ORIGINAL ARTICLE

REVISTA ENFERMAGEM ATUAL IN DERME

USE OF COSMETICS WITH THE POTENTIAL PRESENCE OF ENDOCRINE DISRUPTORS BY HIGH-RISK PREGNANT WOMEN

USO DE COSMÉTICOS CON POTENCIAL PRESENCIA DE DISRUPTORES ENDOCRINOS POR MUJERES EMBARAZADAS DE ALTO RIESGO

USO DE COSMÉTICOS COM POTENCIAL PRESENÇA DE DISRUPTORES ENDÓCRINOS POR GESTANTES DE ALTO RISCO

Ana Izabel de Oliveira Neta[1]
Laís dos Santos Rocha Souza[2]
Amanda Alves de Jesus[3]
Dário Soares Ruas[4]
Suellen Cristina Dias Emídio[5]
Alanna Fernandes Paraíso [6]

[1]Montes Claros State University, Montes Claros, Minas Gerais, Brazil. Orcid: 0000-0003-3777-1290
[2]Capixaba Institute of Education, Research, and Innovation in Health, Cachoeiro de Itapemirim, Espírito Santo, Brazil. Orcid: 0009-0005-7481-5856
[3]School of Health and Humanities, Montes Claros, Minas Gerais, Brazil. Orcid: 0009-0009-3976-2401
[4]Santo Agostinho Colleges, Montes Claros, Minas Gerais, Brazil. Orcid: 0009-0000-3089-4410
[5]Federal University of Juiz de Fora, Juiz de Fora, Minas Gerais, Brazil. Orcid: 0000-0003-2790-0271
[6]Federal University of Juiz de Fora, Juiz de Fora, Minas Gerais, Brazil. Orcid: 0000-0001-7400-140X

Corresponding author
Alanna Fernandes Paraíso
Rua José Lourenço Kelmer, s/n, São Pedro, Juiz de Fora, Minas Gerais - MG, Brazil. Zip code: 36036-900.
Email: lana.paraiso@ufjf.br Contact: +55 (32) 99990-3664

Submission: 15-04-2025
Approval: 02-07-2025

ABSTRACT
Introduction: cosmetic products, widely used by modern society, can contain endocrine disruptors and cause negative impacts on health, especially in women who make up the largest consumer segment of the population. Consequently, pregnant women are a cause for concern, as they experience several physiological changes that can make them more susceptible to the emergence of diseases and injuries. **Objective:** to identify the use of cosmetics with potential presence of endocrine disruptors by high-risk pregnant women and to evaluate changes in habits during pregnancy. **Methods:** cross-sectional, descriptive, and quantitative study with 253 high-risk pregnant women followed by a specialized service in northern Minas Gerais. Participants answered questionnaires about sociodemographic characteristics and use of cosmetics. **Results:** fears or uncertainties regarding the safety of cosmetics were reported by 58.1%; despite this, 56.2% did not seek guidance. Among those who sought guidance, the most sought-after topics were straightening (28.9%) and hair dye (26.5%) with the internet (23.7%) and doctors (20.2%) as the main sources. The need to chance habits was greater among pregnant women with ≥ 12 years of schooling (p=0.007), and fears/uncertainties were more common in pregnant women aged 36 years or older (p=0.016) and more years of study (p=0.002). **Conclusion:** Pregnant women use cosmetic products extensively; however, the search for specialized advice was limited, and guidance on the safe use of cosmetics during pregnancy was incipient, highlighting a gap in healthcare practice. Our findings are important to raise awareness about the risks and guide health professionals.
Keywords: High Risk Pregnancy; Cosmetics; Endocrine Disruptor; Pregnancy.

RESUMEN
Introducción: los productos cosméticos, ampliamente utilizados por la sociedad moderna, pueden contener disruptores endocrinos y causar impactos negativos en la salud, especialmente en las mujeres que constituyen el mayor segmento de consumidores de la población. Por ello, las mujeres embarazadas son motivo de preocupación, ya que experimentan varios cambios fisiológicos que pueden hacerlas más susceptibles a la aparición de enfermedades y lesiones. **Objetivo:** identificar el uso de cosméticos con potencial presencia de disruptores endocrinos por parte de embarazadas de alto riesgo y evaluar cambios de hábitos durante el embarazo. **Métodos:** estudio transversal, descriptivo y cuantitativo con 253 gestantes de alto riesgo acompañadas por un servicio especializado del norte de Minas Gerais. Los participantes respondieron cuestionarios sobre características sociodemográficas y uso de cosméticos. **Resultados:** el 58,1% manifestó temores o incertidumbres respecto a la seguridad de los cosméticos, a pesar de ello el 56,2% no buscó orientación. Entre quienes realizaron búsquedas, los temas más buscados fueron el alisado (28,9%) y el tinte para el cabelo (26,5%), siendo internet (23,7%) y los médicos (20,2%) las principales fuentes. La necesidad de cambio de hábitos fue mayor entre las embarazadas com ≥ años de educación (p=0,007), y los miedos/incertidumbres fueron más frecuentes em las embarazadas de 36 años o más (p=0,016) y com más años de estudio (p=0,002). **Conclusión:** las mujeres embarazadas utilizan ampliamente los cosméticos, sin embargo, la búsqueda de asesoramiento especializado fue limitada y la orientación sobre el uso seguro de cosméticos durante el embarazo fue incipiente, lo que pone de relieve una brecha en la práctica de atención de salud. Nuestros hallazgos son importantes para crear conciencia sobre los riesgos y orientar a los profesionales de la salud.
Palabras clave: Embarazo de Alto Riesgo; Productos cosméticos; Disruptor endocrino; Embarazo.

