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Estimating the relationship between hair relaxer use and uterine leiomyoma occurrence in Nigerian women

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Abstract

Background: Uterine fibroids remain one of the most common pelvic benign tumors of the female reproductive tract, affecting up to 70% of women before menopause. While established risk factors such as age, ethnicity and hormonal influences are well documented, recent years have seen growing concerns regarding the relationship between uterine fibroids and prolonged chemical exposure. In this study, we investigate the relationship between the use of hair relaxers and the prevalence of uterine fibroids among women presenting for pelvic ultrasound.

Methods: A cross-sectional study was conducted among 354 women ≥ 18 years who presented for ultrasound scanning at various diagnostic centers in Nigeria. Data was collected using structured questionnaires administered with the assistance of radiologists and sonographers, alongside ultrasound findings. Sociodemographic, obstetric, anthropometric, and hair care practices were also assessed. Statistical analysis was performed using the Statistical Package for Social Sciences (SPSS) version 26.0 to evaluate associations between variables and fibroid presence.

Results: Participants had a mean age of 37.5 ± 8.6 years, with most being multiparous (73.2%) and of low socioeconomic status (61.9%). Uterine fibroids were detected in 90.1% of participants, with a mean fibroid count of 2.19 ± 1.56 . The use of hair relaxers was common (83.3%). Although most users applied relaxers fewer than five times per year (63.3%), they had also used them for long durations exceeding 16 years (63.3%). Both frequency ($\chi^2 = 194.201$, $p < 0.001$) and duration ($p < 0.001$) of relaxer use showed strong associations with fibroid presence. Notably, fibroids were not observed among women with no history of relaxer use. Tribe ($p < 0.001$) and socioeconomic status ($p = 0.035$) were also significantly associated with fibroid prevalence, with the Benin and Yoruba tribes having the highest number of women with fibroids and no fibroids, respectively. Conversely, age and parity were not associated with fibroid prevalence.

Conclusion: In conclusion, this study demonstrates a strong association between hair relaxer use and uterine fibroids, particularly with prolonged and frequent exposure. These findings highlight the need for increased awareness and further research into modifiable risk factors contributing to fibroid development.

Keywords: Uterine Fibroids; Hair Relaxers; Equity; Nigeria

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1. Introduction

For generations, chemical hair relaxers have been a fundamental component of hair care for women of African descent, serving as a primary method of managing and styling Afro-textured hair [1]. In a society that has historically prioritized Eurocentric beauty standards, relaxed hair has often been viewed as being more 'manageable,' stylish and 'professional [1].' However this pursuit of aesthetic conformity and convenience is currently being overshadowed by a growing body of scientific evidence suggesting that these products may be contributing to a disproportionately high rate of uterine fibroids in the Black community [2,3].

Uterine fibroids, otherwise known as leiomyomas or myomas are benign monoclonal tumors originating from the myometrium (musculature) of the uterus. Their development is not attributed to a single catalyst but rather the result of a multifactorial etiology involving both genetic and environmental factors. The hormones (oestrogen and progesterone) primarily drive this condition explaining why they rarely occur before menarche, often regress following menopause and are more common among nulliparous women [4]. However the response of the uterine musculature to these hormones is influenced by genetic predispositions; consequently, a family history of leiomyomas significantly increases an individual's risk [4,5]. Globally, the burden of uterine fibroids has seen a staggering 74.4% surge over the last three decades, significantly increasing disability adjusted life years for women of reproductive age [6]. Black women face the highest burden with lifetime prevalence rates exceeding 80% [7].

Amid the growing rates of uterine fibroids, emerging studies have argued that environmental endocrine-disrupting chemicals (EDCs), particularly those found in chemical hair relaxers, may act as external catalysts for the development of these tumors [2,8]. Wise et al. [8] found that the risk of developing uterine fibroids was 1.17 times higher in women who had ever used chemical relaxers compared to never-users. Similarly, Ogunsina et al. [2] reported that women who had ever used or frequently used chemical relaxers had 1.15 and 1.18 times higher odds of developing early onset fibroid. However despite the findings of studies on this topic, existing literature suffers from a limited geography. Most of these studies are either conducted within the United States or Western nations [2,8], leaving the native African population vastly underrepresented [9]. While African-Americans and native African women share ancestral ties, their environmental exposures, lifestyle factors, and specific hair care practices vary drastically [10]. In Nigeria, for instance, regulatory oversight on cosmetic formulations differs significantly from Western standards, meaning products sold locally may contain different concentrations or entirely alternate chemical compounds [11,12].

