

Primary dysmenorrhea pain profile among Brazilian women. Case-control study

Perfil da dismenorreia primária entre mulheres brasileiras. Estudo caso-controle

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ABSTRACT

BACKGROUND AND OBJECTIVES: Primary dysmenorrhea (PD) is defined as lower abdominal pain occurring before or during menstruation, unrelated to other diseases. Existing studies investigating potential risk factors for PD development and its incidence in various groups have been fragmented, controversial, or overly broad, posing challenges for analysis. Therefore, this study aims to identify potential risk factors for PD development through a literature-based case-control study.

METHODS: Following the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE), this one-year case-control study aimed to establish relationships between PD variables and pain categories (light, moderate, and severe) among 252 Brazilian women.

RESULTS: The regularity of the menstrual cycle, intensity of menstrual flow, seeking medical assistance, and use of pain drugs demonstrated statistical significance ($p=0.00$) across different pain categories. Conversely, factors such as smoking, alcohol consumption, daily diet, physical activity, regular menstrual cycle, previous pregnancy, active sex life, family history of PD, pain site, and the time of onset of PD after the first menstrual cycle were not statisti-

cally significant within the pain categories. Although no statistical significance was observed, certain observations can still be drawn by comparing this study with similar ones.

CONCLUSION: This study offers valuable insights into the risk factors, pain intensity, menstrual flow patterns, and treatment-seeking behavior associated with PD. By addressing these factors and improving our understanding of PD, we can enhance the well-being and quality of life of women affected by this common gynecological condition.

Keywords: Dysmenorrhea, Menstrual cycle, Pelvic pain.

RESUMO

JUSTIFICATIVA E OBJETIVOS: Define-se dismenorreia primária (DP) como dor no abdômen inferior que ocorre antes ou durante a menstruação, não relacionada a doenças ou patologias. Os estudos existentes que investigaram potenciais fatores de risco para o desenvolvimento da DP e a sua incidência em vários grupos são fragmentados, controversos ou excessivamente amplos, colocando desafios à análise. Este estudo objetivou identificar potenciais fatores de risco para o desenvolvimento da DP através de um estudo de caso-controle com base na literatura.

MÉTODOS: Seguindo o *Strengthening the Reporting of Observational Studies in Epidemiology*, (STROBE), este estudo caso-controle, de um ano, teve como objetivo estabelecer relações entre variáveis de DP e categorias de dor (leve, moderada e intensa) em 252 mulheres brasileiras.

RESULTADOS: A regularidade do ciclo e intensidade do fluxo menstrual, a procura pela assistência médica e o uso de analgésicos demonstraram significância estatística ($p=0,00$) nas diferentes categorias de dor. Por outro lado, fatores como tabagismo, consumo de álcool, dieta diária, e as outras variáveis estudadas não foram estatisticamente relevantes. Embora, não se observou nenhuma significância estatística nessas variáveis, certas observações ainda podem ser feitas comparando o presente estudo com outros semelhantes.

CONCLUSÃO: Este estudo ofereceu informações valiosas sobre os fatores de risco, intensidade da dor, padrões de fluxo menstrual e comportamento de procura ao tratamento associados à DP. Abordar estes fatores e melhorar a compreensão sobre a DP, pode melhorar o bem-estar e a qualidade de vida das mulheres afetadas por esta condição ginecológica comum.

Descritores: Ciclo menstrual, Dismenorreia, Dor Pélvica.

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HIGHLIGHTS

- Menstrual flow intensity is proportional to menstrual pain intensity.
- Women with regular menstrual cycles tend to experience more menstrual pain.
- Physiotherapy can be an excellent alternative to reduce menstrual pain.

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INTRODUCTION

Dysmenorrhea, as defined by The American College of Obstetricians and Gynecologists (ACOG), refers to pain associated with menstruation¹. Specifically, primary dysmenorrhea (PD) is characterized by Nagy and Khan as low abdominal pain occurring before or during menstruation that is not linked to other diseases. The underlying mechanism involves the release of prostaglandins – natural chemicals produced in the uterine lining-which led to the constriction of uterine muscles and blood vessels. Initially, prostaglandin levels are elevated, but they decrease as menstrual bleeding progresses and the uterine lining sheds².