RESUMO
Introdução: produtos cosméticos, amplamente utilizados pela sociedade moderna, podem conter disruptores endócrinos e causar impactos negativos na saúde, especialmente em mulheres que compõem a parcela da população que mais os consome. Consequentemente, as gestantes são alvo de preocupações, pois experienciam diversas mudanças fisiológicas que podem torná-las mais suscetíveis ao surgimento de doenças e agravos. **Objetivo:** identificar o uso de cosméticos com potencial presença de disruptores endócrinos por gestantes de alto risco e avaliar mudanças de hábitos durante a gravidez. **Métodos:** estudo transversal, descritivo e quantitativo com 253 gestantes de alto risco acompanhadas por um serviço especializado no Norte de Minas Gerais. As participantes responderam questionários sobre características sociodemográficas e uso de cosméticos. **Resultados:** medos ou incertezas quanto à segurança dos cosméticos foram relatados por 58,1%, apesar disso, 56,2% não buscaram orientação. Entre as que buscaram, os temas mais procurados foram alisamento (28,9%) e tintura capilar (26,5%), tendo a internet (23,7%) e médicos (20,2%) como principais fontes. A necessidade de mudança de hábitos foi maior entre gestantes com escolaridade ≥ 12 anos (p=0,007), e medos/incertezas foram mais comuns em gestantes com 36 anos ou mais (p=0,016) e maior escolaridade (p=0,002). **Conclusão:** gestantes usam de forma disseminada os produtos cosméticos, entretanto, a busca por aconselhamento especializado foi limitada, e a orientação quanto ao uso seguro de cosméticos na gestação mostrou-se incipiente, evidenciando uma lacuna na prática assistencial. Os achados deste estudo são importantes para sensibilizar sobre os riscos e orientar os profissionais de saúde.
Palavras-chave: Gravidez de Alto Risco; Cosméticos; Disruptor Endócrino; Gravidez.

REVISTA ENFERMAGEM ATUAL IN DERME

INTRODUCTION

Cosmetic products (CPs) are formulations composed of natural or synthetic substances intended for external use on various parts of the human body, such as the skin, hair, nails, lips, external genitalia, teeth, and mucous membranes of the oral cavity. Their main purpose is to cleanse, perfume, and alter appearance[1].

Recently, cosmetics have gained increasing popularity in modern society and have also held an important economic position, as Brazil is the fourth largest consumer market for beauty products in the world[2]. It is important to note that some of these products may contain substances that, if used excessively and for a long time, can harm human health. Among these substances are endocrine disruptors or endocrine-disrupting chemicals[3], which can disrupt hormonal homeostasis, interfering with hormone synthesis, function, storage, and metabolism[4].

Endocrine disruptors are frequently found in cosmetics such as nail polish, deodorants, shampoos, moisturizers, and sunscreens[5]. The most common chemicals found in these products include parabens, benzophenone, phthalates, triclosan, BPA, formaldehyde, and fragrances[5]. They are present in a variety of items, such as makeup, deodorants, moisturizers, sunscreen, nail polish, oils, hair products, and perfumes. These items are widely used by women and pregnant women[6] and can affect women's health by causing changes in the endocrine system and leading to metabolic impacts, such as obesity and diabetes[7], fertility disorders[8], and an increased risk of certain types of cancer, such as breast câncer[9].

As pregnancy progresses, some studies link endocrine disruptors to a higher risk of adverse pregnancy outcomes and may increase the risk of complications[10] such as intrauterine growth restriction, gestational diabetes, preeclampsia[11-13], small-for-gestational-age newborns, low birth weight, premature birth, and spontaneous abortion, among others[8,9]. These conditions can impact pregnancy and modify gestational risk stratification, which can be assessed as low, intermediate, or high risk. Gestational risk stratification is determined based on factors grouped according to: individual, socioeconomic, and family conditions; previous reproductive history; and clinical or obstetric conditions and complications in the current pregnancy[14].

In pregnant women, these compounds can be detectable in urine, blood, breast milk, and amniotic fluid, where they can accumulate and impair placental function. The placenta plays a crucial role during pregnancy, as it promotes fetal safety and homeostasis, exchanges nutrients and gases essential for fetal development and acts as a protective barrier against external aggressions [15].

Globally, women appear to be more concerned about the risks associated with PC exposure during pregnancy. Studies have shown that pregnant women consider cosmetics to be a risk during pregnancy[16] and a source of

REVISTA ENFERMAGEM ATUAL IN DERME

endocrine disruptors[17]. A study conducted in France, which followed 484 pregnant women, observed higher urinary concentrations of triclosan and parabens in those with less education[18]. In contrast, a cohort study conducted in China with 600 pregnant women to identify possible exposure to endocrine-disrupting chemicals showed that serum concentrations of these substances tend to be higher in participants with higher levels of education and those over 35 years of age, compared to those under 35 years of age[15]. This may be explained by the fact that women with these characteristics tend to use PCs more frequently, which increases the risk of exposure.

Research shows that pregnant women frequently use various personal care products without paying much attention or understanding their safety [5,8]. Therefore, it is crucial to conduct studies evaluating the use of cosmetics that may contain substances with potential endocrine disruption in this specific population [19].

Although the effects of endocrine disruptors on human health have been widely discussed in international journals in recent years, it is observed that pregnant women's perceptions of cosmetic use during pregnancy, their risks, and the potential presence of endocrine disruptors remain underexplored, particularly in Brazilian journals. Given the hypothesis that pregnant women use cosmetics containing endocrine disruptors during pregnancy, questions arise about the level of information they have and the ability to identify the potential harm to their health and fetal development. Therefore, it is crucial to recognize changes in the use of these products during pregnancy so that awareness-raising strategies can be adopted to modify attitudes and behaviors during pregnancy and prevent and/or reduce pregnant women's exposure to endocrine disruptors.