Consequently, to address these gaps this study aims to estimate the relationship between chemical hair relaxer use and the occurrence of uterine leiomyomas among women in Nigeria. By evaluating specific exposure metrics such as the duration and frequency of application. We hypothesize that a positive, dose-dependent relationship exists between the frequency and duration of chemical hair relaxer use and the prevalence of uterine leiomyomas in Nigerian women, driven by systemic exposure to endocrine-disrupting chemicals. Ultimately, this study aims to provide native empirical data to inform public health awareness and guide cosmetic safety regulations in Nigeria.

2. Methodology

This was a cross-sectional study conducted to estimate the relationship between chemical hair relaxer use and the occurrence of uterine leiomyoma (fibroids) among women in Nigeria. The study was carried out in collaboration with radiologists and sonographers across various hospitals and diagnostic centers in Nigeria.

A total of 354 women undergoing abdominopelvic ultrasound scans (USS) were recruited for the study. Inclusion criteria were female patients aged 15 years and older who consented to participate and underwent pelvic ultrasound evaluation during the study period. Patients with incomplete ultrasound records or unclear imaging data were excluded from the study.

Data were collected using a structured approach combining clinical imaging and structured questionnaires.

- **Sociodemographic & Anthropometric Data:** Information on age, tribe, socioeconomic status, parity, weight, and height (to calculate Body Mass Index, BMI) was recorded.
- **Hair Relaxer Usage:** Participants were questioned on their history of chemical hair relaxer use, including the frequency of application per year and the total duration (years) of exposure.
- **Radiological Assessment:** Transabdominal or transvaginal ultrasound scans were performed and interpreted by qualified radiographers and radiologists to detect the presence, absence, and number of uterine fibroids.

Data were entered into Microsoft Excel and checked for completeness and accuracy. Statistical analysis was carried out using the Statistical Package for Social Sciences (SPSS) version 25.0. Descriptive statistics, including frequencies, percentages, means, and standard deviations ($\pm$ SD), were used to summarize categorical and continuous variables. The results were represented in tables, bar charts, and pie charts. The chi-square (χ^2) test was used to assess the association between independent variables (sociodemographic characteristics, parity, frequency of hair relaxer use, and years of exposure) and the presence of uterine fibroids. A p-value <0.05 was considered statistically significant.

Ethical approval was obtained from the Health Research Ethics Committee of the participating institutions. Informed consent was obtained from all participants prior to data collection. To ensure confidentiality, all personal identifiers were removed from the dataset, and the study adhered to the ethical principles of the Declaration of Helsinki.

3. Results

3.1. Sociodemographic Characteristics

A total of 354 respondents were included in the study. The mean age of participants was 37.5 ± 8.6 years, with majority aged 25-64 years (56.5%, 200), of the Benin tribe (45.2%, 160), and belonged to the low socioeconomic class (61.9%, 219). (Table 1)

Table 1 Socio-Demographic Characteristics of Respondents

Variable	Frequency (n)	Percentage (%)
Age (Years)		
15–24 years	3	0.8%
25–34 years	151	42.7%
35–49 years	200	56.5%
Total	354	100.0%
Mean $\pm$ SD	37.5 $\pm$ 8.6 years	
Tribe		
Benin	160	45.2
Efik	5	1.4
Fulani	8	2.3
Hausa	24	6.8
Ibibio	3	0.8
Igbo	59	16.7
Ijaw	4	1.1
Tiv	6	1.7
Yoruba	85	24.0
Total	354	100.0
Socioeconomic Status		
Low	219	61.9%
Middle	97	27.4%
High	38	10.7%
Total	354	100.0

3.2. Obstetric Characteristics of respondents

The mean parity among the respondents was 2.32 ± 1.61 , with a median of 2 children. The majority of the respondents were multipara (73.2%, 259) while 17.5% were nulliparous having no children and 9.3% were grand multiparous having more than five children. (Figure 1)