While the ACOG notes that PD pain is usually mild, many women experience severe pain that significantly disrupts their daily activities¹. PD is prevalent among women of reproductive age, imposing considerable emotional, psychological, and functional burdens on their health. The impact of PD extends beyond mere physical discomfort, as it leads to limitations in performing activities of daily living (ADLs) and psychological stress, making it a leading cause of school absenteeism among adolescents and work absenteeism among adults². An epidemiological review highlights dysmenorrhea as the most common menstrual complaint, presenting a greater disease burden than any other gynecological issue, particularly in developing countries³.

Despite numerous studies examining potential risk factors for developing PD and its incidence across different populations, these studies are often fragmented, contentious, or overly general, complicating comprehensive analysis. To date, no research has specifically explored the relationships between potential risk variables for PD and pain severity categories (light, moderate, severe) in Brazilian women.

Therefore, the present study aims to identify potential risk factors for the development of PD through a case-control study grounded in existing literature. By addressing these factors, this research seeks to enhance our understanding of PD, ultimately improving the well-being and quality of life for women affected by this prevalent gynecological condition. The findings will contribute to establishing an effective database, facilitating more accurate diagnoses, and enabling the development of more effective treatments for PD.

METHODS

This case-control observational study was conducted over a year with Brazilian women following the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE)⁴. The exclusion criteria for this study were not being Brazilian, being going through or having gone through the menopause period and having been diagnosed with any injury or disease in the reproductive system.

This research was approved by the University Center of Lavras Ethics Research Committee and registered under the number 61268422.6.0000.5116.

Sample size

The sample was defined by random sampling. G*Power Software version 3.1.9.7 was used to determine the sample size $f=0.25$, $\alpha=0.05$, and power $(1-\beta)=0.95$, culminating in an actual power of 0.951 and a sample size of 252 individuals.

Sample recruitment and participation

All women who participated in the study were invited through social media posts. Each participant accepted the consent form, which was previously approved by the ethics committee, and completed a questionnaire via Google Forms.

Data collection

Variables were collected through a subjective (volunteer perception) questionnaire created by the researchers and pain intensity was measured with Numeric Pain Scale (NPS), going from 0 to 10, where 0 is no pain and 10 is the worst pain possible. Groups were defined as Light Pain (NPS between 0 and 3), Moderate Pain (NPS between 4 and 6), and Severe Pain (NPS above 6).

Statistical analysis

Initially, the Levene's test was performed for variables to check homogeneity. Also, the Kolmogorov-Smirnov test was performed with all variables to analyze the data distribution. All the variables analyzed were not normally distributed, so a Kruskal-Wallis nonparametric test was suitable. All data were analyzed with SPSS software version 26.0.0 and were given a 95% confidence level.

Bias

There is a risk of bias due to the investigation's time frame, as relevant information for this study may pertain to events that occurred decades ago in the women's lives, potentially affecting the accuracy of the collected data. To mitigate this risk, we employed questions that did not lead the participants toward any specific responses.

RESULTS

Levene's test shows that only the variables menstrual cycle regularity ($p<0.001$), menstrual flow ($p<0.001$), dysmenorrhea family history ($p<0.001$), seek for medical help ($p<0.001$), and use drugs for pain ($p<0.001$) are not equally distributed (Table 1).

The effect size for each variable was calculated using Cohen's d and is shown in table 2. It was found that only the variable "use of drugs for pain" has a large effect size. The variables "menstrual flow" and "seeking medical assistance" have a medium effect size. The effect size for "regular menstrual cycle" was small. The other variables have shown a very small effect size.

The descriptive data were analyzed according to table 3. The first analysis was conducted using the entire sample to gain a comprehensive understanding of the prevalence of certain characteristics among females experiencing PD. The second analysis focused on comparing these characteristics among three groups defined by the intensity of pain within the same sample.

Table 1. Levene’s test for homogeneity assumption

Variables	Levene statistic	p-value
Age (years)	0.845	0.431
Smoker	2.941	0.055
Alcohol intake	1.000	0.370
Healthy food intake	1.301	0.274
Regular physical activity	2.967	0.053
Age at first menstrual cycle (years)	1.110	0.331
Regular menstrual cycle	24.592	0.000
Menstrual flow (bleeding)	10.960	0.000
Time of appearance of primary dysmenorrhea after first menstrual cycle	2.615	0.075
Previous pregnancy	2.126	0.121
Active gender life	0.938	0.393
PD family history (Sister/Mother)	10.398	0.000
Local pain (uterus region) or referred pain (other regions)?	2.653	0.072
Seek medical assistance	37.721	0.000
Seek physiotherapy assistance	2.201	0.113
Use of drug for pain?	15.880	0.000