In light of the above, the objective of this study was to identify the use of cosmetics with potential endocrine disruptors by pregnant women treated at a high-risk clinic and to assess changes in habits during pregnancy.

METHODS

This was a descriptive, quantitative study that followed the "Strengthening the Reporting of Observational Studies in Epidemiology" (STROBE) guidelines[20].

The study setting was a Specialized Center for Women's Health, which monitors pregnant women during high-risk, medium-complexity prenatal care. It is located in a city in Minas Gerais that is a healthcare hub in the northern macro-region of the state[21]. This center has a multidisciplinary team that offers reproductive health care, prenatal monitoring, labor and delivery, cytopathological exams, mammograms, and physical therapy services.

The sample of pregnant women was composed using the formula for cross-sectional studies with a finite population[22]. A tolerable sampling error of 5%, a 95% confidence interval (95% CI), and a population proportion of 50% were adopted. A correction was made for the

REVISTA ENFERMAGEM ATUAL IN DERME

finite population (n=468 pregnant women) and a 10% increase was established to compensate for possible non-responses and losses, resulting in a sample of at least 232 pregnant women. The statistical sample size calculation was performed using Open Epi software, version 3.

The study population included 253 pregnant women who were selected by convenience from the appointment scheduling list. The inclusion criteria were: pregnant women of any gestational age, referred for high-risk prenatal care at the service, residing in an urban area, aged 18 or older, and who agreed to participate in the study after reading and signing the Informed Consent Form. Pregnant women with cognitive impairments that prevented participation were excluded from the study.

Data collection was conducted between July and November 2023 by a team of three researchers qualified to ensure scientific rigor. Data were collected in the waiting room while the pregnant women awaited outpatient care. Initially, data collection was conducted through a two-part questionnaire: the first addressed sample characterization using a validated questionnaire entitled "Sociodemographic and Economic Characterization Instrument"[23]. The second included 26 objective questions about PC use during pregnancy. The questionnaire was developed by the researchers based on similar questionnaires found in studies related to this topic, which served as the basis for the development of this instrument[16]. Each collection lasted approximately 30 minutes.

Data were tabulated using the Statistical Package for Social Sciences (SPSS) software, version 22.0 for Windows®. Descriptive analysis of all variables was performed using their absolute (n) and relative (%) frequency distributions. In the bivariate analysis, the chi-square test was applied to verify the association between the dependent variable and the independent variables at a significance level of $p < 0.05$.

The study was conducted in accordance with the standards for research involving human subjects set forth in Resolution 466/2012 of the National Health Council, following Opinion No. 6,136,690 and CAAE 68026623.1.0000.5147 of the Research Ethics Committee of the Federal University of Juiz de Fora.

RESULTS

The sample consisted of 253 pregnant women, the majority aged 18 to 45 years, with an average of 29±7. A significant number of pregnant women self-identified as brown, constituting 63.2% (n=160) of the studied group. Regarding marital status, 71.5% (n=181) of the pregnant women lived with their partner. Regarding education, the predominance was of pregnant women with 12 or more years of education, 87% (n=220), and the majority had only completed high school. The majority of pregnant women identified as Catholic, 47.8% (n=121), or Evangelical, 45.5% (n=115). Regarding their employment status, 60.9% (n=154) were employed and 39.1% (n=99) were unemployed (Table 1).

REVISTA ENFERMAGEM ATUAL IN DERME

Regarding gestational age, most pregnant women were in their third trimester, representing 50.6% (n=128). The majority of pregnancies were singletons, accounting for 95.2% (n=240). The main reasons for seeking care at a high-risk referral center during pregnancy included gestational diabetes mellitus, present in 30.6% (n=72) of the pregnant women, hypertensive disorders specific to pregnancy, in 11.1% (n=26), and high blood pressure, in 5.1% (n=12). A significant number of pregnant women, totaling 60.1% (n=152), were not in their first pregnancy. Furthermore, 79.8% (n=202) of the pregnant women had not experienced a miscarriage (Table 1).

Table 1 - Sociodemographic, obstetric and clinical characteristics of pregnant women (n=253), Montes Claros/MG.

Variable		**n**	**%**
Age	18 – 35	197	77,9
	> 36	56	22,1
Self-reported race	Brown	160	63,2
	Black	50	19,8
	White	39	15,4
	Others (yellow and indigenous)	4	1,6
Marital status	Lives with a partner	181	71,5
	Lives without a partner	72	28,5
Education	< 9 years	4	1,6
	9 to 11 years	29	11,5
	> = 12 years	220	87,0
Religion	Catholic	121	47,8
	Christian	115	45,5
	Spiritist	17	6,7
Situação funcional	Com ocupação laboral	154	60,9
	Sem ocupação laboral	99	39,1
Gestational age	1st trimester	20	7,9

REVISTA ENFERMAGEM ATUAL IN DERME

	2nd trimester	105	41,5
	3rd Trimester	128	50,6
Tipes of pregnancy	Singular (single fetus, only one baby)	240	95,2
	Multiple (twins)	11	4,4
What is the reason for the	Gestational diabetes mellitus	72	30,6
	Hypertensive disorders specific to pregnancy	26	11,1
risk monitoring?	Not informed	11	4,7
	High blood pressure	12	5,1
	Anemia	15	6,4
	Others	98	41,7
First pregnancy?	No	152	60,1
	No	101	39,9
Have you had miscarriages?	No	202	79,8
	Yes	51	20,2

Source: Prepared by the authors (2024).