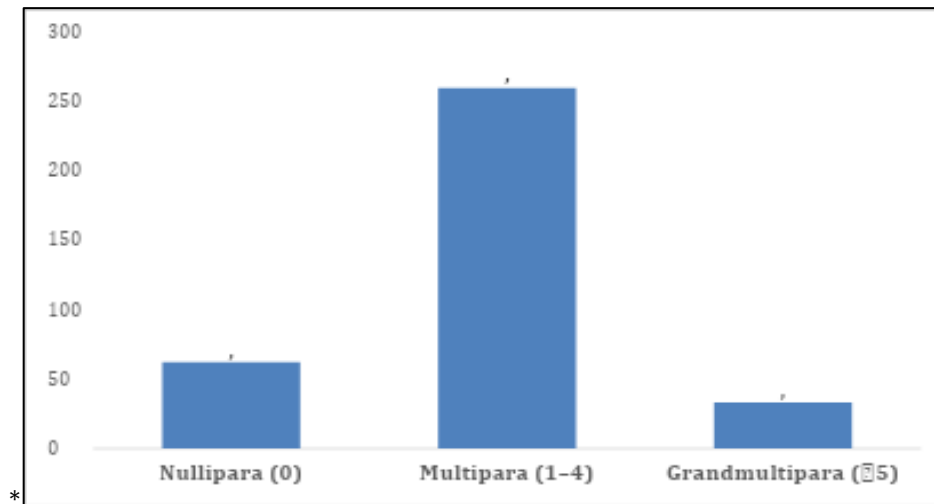


Figure 1 The obstetrics characteristics of respondents

3.3. Anthropometric Data

The mean weight of participants was 68.97 ± 9.11 kg, and the mean height was 1.64 ± 0.07 m, resulting in a mean BMI of 25.84 ± 3.71 kg/m², falling within the overweight range. However, majority 48.6% (172) maintained a healthy weight. (Figure 2)

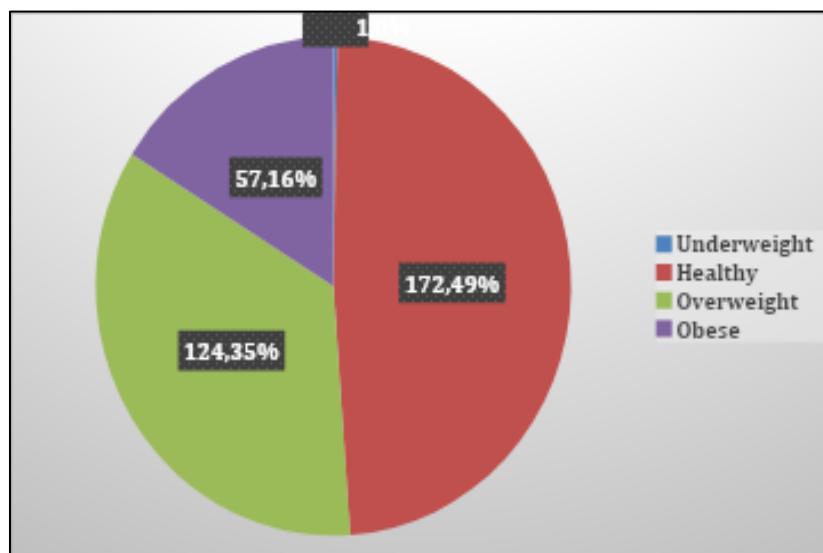


Figure 2 The BMI category distribution amongst respondents

3.4. Hair Relaxer Usage

Regarding hair care practices, 83.3% of the women used chemical relaxers (Figure 3). Among users, 63.3% applied relaxers less than five times per year. The mean frequency of relaxer use was 2.99 ± 1.93 times per year. Long-term exposure was common, with 63.3% (224) of the total population having used relaxers for over 16 years.

