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Menstrual Cycle Patterns as A Key to Understand Hair and Scalp Disorders: an International Study on 17,009 Women

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Abstract

Introduction: Hair and scalp conditions are significant indicators of overall health and well-being, impacting quality of life in multiple domains, including emotional and social aspects. This international study assessed self-reported hair and scalp disorders in women aged 18–55 years and explored their associations with menstrual cycle regularity and phases.

Methods: This cross-sectional observational study was conducted between January 13 and February 20, 2023, across 20 countries. A stratified proportional quota sampling ensured national representativeness. A digital questionnaire collected data on demographics, menstrual cycle characteristics, and 11 hair and scalp disorders, with additional details on the timing and persistence of these disorders. Women without recent menses, peri-menopausal, post-menopausal, and post-partum participants were excluded. Statistical analyses were performed using HARMONIE 1.7 software, with $p<0.05$ considered significant.

Results: Among 20,001 surveyed women, 17,009 with active menses were included. The mean age was 34.49 ± 9.66 years. 58.8% of women reported regular cycles, while 41.2% had irregular cycles. Overall, 83% of participants reported at least one hair or scalp disorder. The most common conditions were itchy scalp (48.8%), dandruff (47.6%), and oily scalp (45.8%). Disorders were more prevalent in women with irregular menses; for instance, itchy scalp (55.9% vs. 46.6%) and dandruff (55% vs. 47.3%) were significantly higher ($p<10^{-3}$). Permanent conditions like diffuse hair loss and frontal alopecia were noted, while intermittent disorders showed higher prevalence during premenstrual and menstrual phases than in the peri-ovulatory phase.

Conclusion: This study highlights the significant association between menstrual irregularities and hair and scalp disorders, emphasizing hormonal influences. These findings call for further research into targeted treatments addressing hormonal imbalances to improve women's dermatological and overall well-being.

Keywords: Hair; Scalp; Quality of Life; Cycle; Menses; Period; Disorders; Problems

Introduction

The skin's appendages constitute essential elements for diagnosing and monitoring various bodily conditions and imbalances [1-3]. Not only are they capable of producing numerous hormones, but they also act as a key target for their diverse biological effects. Hair is considered the most important

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Table 1: Studied population in each country.

Country	Surveyed	Excluded (pregnant or post-menopausal or no period or perimenopausal)	Did not wish to answer	Studied Population
United States	1200	173	87	940
Canada	1200	163	67	970
France	1200	166	138	896
Argentina	750	90	17	643
Brazil	1200	135	72	993
Chile	750	97	52	601
China	1200	152	20	1028
Egypt	1000	20	16	964
Germany	1200	196	146	858
Greece	751	105	14	632
Italy	1200	169	35	996
Mexico	1200	100	42	1058
Nigeria	500	35	6	459
Poland	1200	122	27	1051
Saudi Arabia	1200	22	25	1153
South Africa	800	83	40	677
Spain	1200	139	48	1013
Thailand	750	49	29	672
Turkey	750	53	5	692
Vietnam	750	14	23	713
Total	20001	2083	909	17009

skin appendage, often reflecting an individual's overall health and well-being. The condition of hair and scalp can significantly impact the quality of life of women [4]. This influence manifests in several areas including emotional well-being, social interactions, and even physical health [4]. Our objective was to conduct an international study to evaluate self-perceived hair or scalp disorders in women aged 18-55 years and their association with menstrual cycle regularity and menstrual cycle phases.

Materials and Methods

Data collection and sample size

This is a cross-sectional observational study, conducted by a polling company (IPSOS) between January 13 and February 20, 2023. A representative sample of women, aged between 18 and 55 years, was recruited in 20 countries using a stratified, proportional quota sampling (PQS) with a replacement design. PQS was used based on the distribution of the population according to age, sex, environment (large cities, towns, and rural areas), and income, in each participating country, in order to guarantee national representativeness of the sample (Table 1). The sample size per country also depended on the ability of the referenced panels in each country to extract a representative sample. Baseline data on the sociodemographic distribution of the population in each country were extracted from the Eurostat database, updated at the time of the survey, and supplemented by data provided by the United Nations [7]. Selected participants were contacted by personal email inviting them to take part in a survey without any specification of the survey's topic, to prevent a self-selection bias of participants with skin diseases. In case of nonresponding, another potential participant with the same sociodemographic characteristics was randomly selected. The eligibility of a responder was based on demographic data, which were used to create a quota-based sample. At quota completion, individuals of this category were no longer recruited. To ensure the robustness of the data collected, individuals who did not complete the whole survey were excluded.