Table 2 shows the frequency of cosmetic use by the pregnant women in the study before pregnancy. All participants regularly used soap and shampoo. The overwhelming majority, 99.2% (n=252), used toothpaste, conditioner, and deodorant. Mouthwash was used by 50.6% (n=128) of pregnant women. Body moisturizer was also widely used, with 96% (n=243) of pregnant women using it frequently. Sunscreen, in turn, was used regularly by 53% (n=134). Regarding skincare and beauty products, 91.7% (n=232) used perfume. Makeup was popular among 71.1% (n=180) of pregnant women, followed by nail polish and acetone use by 66% (n=166) and body oil by 35.3% (n=90). The results regarding hair dyes and straightening treatments show that pregnant women did not use these products or used them rarely.

Table 2 - Use of cosmetic products before pregnancy by pregnant women (n=253).

Variables		**n**	**%**
Soap/Shampoo	Frequent use	253	100
	Rarelly use	-	-

	Don't use	-	-
Body cream	Frequent use	243	96,0
	Rarelly use	3	1,3
	Don't use	7	2,8
Sunblock*	Frequent use	134	53,0
	Rarelly use	23	9,1
	Don't use	95	37,5
Conditioner	Frequent use	251	99,2
	Rarelly use	-	-
	Don't use	2	0,8
Tooth paste	Frequent use	252	99,6
	Rarelly use	-	-
	Don't use	1	0,4
Mouthwash	Frequent use	128	50,6
	Rarelly use	7	2,8
	Don't use	118	46,6
Deodorants	Frequent use	251	99,2
	Rarelly use	1	0,4
	Don't use	1	0,4
Nail Polish/Acetone *	Frequent use	166	66,0
	Rarelly use	67	26,5
	Don't use	19	7,5
Whitening agents	Frequent use	26	10,3
	Rarelly use	7	2,8
	Don't use	220	86,9
Make-up*	Frequent use	180	71,1
	Rarelly use	41	16,2
	Don't use	30	11,9
Body oil*	Frequent use	90	35,3
	Rarelly use	24	9,5

REVISTA ENFERMAGEM ATUAL IN DERME

	Don't use	137	54,2
Perfume	Frequent use	232	91,7
	Rarelly use	7	2,8
	Don't use	14	5,5
Hair dye *	Frequent use	5	2,0
	Rarelly use	115	45,5
	Don't use	132	52,2
Straightening *	Frequent use	2	0,8
	Rarelly use	123	48,6
	Don't use	127	50,2

Source: Prepared by the authors (2024).

Table 3 displays data identifying the variation in the quantity and frequency of cosmetic use among the pregnant women in the study, considering their personal care habits during pregnancy. Regarding facial and nail care, most respondents did not change their habits. Changes were observed regarding body and hair care. Regarding body care, there was an increase in both quantity, at 70.4% (n=178), and frequency, at 68.8% (n=174). Hair care showed a decrease, at 53.4% (n=135) for quantity and 53% (n=134) for frequency.

Table 3 - Identification of the quantity and frequency of use of cosmetic products during pregnancy (n=253).

Variable	**Quantity (n)**	**%**	**Frequency (n)**	**%**
Facial care				
Increased	75	29,6	74	29,3
Decreased	35	13,8	35	13,8
No alterations	143	56,6	144	56,9
Body care				
Increased	178	70,4	174	68,8

Decreased	12	4,7	11	4,3
No alterations	63	24,9	68	26,9
Hair care				
Increased	14	5,5	13	5,1
Decreased	135	53,4	134	53,0
No alterations	104	41,1	106	41,9
Nails care				
Increased	7	2,8	7	2,8
Decreased	36	14,2	35	13,8
No alterations	210	83,0	211	83,4

Source: Prepared by the authors (2024).

Among the pregnant women in the study, 58.1% (n=147) expressed fears or uncertainties regarding the safety of these products. A larger proportion of pregnant women, 64.8% (n=164), felt the need to change their cosmetic use habits during pregnancy. Although the majority felt the need to change their habits regarding the use of cosmetics during pregnancy, 56.2% (n=141) did not seek advice on the use of cosmetics during pregnancy (Table 4).

Table 4 - Habits and feelings related to the use of cosmetics among the pregnant women evaluated (n=253), Montes Claros/MG.

Variable		n	%
Do you have any fears/uncertainties about using cosmetics during pregnancy?	No	104	41,1
	Yes	147	58,1

REVISTA ENFERMAGEM ATUAL IN DERME

Did you feel the need to change your cosmetics habits during pregnancy?	No	89	35,2
	Yes	164	64,8
Seeked advice on using cosmetics during pregnancy	No	141	56,2
	Yes	110	43,8

Source: Prepared by the authors (2024).

Below are the responses regarding the alternatives, which could only be answered by pregnant women who answered "yes" to the options in Table 4. Pregnant women who answered "yes" (n=147) to the question "what fears/uncertainties do you have regarding the use of cosmetics during pregnancy?" could choose more than one option regarding these fears/uncertainties or describe some other fear, in addition to the alternatives provided. The response options were using cosmetics that could harm the baby's development; using cosmetics in excess; not using appropriate cosmetics to prevent body changes caused by pregnancy; and using cosmetics that were harmful to the pregnant woman's health. The majority of pregnant women, 54.5% (n=138), reported being afraid of using products that could harm the baby's development or that were harmful to their own health (15.8% (n=40). A small proportion reported not using appropriate products to prevent body changes caused by pregnancy (2.4% (n=6), and 0.8% (n=2) using excessive cosmetics.