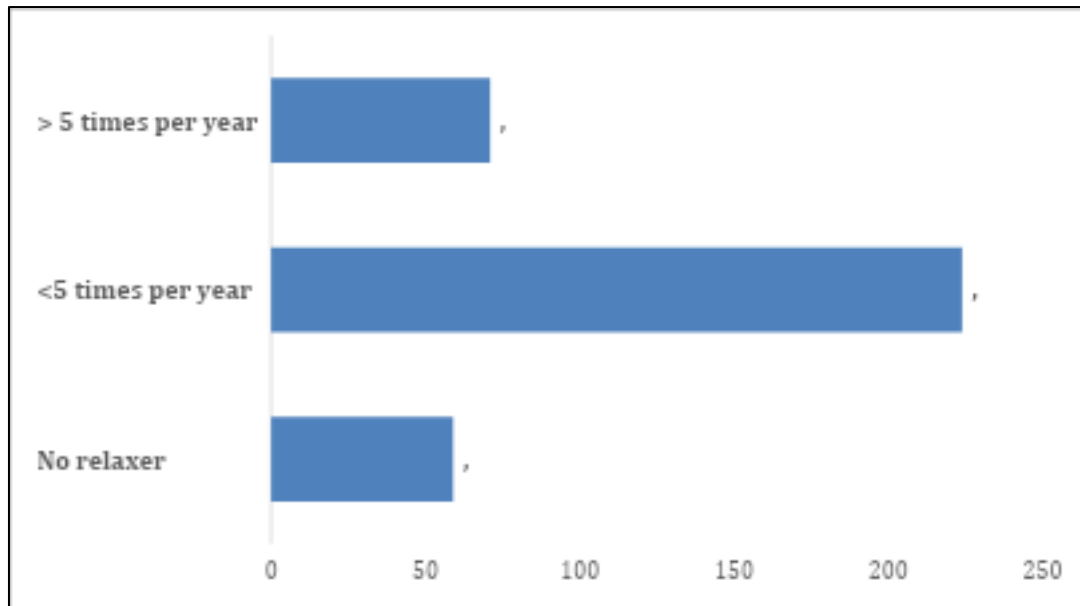


Figure 3 Usage of hair relaxer amongst respondents

3.5. Prevalence of Fibroid

The mean number of fibroids detected on ultrasound was 2.19 ± 1.56 , with a range of 0 to 8 fibroids. The vast majority of participants 319 (90.1%) had uterine fibroids, while only 35 9.9% had no fibroids. (Figure 4)

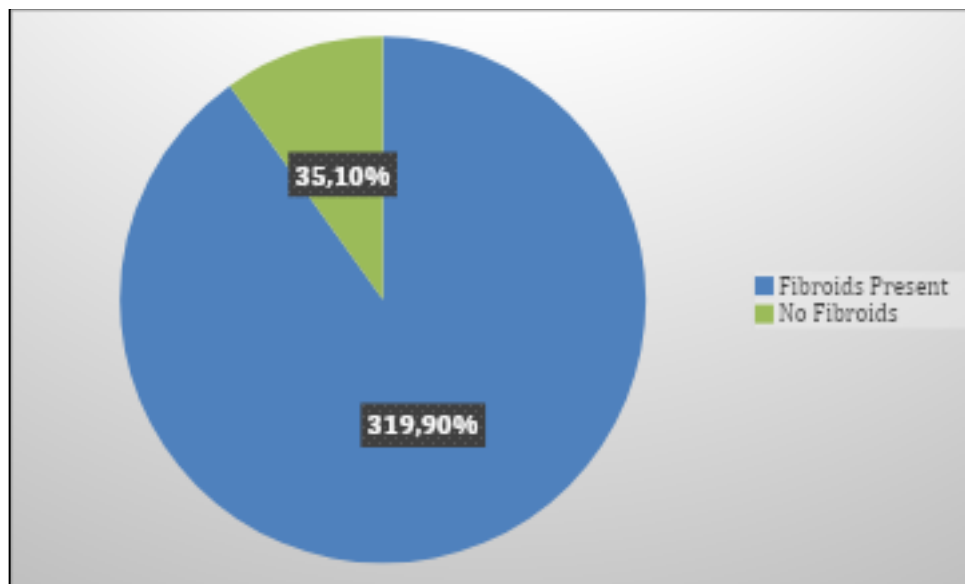


Figure 4 Prevalence of Fibroid

3.6. Relationship Between Socio-Demographic and Uterine Fibroids

Cross tabulation analysis revealed that there was a significant association between tribe and uterine fibroids ($P < 0.001$, χ^2 : 28.308). The Benin tribe accounted for the highest proportion of fibroid cases (157, 44.4%), while the Yoruba tribe had a disproportionately higher number of "No Fibroid" cases (18, 5.1% of the total) compared to their peer groups. Also, socioeconomic status was significantly associated with the presence of fibroids ($\chi^2=6.720$, $p=0.035$). Respondents in the "low" socioeconomic category had the majority of fibroid cases (204, 57.6%) (Table 2)