Questionnaire and outcomes

A structured digital questionnaire with various sociodemographic data, the presence or absence of menses in the past year, and the regularity or irregularity of the periods was provided to the participants. Regular cycle was defined as having menses every month around the same time point. We excluded peri-menopausal, post-menopausal, and post-partum women. Peri-menopausal women were defined as women aged above 35 years with changes in the duration of their cycle, in the flow/intensity of their periods, or hot

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flushes/sweating. Menopausal women were those >40 years with no menses for at least 12 months. Post-partum women were those who gave birth less than 6 months ago. Participants were asked whether they were concerned or not with 11 hair disorders: itchy scalp, burning sensation of the scalp, scalp redness, oily scalp, scalp pain, diffuse hair loss, patchy hair loss, frontal hair loss, alopecia at the top of the head, poorly dense hair on the scalp, and dandruff. Furthermore, the participants were also asked to precise whether these disorders were permanent or transient, and whether they were related to their menstrual cycle. Participants with disorders related to the menstrual cycle, were asked to precise if the disorder occurred during the menses, pre-menstrual phase, or peri-ovulatory phase.

The questionnaire for data collection was designed in English by the scientific committee of the project which includes expert dermatologists and public health specialists. Once created, the questionnaire was validated in a small sample of participants, also ensuring that it was properly understood. The questionnaire was then translated into each language by native speakers of the country concerned. To validate linguistic similarity and cultural coherence between different language versions, the translations produced by native speakers were 'back-translated' in English.

Statistical analysis

Qualitative and ordinal variables were described by their number and frequency. Quantitative variables were described by their mean value, standard deviation, median, and distribution. In each country, the total population of individuals were calculated by direct extrapolation of the proportions from the proportionally stratified sample in each country. The statistical analyses were carried out using the HARMONIE 1.7 software, registered with the INPI under the name DSE-HARMONIE since 25 April 2013 with the registration number 4000937. Statistical significance was assessed at $p<.05$.