The following questions related to pregnant women who answered "yes" (n=110) regarding "seeking advice on cosmetic use during pregnancy." When asked about the cosmetics and skincare products they sought guidance on during pregnancy, they could indicate more than one cosmetic product or describe another product, in addition to the available alternatives. Hair treatments/straightening and hair dye were the most prevalent cosmetics and skincare products sought by pregnant women in this study, at 28.9% (n=73), followed by hair dye at 26.5% (n=67). Another concern was the use of face and body creams at 8.7% (n=22). Regarding the use of insect repellents, pregnant women showed low rates of seeking help and advice, with only 4.3% (n=11) seeking help and advice, followed by makeup (3.2% (n=8), nail products (1.2% (n=3), and hair hygiene (0.8% (n=2).

Regarding the question from which person(s), professionals, or media outlets the pregnant woman sought help/advice for guidance, which allowed multiple responses, the main source of information for pregnant women in the study was the internet (23.7% (n=60), and 20.2% (n=51), primary care physicians (PHCs), gynecologists, and dermatologists). Other sources of advice sought were friends and family (13.8% (n=35). Few pregnant women consulted

REVISTA ENFERMAGEM ATUAL IN DERME

a PHC nurse; 5.1% (n=13) were nurses specializing in women's health and obstetrics, 3.9% (n=10) were hairdressers, and 3.6% (n=9) were pharmacists.

Table 5 presents the results of the bivariate analysis between sociodemographic characteristics (self-reported race, age, and education) and the pregnant women's perception of the need to change habits and the presence of fears or uncertainties related to the use of cosmetics during pregnancy. Regarding self-reported race, no significant difference was observed in the bivariate analysis (p=0.806 and p=0.461). Regarding age group, a significant association was observed with the presence of fears/uncertainties regarding the use of cosmetics in pregnant women aged 36 or older (p=0.016), compared to younger women. Higher education level (≥12 years) was associated with both the need to change habits (p=0.007) and fears/uncertainties related to the use of cosmetics during pregnancy (p=0.002).

Table 5 - Bivariate analysis of self-reported color, age and education associated with the need to change habits and fears/uncertainties regarding the use of cosmetics during pregnancy (n=164), Montes Claros/MG.

Variables		Did you feel the need to change your habits regarding the use of cosmetics?			Had fears/uncertainties about using cosmetics		
		Yes	No	p-value	Yes	No	p-value
		n (%)	n (%)		n (%)	n (%)	
Self-reported color a				0,806			0,461
	White	25 (64,1)	14 (35,9)		26 (66,7)	13 (33,3)	
	Black	35 (70)	15 (30)		32 (64)	18 (36)	
	Brown	101 (73,1)	59 (36,9)		87 (55,1)	71 (44,9)	
	Others	3 (75)	1 (25)		2 (50)	2 (50)	
Age				0,241			***0,016**
	18-35	124 (62,9)	73 (37,1)		107(54,6)	89 (45,4)	
	36+	40 (71,4)	16 (28,6)		40 (72,7)	15 (27,3)	

REVISTA ENFERMAGEM ATUAL IN DERME

Education			***0,007**		***0,002**
	< 9 years	7 (77,8)	2 (22,2)	4 (44,4)	5 (55,6)
	9 to 11 years	110 (59,1)	76 (40,9)	98 (53)	87 (47)
	≥12 years	47 (81)	11 (19)	45 (78,9)	12 (21,1)

Source: Prepared by the authors (2024). *Qui-quadrado de Pearson = p<0,05

DISCUSSION

The population analyzed consisted of young adult pregnant women being treated at a high-risk prenatal care center. At the time of the study, most participants were in their third trimester. Significant cosmetic use was observed among all pregnant women prior to pregnancy. Most women increased their body care, while a significant portion reduced their hair care. Fears or uncertainties regarding the safety of cosmetics were reported, particularly related to the baby's development. Despite this, a significant proportion did not seek guidance. Among those who did seek guidance, the search for information related to hair straightening and coloring predominated, with the internet and doctors as the main sources.

The sociodemographic characteristics of this study indicate a predominance of brown women, followed by Black women. This profile is significant when considering access to and use of PCs, which can vary substantially by ethnicity due to cultural and economic differences, as well as the availability of specific products on the market. Variability in cosmetic use across ethnic groups can directly influence exposure to endocrine-disrupting chemicals[17].

In a cohort of Black women, hair product use was associated with higher concentrations of phthalates and parabens. Hair products may be an important route of exposure to endocrine-disrupting chemicals among Black women[24], who are more likely to use these products than women of other racial groups. The study also indicates that hair texture patterns influence hair product use, with Black women more likely to use hair relaxers and root stimulators due to sociocultural pressures[25].

The participants in the afore mentioned study were similar to the women investigated in this study in terms of racial and cultural characteristics and habits related to hair product use. Pregnant women reduced their use of hair products during pregnancy and expressed fear or uncertainty about some hair treatments during pregnancy. These results indicate the need for access to information about the consumption of CPs that offer lower exposure to endocrine-disrupting chemicals, as well as about the various forms of exposure disparities. A

REVISTA ENFERMAGEM ATUAL IN DERME

preventive approach and adequate labeling would allow women to select products that align with their values, providing greater safety.

Another relevant sociodemographic factor is age. Age can be a significant determinant in assessing risk perception related to exposure to endocrine-disrupting chemicals during pregnancy or the postpartum period, as pregnant women over 35 tend to have an increased risk perception regarding exposure to these substances[19]. Although age is widely recognized as a determinant of risk perception, this may be more closely related to personal risk experience. After all, older women are more likely to have experienced risk situations throughout their lives than younger women[19]. Corroborating this study, the findings showed a positive association among pregnant women aged 36 and over regarding fears and uncertainties regarding cosmetic use.