Table 2 Crosstabulation between sociodemographic characteristics and uterine fibroids

Variable	No Fibroid (n=35)	Fibroid (n=319)	Total (n=354)	χ^2	p-value
Age Groups				0.332	0.847
15–24 years	0 (0.0%)	3 (0.8%)	3 (0.8%)		
25–34 years	15 (4.2%)	136 (38.4%)	151 (42.7%)		
35–49 years	20 (5.6%)	180 (50.8%)	200 (56.5%)		
Tribe				28.308	<0.001*
Benin	3 (0.8%)	157 (44.4%)	160 (45.2%)		
Efik	1 (0.3%)	4 (1.1%)	5 (1.4%)		
Fulani	1 (0.3%)	7 (2.0%)	8 (2.3%)		
Hausa	2 (0.6%)	22 (6.2%)	24 (6.8%)		
Ibibio	0 (0.0%)	3 (0.8%)	3 (0.8%)		
Igbo	9 (2.5%)	50 (14.1%)	59 (16.7%)		
Ijaw	1 (0.3%)	3 (0.8%)	4 (1.1%)		
Tiv	0 (0.0%)	6 (1.7%)	6 (1.7%)		
Yoruba	18 (5.1%)	67 (18.9%)	85 (24.0%)		
Socioeconomic class				6.720	0.035*
Low	15 (4.2%)	204 (57.6%)	219 (61.9%)		
Middle	13 (3.7%)	84 (23.7%)	97 (27.4%)		
High	7 (2.0%)	31 (8.8%)	38 (10.7%)		

*Significant at $p < 0.05$

3.7. Relationship Between Parity and Uterine Fibroids

The number of children a woman has (parity) did not show a significant relationship with fibroid status ($p=0.809$). (Table 3)

Table 3 Crosstabulation between parity and uterine fibroids

Variable	No Fibroid (n=35)	Fibroid (n=319)	Total (n=354)	χ^2	p-value
Parity				0.423	0.809
Nullipara	5 (1.4%)	57 (16.1%)	62 (17.5%)		
Multipara (1-4)	26 (7.3%)	233 (65.8%)	259 (73.2%)		
Grandmultipara (>5)	4 (1.1%)	29 (8.2%)	33 (9.3%)		

3.8. Relationship Between Hair Relaxer Usage and Uterine Fibroids

There was significant relationship between the frequency of hair relaxer use per year and the presence of fibroids ($\chi^2 = 194.201$, $p < 0.001$). Notably, all the women who used relaxers were found to have fibroids.

Table 4 Crosstabulation between Hair Relaxer Usage and Uterine Fibroids

Variable	No Fibroid (n=35)	Fibroid (n=319)	Total (n=354)	χ^2	p-value
Relaxer Frequency				194.201	<0.001*
No Relaxer	35 (9.9%)	24 (6.8%)	59 (16.7%)		
< 5 times/year	0 (0.0%)	224 (63.3%)	224 (63.3%)		
> 5 times/year	0 (0.0%)	71 (20.1%)	71 (20.1%)		
Years of relaxer use				194.201	<0.001
No relaxer	35 (9.9%)	24 (6.8%)	59 (16.7%)		
5-10 years	0 (0.0%)	15 (4.2%)	15 (4.2%)		
11-15 years	0 (0.0%)	56 (15.8%)	56 (15.8%)		
16-20 years	0 (0.0%)	75 (21.2%)	75 (21.2%)		
21-25 years	0 (0.0%)	77 (21.8%)	77 (21.8%)		
>25 years	0 (0.0%)	72 (20.3%)	72 (20.3%)		

4. Discussion

This cross-sectional study evaluated the relationship between chemical hair relaxer usage and the occurrence of uterine leiomyoma among women in Nigeria, utilizing ultrasonographic evaluation for definitive diagnosis. Our findings reveal a strikingly high prevalence of uterine fibroids (90.1%) within the study population with a higher concentration of the incidence of this condition among women who had a long-term exposure to chemical hair relaxers. We observed a highly significant association between both the annual frequency and cumulative years of hair relaxer use and the occurrence of uterine fibroids ($p < 0.001$), underscored by the striking finding that every single individual who used chemical relaxers in this study was diagnosed with uterine fibroids. Significant associations were also found with lower socioeconomic status (SES), specific tribal lineages (notably the Benin tribe), suggesting that other lifestyle practices, socioeconomic disparities or underlying genetic predispositions may also compound the risk within these subgroups. Collectively, these findings highlight the need for targeted awareness campaigns regarding chemical hair care practices and early radiological screening among Nigerian women.