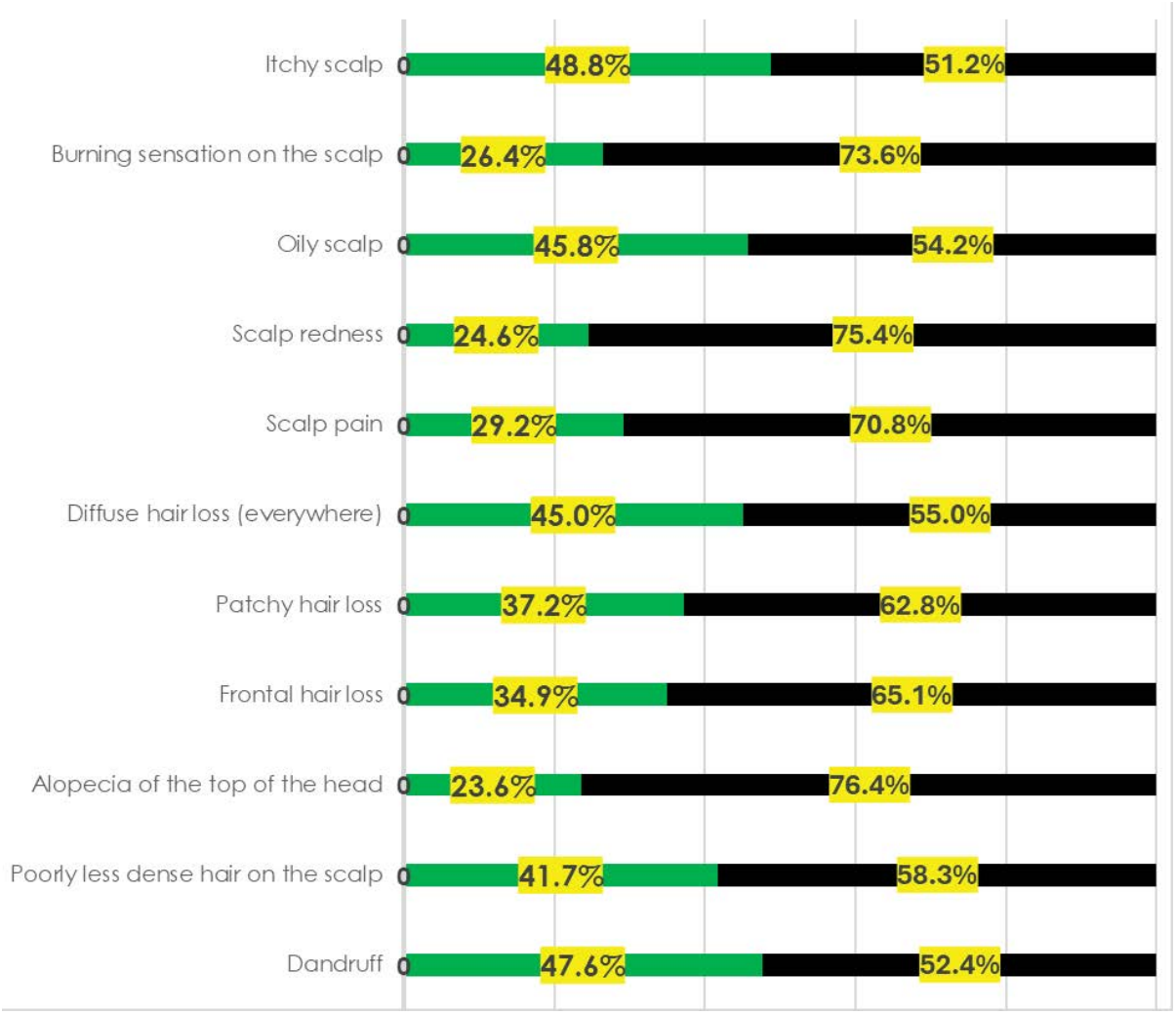

Figure 1: Prevalence of the studied skin conditions.