Education, another relevant characteristic, shows that the majority of women had completed high school. Studies indicate that educational level can influence knowledge about cosmetic ingredients and the perception of their risks, with pregnant women with higher levels of education tending to choose products with fewer risk components[16]. In this study, there was a positive correlation between corresponding factors related to doubt, fear, and uncertainty regarding the need to change habits during pregnancy and education level. The data show that pregnant women with >12 years of education felt the need to change their habits due to fears and uncertainties regarding the use of cosmetics. These results suggest that factors such as higher education level and age may be associated with greater risk perception and awareness of the possible adverse effects of using cosmetics with the potential presence of endocrine disruptors during pregnancy.

In this study, most of the pregnancies analyzed were singletons, with some complications such as gestational diabetes and pregnancy-specific hypertensive syndromes. These observed conditions can be influenced by environmental factors and exposure to chemicals containing endocrine disruptors, which, in turn, lead to endocrine disorders that can contribute to these changes in gestational health [26].

In the current study, most pregnant women increased their use of body products, such as body moisturizers, mineral oils, and stretch mark prevention products, followed by hair care products such as shampoo and conditioner. However, they reduced their use of insect repellents, and most did not use sunscreen, although they did not receive guidance on its use, even though they lived in a city with a climate with high temperatures and sunlight most of the year. Almost all pregnant women used chemical protective agents, such as soap and shampoo, suggesting extensive exposure to potentially harmful components of these products. Recurrent use of PCs is associated with higher levels of parabens in pregnant women's hair, compounds commonly found in soaps and shampoos[26].

Therefore, it is advisable to exercise caution when using cosmetics during pregnancy

REVISTA ENFERMAGEM ATUAL IN DERME

and maintain product use with safe formulas to prevent changes that may occur during pregnancy, such as changes in skin pigmentation, which can lead to dissatisfaction with self-image and harm to the pregnant woman's health[13,27].

This study found that the majority of pregnant women (58.1%) had fears and uncertainties regarding the use of cosmetics, and 64.8% felt the need to change their cosmetic habits during pregnancy. Among the pregnant women who reported fears and uncertainties regarding the use of cosmetics during pregnancy, the majority identified their main fears as being the use of products that could harm the baby's development and the use of products that were harmful to the pregnant woman's health. Corroborating this study, a survey carried out in France with pregnant women found that changing habits is preceded by the perception of the risk to which women are exposed. When experiencing a period of pregnancy care, pregnant women tend to change their cosmetic use habits during this period, as they believe that cosmetics may pose a risk to the developing fetus[16].

Given that the study participants were at-risk pregnancies, it is important to consider the potential for doubts, fears, and uncertainties regarding the need to change habits during pregnancy to protect their own health and that of the fetus. The data show that doubts lead to fears, which in turn lead to sources of guidance for changes in the context of pregnancy habits. Unlike the data from this study, reducing cosmetic use during pregnancy may not always be effective[14]. Another study showed that the reduction in the use of cosmetics containing endocrine-disrupting chemicals was limited, with only 13% of women reporting a reduction and 30% adapting to the use of alternative cosmetics[19].

Changes in cosmetic use habits during pregnancy, driven by safety concerns, reflect growing awareness but also the need for clear, evidence-based information. A survey of 9,710 pregnant women highlighted the need for adequate information about the risks associated with the use of cosmetics during pregnancy, indicating that many pregnant women do not receive such guidance[17].

The search for guidance is generally preceded by prior experience or knowledge, whether scientific or informal, about the effects and influences that cosmetics can have on certain conditions[28]. The search for advice related to the use of cosmetics during pregnancy showed a heterogeneous profile regarding the sources consulted. This is because pregnant women sought information online, from gynecologists, family physicians and nurses, friends, family members, and hairdressers. This diversity of sources indicates a lack of centralized reference and decentralization in the search for information. Furthermore, the findings of this study showed that most guidance on the safe use of cosmetics is not provided by healthcare professionals.

A recently published study sought to understand healthcare professionals' risk

REVISTA ENFERMAGEM ATUAL IN DERME

perception regarding endocrine disruptors present in cosmetics and pregnancy. The results showed that most respondents were unfamiliar with the term "endocrine disruptor" and the possible complications arising from exposure during pregnancy. They also felt incapable of providing reliable advice on the topic, due to a lack of information during their academic training. Difficulty finding reliable information about cosmetics that can be used during pregnancy was also frequently reported by participants. This becomes a risk factor, given their harmful effects on pregnancy and fetal development [29,30].

The internet stands out as an accessible platform for obtaining information, where communities clarify questions about care and emotional support during pregnancy [31]. However, the demand for support and advice from healthcare professionals has been low. It is hoped that the results of this study will encourage healthcare professionals to seek information and advise pregnant women about the risks of cosmetics that may contain endocrine-disrupting chemicals.

Data show that more than half of professionals in the medical specialties of dermatology and obstetrics/gynecology have difficulty finding literature on the use of PCs during pregnancy, with no significant difference between the two specialties. The lack of data demonstrating the safety of these products makes it difficult for prescribers to decide what to recommend, so the internet has become the primary source of information about these products for professionals[29].

To address this issue, pregnant women should be advised to reduce the frequency and quantity of products they use, opting for those with the fewest ingredients possible. Furthermore, it is essential to conduct risk assessments to analyze this cumulative exposure and consider the potential synergistic effect of certain compounds that share similar mechanisms of action[8].

Thus, the discussions and results demonstrate the urgent need for stricter and more specific public policies to regulate the components of cosmetics available on the market, especially those intended for pregnant women. It is essential to ensure that these products are safe and free of substances that could harm the health of pregnant women or fetal development. The studies cited in this article indicate a direct link between exposure to endocrine-disrupting chemicals and various complications in fetal health and development, reinforcing the need for regulatory and educational interventions.