The association between chemical hair relaxers and uterine fibroids has been postulated to be rooted in the systemic absorption of endocrine-disrupting chemicals (EDCs) and their subsequent interference with myometrial physiology. These products serve as delivery vehicles for compounds such as phthalates and parabens which possess hormone-mimicking properties that disrupt natural endocrine signalling and homeostasis [9]. Although these chemicals are only applied in the skin, they have been observed to cause chemical burns and scalp damage owing to their highly alkaline formulation [9]. Consequently, a disruption in the structural integrity of the skin has been proposed to be the primary mechanism by which these chemicals gain entry into the bloodstream [8,9,13].

The 90.1% prevalence of uterine fibroids observed in this study significantly exceeds previously documented regional estimates of 67% in Nigeria and 10-20% in Kenya, aligning more closely with the 79% reported in Ghana [9]. More strikingly, the 100% prevalence rate found among women who had used relaxers in this cohort provides an even stronger link than the five-fold increase in odds ($OR = 5.12$) reported in a recent Kenyan case-control study [9]. This near-perfect correlation suggests that within Nigeria, hair relaxers may act as an environmental driver of myometrial pathology, likely due to local product formulations containing high concentrations of EDCs. This interpretation is heavily supported by the chronic nature of exposure to chemical relaxers observed in our cohort, where 63.3% of respondents had used relaxers for over 16 years, a duration that far exceeds the median exposure of 3 years reported by the Kenyan literature [9]. This chronic exposure in itself is significant: large-scale longitudinal data from Black Women's Health Study (BWHS) indicate that the risk of myometrial tumors increases significantly with the total number of years of use ($P\text{-trend} = 0.015$) [8]. Our finding is therefore mirrors global findings suggesting that the highest disease rates occur in women with more than 15 years of consistent exposure [3].

Interestingly, while the mean frequency of use in this study (2.99 times per year) falls below the high frequency threshold such as >7 times, associated with a 1.4 to 1.6-fold increase in US cohorts, the prevalence among users still

remained high [2]. This indicates that even a moderate frequency application of these chemicals may be sufficient to drive tumorigenesis when sustained over time. The lack of a significant protective relationship between parity and fibroid in this study suggests that this chemical insult [2] may be potent enough to overwhelm the biological protective effect typically offered by childbirth. The significant association found with the Benin tribe and low SES further suggests that cultural hair care practices or the reliance on less-regulated, at-home relaxer kits [11] may be compounding the ongoing crisis.

A major strength of this study lies in its use of definitive radiological confirmation via ultrasonography by qualified radiologists and sonographers which eliminated the diagnostic recall bias frequently associated with self-reported fibroid status. Additionally, capturing highly detailed exposure metrics such as the specific annual frequency and cumulative years of use provided a view of long-term chemical exposure in the cohort. However, a few limitations must be acknowledged. Due to the cross-sectional design of the study, a definitive causal relationship between hair relaxer use and uterine leiomyoma cannot be established, as both exposure and outcome were assessed simultaneously. Also, the study population was also drawn from women already presenting for clinical pelvic scans, which may account for the exceptionally high baseline prevalence (90.1%) and introduce selection bias compared to the general population. Finally, although we identified significant associations with specific tribal lineages and low SES, we did not evaluate confounding variables such as habits, genetic predispositions, or the specific chemical compositions of the relaxer brands used. Moving on, Future research should focus on large-scale, prospective cohort studies across diverse geopolitical zones in Nigeria to track exposure progressively from adolescence. Also, Chemical analyses of locally available hair products are also urgently needed to quantify exact concentrations of EDCs like phthalates and parabens.