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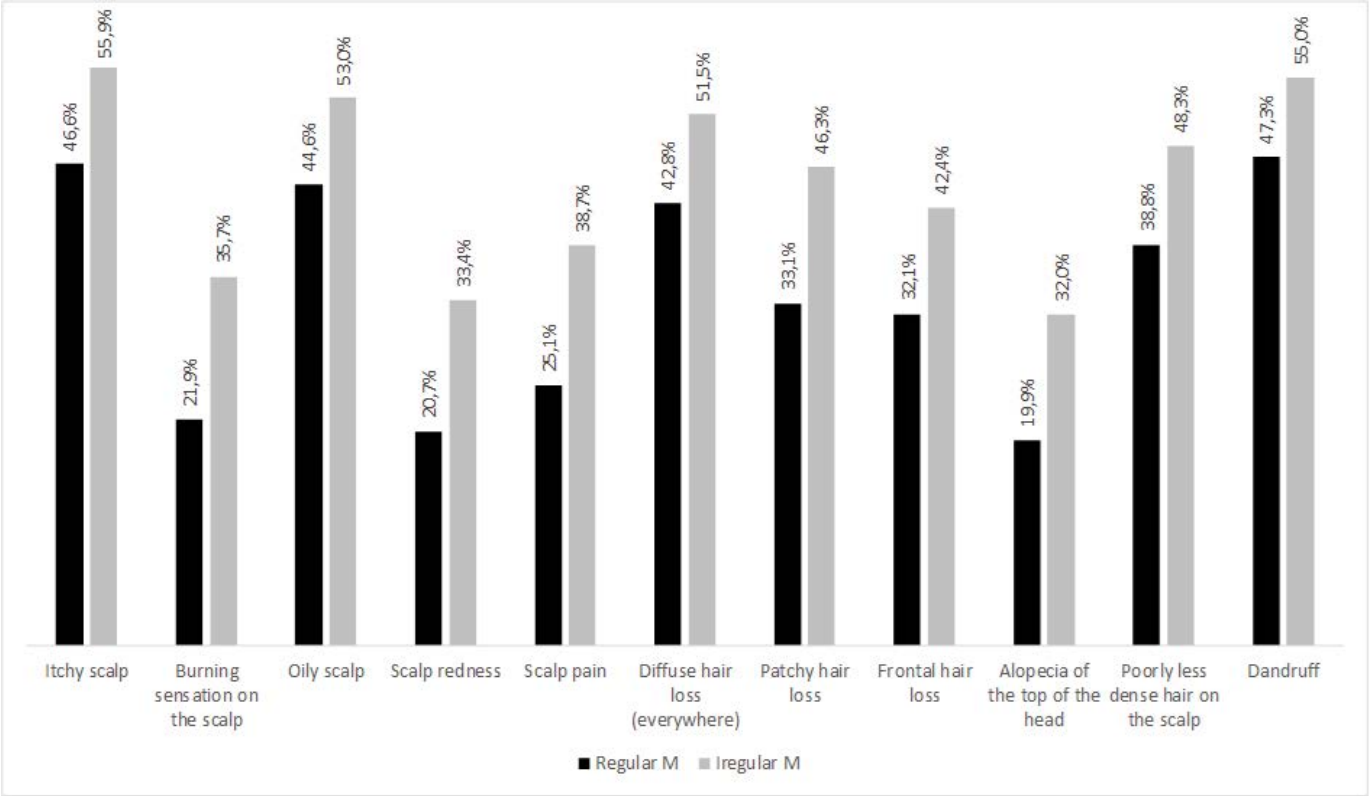