The limitations of this study are based on the fact that it targeted a specific population of high-risk pregnant women, which may influence their perception of fear/uncertainty. It was also not possible to analyze which endocrine disruptors are present in the cosmetics or brands reported by pregnant women during the study. Despite its limitations, this study provides results that highlight the importance of considering the presence of endocrine disruptors in cosmetics

REVISTA ENFERMAGEM ATUAL IN DERME

when counseling pregnant women. The results may inform future research aimed at identifying cosmetics containing endocrine disruptors for pregnant women, thus facilitating product selection.

CONCLUSION

This study found that pregnant women did not identify the skin as a significant route of exposure to endocrine-disrupting chemicals through the use of CPs.

Furthermore, follow-up studies in the postpartum period are recommended to investigate possible maternal and neonatal outcomes related to exposure to these substances during pregnancy. It also highlights the importance of developing and providing educational health technologies, such as booklets and e-books, for healthcare professionals who work directly with pregnant women, especially in primary care and high-risk prenatal services, to support professionals in providing safe counseling and prevention regarding the use of potentially harmful CPs.

Finally, given the relevance of this topic due to its consequences on the health of pregnant women and fetuses, it is necessary to implement public policies that encourage research and the dissemination of clear information about the components of PCs that could mitigate the risks associated with the use of potentially harmful substances and promote a safer and more informed market, benefiting both consumers and the cosmetics industry in Brazil.

ACKNOWLEDGMENTS

The authors would like to thank the Postgra-duate Program in Nursing of the Federal University of Juiz de Fora for their support and encouragement in carrying out this study.

REFERENCES

1. Centurião PO, Santos PE, Rosa AM, Kassab NM. Avaliação da qualidade de produtos cosméticos contendo ácido glicólico. Rev Colomb Cienc Quím Farm. 2021;50(1):158-73. DOI: 10.15446/rcciquifa.v50n1.77988.

2. Barbosa CM, Costa M. Aspectos práticos da regulamentação dos produtos cosméticos na UE. Rev Cosmetics e Toiletries (Brasil) [Internet]. 2021[citado 2025 Jan 12];33(1):1. Disponível em: https://cosmetoguia.com.br/article/read/aspectospraticosdaregulamentacaodosprodutoscosmeticosnaUE.

3. Silva KM, Almeida JN, Martins AS, Medeiros JL, Jorge VCF, Lima FAR, et al. A influência dos disruptores endócrinos em condições dermatológicas. Braz J Implantol Health Sci. 2024;6(1):1841-61. DOI: 10.36557/2674-8169.2024v6n1p1841-1861.

4. Marconetto A et al. Main endocrine disruptors related to female reproductive health: biological basis of their association. Medicina (Buenos Aires) [Internet]. 2022 [citado 2025 Jan 12];82(3):428-38. Disponível em: https://www.scielo.org.ar/scielo.php?pid=S0025-76802022000500428&script=sci_abstract.d

5. Li H, Zheng J, Wang H, Huang G, Huang Q, Feng N, et al. Maternal cosmetics use during pregnancy and risks of adverse outcomes: a prospective cohort study. Sci Rep. 2019;9(1):1-8. DOI: 10.1038/s41598-019-44546-z.

6. Arruda HFB, Silva LS. Cuidados estéticos com a pele com uso de dermocosméticos e cosméticos na gravidez: Esthetic skin care with the use of dermocosmetics and cosmetics during

pregnancy. Braz J Dev. 2022;8(12):77348-69. DOI: 10.34117/bjdv8n12-040.

7. Kahn LG, Philippat C, Nakayama SF, Slama R, Trasande L. Endocrine-disrupting chemicals: implications for human health. Lancet Diabetes Endocrinol. 2020;8(8):703-18. DOI: 10.1016/S2213-8587(20)30129-7.

8. Marie C, Garlantézec R, Béranger R, Ficheux AS. Uso de produtos cosméticos em mulheres grávidas e lactantes e crianças pequenas: diretrizes para intervenções durante o período perinatal do Colégio Nacional Francês de Parteiras. J Midwifery Womens Health. 2022;67. DOI: 10.1111/jmwh.13428.

9. Liu B, Lu X, Jiang A, Lv Y, Zhang H, Xu B. Influence of maternal endocrine disrupting chemicals exposure on adverse pregnancy outcomes: a systematic review and meta-analysis. Ecotoxicol Environ Saf. 2024;270:115851. DOI: 10.1016/j.ecoenv.2023.115851.

10. Asori M, Odei J, Katey D, Abuosi TA, Gyasi RM. Impacts of endocrine disruptors on reproductive health in the era of increased personal care and beauty products usage. Bull Natl Res Cent. 2022;46(1):61. DOI: 10.1186/s42269-022-00732-0.

11. Bae J, Kim S, Kannan K, Louis GMB. Concentrações urinárias de filtros ultravioleta do tipo benzofenona em casais e a proporção sexual secundária. Sci Total Environ. 2016;543:28-36. DOI: 10.1016/j.scitotenv.2015.11.019.

12. Berman YE, Doherty DA, Main KM, Frederiksen H, Hickey M, Keelan JA, et al. Associations between Prenatal Exposure to Phthalates and Timing of Menarche and Growth and Adiposity into Adulthood: A Twenty-Years Birth Cohort Study. Int J Environ Res Public Health. 2021;18:4725. DOI: 10.3390/ijerph18094725.

13. Philippat C, Nakiwala D, Calafat AM, Botton J, De Agostini M, Heude B, et al. Prenatal exposure to nonpersistent endocrine disruptors and behavior in boys at 3 and 5 years. Environ Health Perspect. 2017;125(9):097014. DOI: 10.1289/EHP1314.

14. Miranda RAD, do Nascimento DDG, Duarte SJH. Avaliação do risco gestacional em pré-natal realizado na atenção primária à saúde. Rev Foco. 2023;16(12). DOI: 10.54751/revistafoco.v16n12-032.

