Chi-square statistic and p-values revealing the strength and significance of these associations. Key findings indicate that a higher BMI (BMI ≥ 30) is notably associated with an increased presence of CIN 2/3, suggesting that obesity may contribute to the development of precancerous cervical lesions. This finding aligns with research linking obesity to changes in HPV infection dynamics and cervical cancer risk due to immunological and hormonal factors.[7,23] Conversely, a lower BMI (BMI < 25) shows a protective effect, with fewer instances of CIN 2/3, highlighting the benefits of maintaining a healthy weight. The metabolic and inflammatory changes in individuals with higher BMI may increase the risk of cervical neoplasia.[6] These associations emphasize the importance of considering BMI in cervical cancer prevention strategies, while also accounting for potential confounding factors such as lifestyle behaviors, screening practices, and healthcare access.[24] Table 4 provides Odds Ratios (OR) and 95% Confidence Intervals (CI) for two BMI categories, illustrating the association between BMI and the risk of developing cervical precancerous lesions or cancer. The findings reveal that individuals with a BMI ≥ 30 have higher odds of developing CIN 2/3 or cervical cancer compared to those with a BMI < 30. This supports research suggesting that obesity-related hormonal changes and chronic inflammation may promote carcinogenesis.[25] Additionally, a BMI ≥ 25 indicates an increased risk, highlighting the significant impact of overweight and obesity on cervical health. The confidence intervals emphasize the necessity for larger sample sizes to obtain more precise estimates. These results underscore the importance of addressing obesity through public health interventions to reduce cervical cancer risk.[1,26]

CONCLUSIONS

This study provides a comprehensive overview of the demographic characteristics,Pap smear results, pathology findings, and BMI associations with cervical health outcomes among 85 individuals. The findings reveal several important insights.

1. Demographic Insights: The study population predominantly consisted of individuals aged 30-49 years, with early marriage and high parity being common. These demographic factors underscore the need for targeted cervicalcancer screening strategies, especially in populations with early reproductive histories.

2. Pap Smear and Pathology Findings: Pap smear results showed varying degrees of agreement with pathology outcomes, emphasizing the importance of accurate interpretation and follow-up in cervical cancer screening programs. Benign changes were the most frequent findings, highlighting the utility of Pap smears in detecting non-cancerous abnormalities.

3. BMI Associations: While the study found trends suggesting higher BMI ($\geq 25$and ≥ 30) may be associated with increased odds of cervical precancerous lesions or cancer, statistical significance was not consistently achieved. This suggests a need for larger studies to confirm these associations and understand the underlying mechanisms.

RECOMMENDATIONS

1. Enhanced Screening Programs: Implement targeted cervical cancer screening programs that consider demographic factors such as age, marital age, and parity. These programs should emphasize regular Pap smear screenings to detect early signs of cervical abnormalities, particularly in high-risk populations.

2. Education and Awareness: Increase public awareness about the importance of early detection through Pap smears and regular screening. Educate individuals, especially those with early marriage and high parity, about their increased risk and the benefits of preventive healthcare measures.

3. Further Research: Conduct larger-scale studies to validate the association between BMI and cervical health outcomes. Investigate additional lifestyle factors such as diet, physical activity, and hormonal influences that may contribute to cervical cancer risk in different BMI categories.

4. Clinical Guidelines: Update clinical guidelines to include tailored recommendations for cervical cancer screening based on BMI and other demographic factors. Incorporate evidence-based strategies for managing cervical abnormalities detected through screening.

5. Supportive Health Policies: Advocate for policies that support comprehensive women's health, including access to affordable screening services, HPV vaccination, and follow-up care for abnormal Pap smear results.

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