Figure 2: Prevalence of the studied hair and scalp disorders in women with regular vs irregular menses ($p<10^{-3}$ in all).

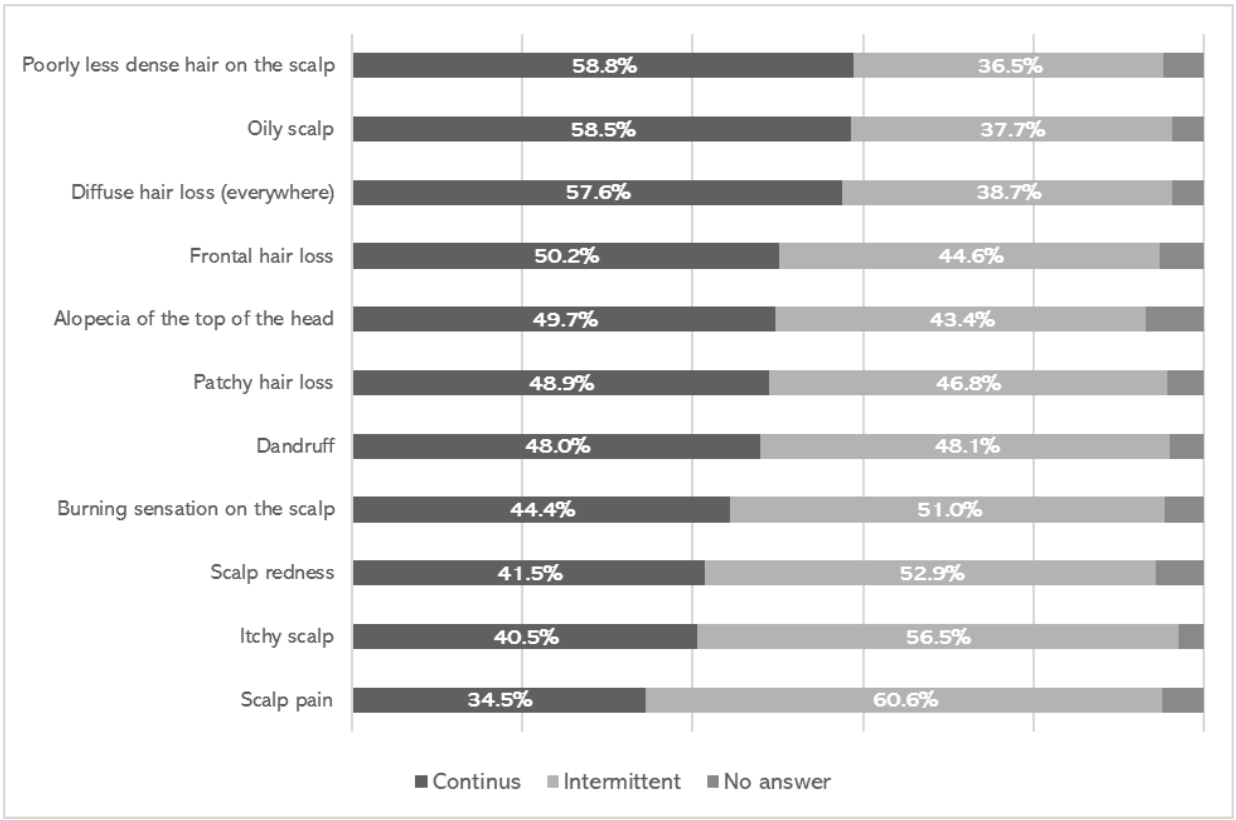

Figure 3: Permanent vs intermittent hair and scalp disorders in women with regular menses.

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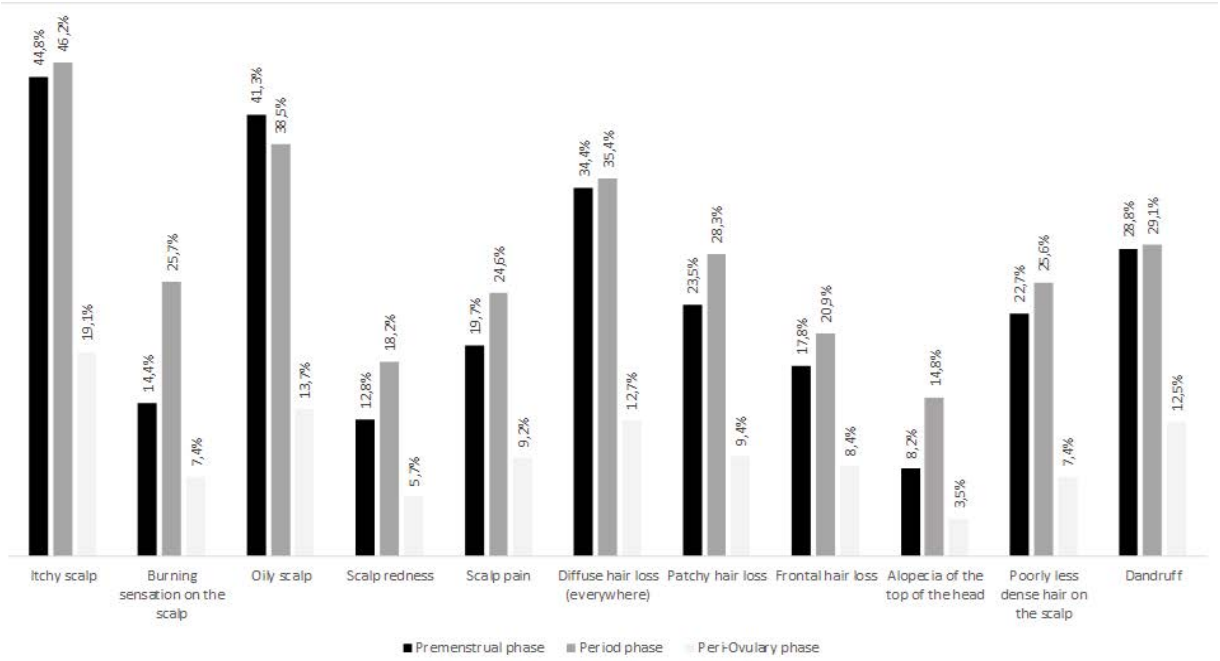

Figure 4: Hair and scalp disorders and relations with menstrual cycle ($p<10^{-3}$ in all).

Ethics

Data collection were done in respect of ethical codes of the European Society for Opinion and Marketing Research (ESOMAR) in compliance with the GDPR rules: Regulation (EU) 2016/679 of the European parliament and of the council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing directive 95/46/ec (general data protection regulation).