15. Puche-Juarez M, Toledano JM, Moreno-Fernandez J, Gálvez-Ontiveros Y, Rivas A, Diaz-Castro J, et al. The Role of Endocrine Disrupting Chemicals in Gestation and Pregnancy Outcomes. Nutrients [Internet]. 2023[citado 2025 Jan 12];15(4):4657. Disponível em: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10648368/pdf/nutrients-15-04657.pdf.

16. Marie C, Cabut S, Vendittelli F, Sauvant-Rochat MP. Changes in cosmetics use during pregnancy and risk perception by women. Int J Environ Res Public Health. 2016;13(4):1-16. DOI: 10.3390/ijerph13040383.

17. Schildroth S, Geller RJ, Wesselink AK, Lovett SM, Bethea TN, Henn BC, et al. Hair product use and urinary biomarker concentrations of non-persistent endocrine disrupting chemicals among reproductive-aged Black women. Chemosphere. 2024;361:142442. DOI: 10.1016/j.chemosphere.2024.142442.

18. Philippat C, Rolland M, Lyon-Caen S, Pin I, Sakhi AK, Sabaredzovic A, Thomsen C, Slama R. Pre- and early post-natal exposure to phthalates and DINCH in a new type of mother-child cohort relying on within-subject pools of repeated urine samples. Environ Pollut. 2021;287:117650. DOI: 10.1016/j.envpol.2021.117650.

19. Marques ICO, Vieira GVMC, Almeida S. A relação dos disruptores endócrinos na saúde reprodutiva feminina. Res Soc Dev. 2024;13(5). DOI: 10.33448/rsd-v13i5.45766.

20. Von Elm E, Altman DG, Egger M, Pocock SJ, Gøtzsche PC, Vandenbroucke JP. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Statement: guidelines for reporting observational studies. Lancet. 2007;370(9596):1453-57. DOI: 10.1016/j.jclinepi.2007.11.008.

21. Ministério da Saúde (BR). e-Gestor Atenção Básica [Internet]. Brasília-DF: Ministério da Saúde; 2024. [citado 2025 Jan 12]. Disponível em: https://egestorab.saude.gov.br/.

22. Medronho RA, Bloch KV, Luiz RR, Werneck GL. Epidemiologia. 2nd. ed. Rio de Janeiro: Atheneu; 2009.

23. Parreira BDM, Goulart BF, Ruiz MT, Monteiro JCS, Gomes-Sponholz FA. Sintomas de ansiedade entre mulheres rurais e fatores associados. Esc Anna Nery. 2021;25. DOI: 10.1590/2177-9465-EAN-2020-0415.

24. Collins HN, Johnson PI, Calderon NM, Clark PY, Gillis AD, Le AM, et al. Differences in personal care product use by race/ethnicity among women in California: implications for chemical exposures. J Expo Sci Environ Epidemiol. 2023;33:292–300. DOI: 10.1038/s41370-021-00404-7.

25. Dodson RE, Cardona B, Zota AR, Flint JR, Navarro S, Shamasunder B. Personal care product use among diverse women in California: Taking Stock Study. J Expo Sci Environ Epidemiol. 2021;31(3):487-502. DOI: 10.1038/s41370-021-00327-3.

26. Karzi V, Tzatzarakis M, Katsikantami I, Stavroulaki A, Alegakis A, Vakonaki E, et al. Investigating exposure to endocrine disruptors via hair analysis of pregnant women. Environ Res. 2019;178:108692. DOI:10.1016/j.envres.2019.108692.

27. Geoffrey K, Mwangi AN, Maru SM. Sunscreen products: rationale for use, formulation development and regulatory considerations. Saudi Pharm J. 2019;27(7):1009–1018. DOI: 10.1016/j.jsps.2019.08.003.

28. Almeida GB, de Souza MCM. O conhecimento da gestante sobre a hipertensão na gravidez. Rev APS. 2016;19(3). DOI: 10.14295/raaps.v19n3.849.

29. Coutinho GSL, Varão Filho I, Barros LC, Marinho HT, Pires RC, Packer JF. Prescrição de produtos dermocosméticos durante a gravidez. Rev Ciênc Saúde. 2012;5(1):16-25. DOI:10.5935/1678-960X.2012004.

30. Souza LSR, Oliveira Neta AI, Gomes JS, Silva EAE, Pacheco ZML, Emidio SCD, Paraíso AF. Cosméticos com presença de disruptores endócrinos e gestação: percepção de risco pelos profissionais de saúde. Rev Rene (Online). 2024;25:e93619. DOI: 10.15253/2175-6783.20242593619.

31. Silva CM, Bezerril AV, Martins EL, Mouta RJO, Zveiter M. Gestação na pandemia da COVID-19, cuidado pré-natal e tecnologias digitais: experiências de mulheres. Rev Rene. 2023;24. DOI: 10.15253/2175-6783.20232483454.

Conflicts of interest: The authors declare no conflicts of interest/competing disclosures.

Author Contributions:

1. Substantial contributions to the conception and/or planning of the study: Ana Izabel de Oliveira Neta and Alanna Fernandes Paraíso.

2. Data collection, analysis, and/or interpretation: Ana Izabel de Oliveira Neta, Alanna Fernandes Paraíso, Amanda Alves de Jesus, Dário Soares Ruas, Suellen Cristina Dias Emídio.

3. Writing and/or critical review and final approval of the published version: Ana Izabel de Oliveira Neta, Alanna Fernandes Paraíso, Suellen Cristina Dias Emídio.

Scientific Editor: Francisco Mayron Morais Soares. Orcid: https://orcid.org/0000-0001-7316-2519