5. Conclusion

This study demonstrates a strikingly high prevalence of uterine fibroids among Nigerian women, revealing an absolute correlation with chemical hair relaxer usage. The significant associations found with cumulative years and annual frequency of use strongly underscore chronic exposure to endocrine-disrupting chemicals as a primary environmental driver of myometrial pathology. Furthermore, variations across socioeconomic status and tribal lineages suggest compounding demographic risks. To mitigate this widespread health burden, public health initiatives must urgently leverage these findings to foster clinical awareness, advocate for stricter regulatory oversight on cosmetic formulations, and encourage a protective transition toward natural hair care practices.

Compliance with ethical standards

Disclosure of conflict of interest

The authors, Fab-Emerenini Eziokwu Bright, Obi Daniel O, Unini Collins Kelechi, Duru Chimezie Goodluck, Osuigwe Chidera Andrew, Ikemefuna Chinedu Ikemefuna, and Agozie Valentine Nworah have no conflicts of interest regarding the study. All funding was paid for, out-of-pocket, by the authors.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

References

- [1] de Sá Dias TC, Baby AR, Kaneko TM, Robles Velasco MV. Relaxing/straightening of Afro-ethnic hair: historical overview. *Journal of Cosmetic Dermatology*. 2007;6(1):2–5.
- [2] Ogunsina K, O'Brien KM, White AJ, Chang CJ, Gaston SA, Jackson CL, Sandler DP. Hair Straightener Use in Relation to Prevalent and Incident Fibroids in the Sister Study with a Focus on Black Women. *Environmental Health Perspectives*. 2025;133(1):017004.
- [3] Bertrand KA, Delp L, Coogan PF, Cozier YC, Lenzy YM, Rosenberg L, Palmer JR. Hair relaxer use and risk of uterine cancer in the Black Women's Health Study. *Environmental Research*. 2023;239(1):117228–8.
- [4] McWilliams MM, Chennathukuzhi VM. Recent Advances in Uterine Fibroid Etiology. *Seminars in reproductive medicine*. 2017;35(2):181–9.

- [5] Kuznetsova MV, Sogoyan NS, Donnikov AJ, Trofimov DY, Adamyan LV, Mishina ND, Shubina J, Zelensky DV, Sukhikh GT. Familial Predisposition to Leiomyomata: Searching for Protective Genetic Factors. *Biomedicines*. 2022;10(2):508.
- [6] Cheng LC, Li HY, Gong QQ, Huang CY, Zhang C, Yan JZ. Global, regional, and national burden of uterine fibroids in the last 30 years: Estimates from the 1990 to 2019 Global Burden of Disease Study. *Frontiers in Medicine*. 2022;9:1003605.
- [7] Jefferies K, Bland L, Oladimeji B, Rothfus M, Etowa J, Alleyne A, Salami B, Austin S, Aston M, Stirling-Cameron E. Uterine fibroids and Black people of African descent globally: a scoping review protocol. *BMJ Open*. 2024;14(8):e085622-2.
- [8] Wise LA, Palmer JR, Reich D, Cozier YC, Rosenberg L. Hair Relaxer Use and Risk of Uterine Leiomyomata in African-American Women. *American Journal of Epidemiology*. 2012;175(5):432-40.
- [9] Kithikii MM, Mweu MM, Muita JW. Association between hair relaxer use and uterine fibroids among women of reproductive age presenting to a national referral hospital in Kenya: a case control study. 2025;
- [10] Daniels G, Fraser A, Westgate GE. How different is human hair? A critical appraisal of the reported differences in global hair fibre characteristics and properties towards defining a more relevant framework for hair type classification. *International Journal of Cosmetic Science*. 2022;45(1).
- [11] Orisakwe OE, Otaraku JO. Metal Concentrations in Cosmetics Commonly Used in Nigeria. *The Scientific World Journal*. 2013;2013:959637.
- [12] Kadiri, Etonihu C, E KP, Daniel OO. A Study of Toxic Metal Contents in Selected Cosmetics in the Federal Capital Territory and Products Safety... *Continental J Applied Sciences*. 2020;15(2):1-24.
- [13] Bariani MV, Rangaswamy R, Siblini H, Yang Q, Al-Hendy A, Zota AR. The role of endocrine-disrupting chemicals in uterine fibroid pathogenesis. *Current Opinion in Endocrinology, Diabetes & Obesity*. 2020;27(6):380-7.