Results

A total of 20,001 women aged 18-55 years from 20 countries were surveyed. The population distribution is presented in Table 1. From the surveyed women, 1463 were menopausal, 480 perimenopausal with no period, 56 post-partum having given birth less than six months before and 993 women did not wish to answer the entire questionnaire. There were 17,009 women with menses included in the evaluation. Their mean age was 34.49 ± 9.66 years. Among the women in childbearing age, 7981/13571 (58.8%) reported regular periods and 5590/13571 (41.2%) had irregular ones. Among peri-menopausal women, 1983/3438 (57.7%) had regular periods and 1455/3438 (42.3%) had irregular ones (p=0.289). 83% of women reported at least one hair or scalp disorder. The prevalence of each of the studied hair or scalp disorders is represented in Table 1. 48.8% of women reported an itchy scalp, 47.6% of them reported dandruff, 45.8% of them reported oily scalp, and 45% of them reported diffuse hair loss. Women with irregular menses had significantly more hair and scalp disorders (figure 2). For instance, 46.6% of women with regular menses reported itchy scalp versus 55.9% of those with irregular menses ($p<10^{-3}$). 21.9% of women with regular menses reported burning sensation of the scalp versus 35.7% of women with irregular menses ($p<10^{-3}$). For hair dandruff, the prevalence was 47.3% versus 55% respectively ($p<10^{-3}$). Poorly dense hair on the scalp (58.8% versus 36.5%), alopecia on the top of the head (49.7% versus 43.4%), frontal hair loss (50.2% versus 44.6%), patchy hair loss (48.9% versus 46.8%), diffuse hair loss (57.6% versus 38.7%), and oily scalp (58.5% versus 37.7%), were more likely to be permanent . Scalp pain(60.6% versus 34.5%), scalp rednessc(41.5% versus 52.9%), burning sensation on the scalp (44.4% versus 51%), and it's called 40.5% versus 56.5%), were more likely to be intermittent (figure 3). In women who reported intermittent hair and scalp disorders, the relation with the menstrual cycle is represented in figure 4.

Discussion

Our study is the first large-scale international study to assess the prevalence of hair and scalp disorders in women and evaluate differences according to regularity of the menstrual cycle. Almost 9 women out of 10 reported having a hair or scalp disorder. Hair and scalp disorders can significantly impact women's physical appearance, emotional well-being, and overall quality of life. These conditions often lead to distress, embarrassment, and a loss of self-confidence. They can also impact women's social interactions and professional life, as they may feel self-conscious about their appearance and avoid social situations or professional settings where their condition may be noticed [6-14].

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In our study, the most common reported hair and skull disorders were itchy scalp, dandruff, and oily scalp, affecting almost half of women. The least reported hair and scalp disorders were scalp pain, burning sensation of the scalp, scalp redness, and alopecia on the top of the head.

Hair and scalp disorders were significantly higher in women with irregular menses compared to those with regular menses.

The impact of hormones on hair and scalp health in women is a complex interplay that spans across various physiological stages and conditions [6]. Estrogen, progesterone, and androgens are among the key hormonal regulators implicated in hair growth and scalp conditions in females [7,8]. Throughout the menstrual cycle, fluctuations in estrogen and progesterone levels influence the hair cycle, with studies suggesting that higher estrogen levels during the follicular phase may promote hair growth, while progesterone dominance in the luteal phase may lead to hair shedding [9,10] However, women in our study reported that all types of hair loss were continuous rather than intermittent. The exact mechanism of oily scalp, dandruff, and other hair and skin disorders in women with irregular menses is still uncertain. However, we do know that hormones exert a significant influence on the regulation of sebum production, which directly impacts the oiliness of the scalp in women [15-18]. Androgens, particularly testosterone and its derivative dihydrotestosterone, play a crucial role in stimulating sebaceous gland activity [16]. Studies have shown that androgen receptors are present in sebocytes, the cells responsible for producing sebum, indicating the direct involvement of androgens in sebum regulation [17]. Hormonal changes during the menstrual cycle, characterized by fluctuations in estrogen and progesterone levels, can influence sebum secretion, leading to variations in scalp oiliness [18]. Understanding the hormonal regulation of sebum production is essential for managing oily scalp conditions in women and developing targeted interventions to restore sebum balance. In our study there was a significant difference in the prevalence of hair and scalp disorders between the different periods of the menstrual cycle. They were significantly higher in the premenstrual period or during menses than in the peri-ovulatory phase.

Conclusion

In conclusion, our study is the first international survey to highlight the impact of irregular menstrual cycles on self-reported hair and scalp disorders. These findings should encourage dermatologists and researchers to investigate the intricate interactions of hormonal factors in these disorders. By doing so, they can develop new hormonal or topical treatments that address this underlying cause, providing effective hair care solutions for women with irregular cycles.

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