Table 2. Cohen’s D effect size

Variables	Effect size
Age (years)	0.008
Smoker	0.002
Alcohol intake	0.006
Health food intake	0.005
Regular physical activity	0.001
Age at first menstrual cycle (years)	0.001
Regular menstrual cycle	0.04
Menstrual flow (bleeding)	0.09
Time of appearance of primary dysmenorrhea after first menstrual cycle	0.001
Previous pregnancy	0.003
Active gender life	0.006
Primary dysmenorrhea family history (sister/mother)	0.01
Local pain (uterus region) or referred pain (other regions)?	0.01
Seek medical assistance	0.09
Seek physiotherapy assistance	0.003
Use of drug for pain?	0.17

Table 3. Variable descriptive analyzes between ‘Light Pain’ (n=33) ‘Moderate Pain’ (n=120), and ‘Severe Pain’ (n=100) categories of primary dysmenorrhea

Variables	Dysmenorrhea Categories				p-value
	Light pain (n=33)	Moderate pain (n=120)	Severe pain (n=100)	Total (n=253)	
Age (years)	29.12±1.42(26.20:32.03)	27.70±0.69(26.32:29.07)	26.41±0.75(24.91:27.90)		0.130
Age at first menstrual cycle (years)	12.21±0.21(11.77:12.65)	12.55±0.13(12.28:12.81)	12.81±0.21(12.00:12.87)		0.479
Smoker					
%Yes	6	6	10	7±2.31(6.72:7.28)	0.168
%No	94	94	90	93±2.31(92.72:93.28)	
Alcohol intake					
%Yes	42	61	56	53±9.85(51.71:54.71)	0.684
%No	58	39	44	47±9.85(45.79:48.21)	
Health food intake					
%Yes	61	68	65	65±3.51(64.67:65.43)	0.288
%No	39	32	35	35±3.51(34.57:35.43)	
Regular physical activity					
%Yes	64	60	51	58±6.66(57.18:58.82)	0.454
%No	36	40	49	42±6.66(41.18:42.82)	
Regular menstrual cycle					
%Yes	76	83	62	74±10.69(72.68:75.32)	0.0016
%No	24	17	38	26±10.69(24.68:27.32)	

Continue...

Table 3. Variable descriptive analyzes between 'Light Pain' (n=33) 'Moderate Pain' (n=120), and 'Severe Pain' (n=100) categories of primary dysmenorrhea – continued

Variables	Dysmenorrhea Categories			Total (n=253)	p-value
	Light pain (n=33)	Moderate pain (n=120)	Severe pain (n=100)		
Age (years)	29.12±1.42(26.20:32.03)	27.70±0.69(26.32:29.07)	26.41±0.75(24.91:27.90)		0.130
Age at first menstrual cycle (years)	12.21±0.21(11.77:12.65)	12.55±0.13(12.28:12.81)	12.81±0.21(12.00:12.87)		0.479
Previous pregnancy					
%Yes	30	24	21	25±4.58(24.44:25.56)	0.000002
%No	70	76	79	75±4.58(74.44:75.56)	
Active gender life					
%Yes	85	82	80	82±2.52(81.69:81.31)	0.468
%No	15	18	20	18±2.52(17.69:19.31)	
PD Family history (sister/mother)					
%Yes	70	80	67	72±6.81(72.16:72.84)	0.547
%No	30	20	33	28±6.81(27.16:28.84)	
Seek medical assistance					
%Yes	15	40	62	39±23.52(36.10:41.90)	0.794
%No	85	60	38	61±23.52(58.10:64.90)	
Seek physiotherapy assistance					
%Yes	0	1	2	1±1(0.88:1.12)	0.082
%No	100	99	98	99±1(98.88:99.12)	
Local pain (uterus region) or referred pain (other regions)?					
% Local	64	46	42	51±11.72(49.56:52.44)	0.095
% Referred	36	54	58	49±11.72(48.56:50.44)	
Menstrual flow (bleeding)					
%Light	42	18	11	24±16.25(22.00:26.00)	0.0000045
%Moderate	42	64	44	50±12.16(48.51:51.49)	
%Severe	16	18	45	26±16.19(24.01:27.99)	
Time of appearance of PD after first menstrual cycle					
%Before one month	27	36	49	37±11(36.00:38.00)	0.581
%Between one month and six months	45	33	20	33±13(32.40:34.60)	
%Between six months and one year	10	10	6	9±2(8.75:9.25)	
%After one year	18	21	25	21±4(20.51:21.49)	
Use of drugs for pain?					
%Do not use drug	27	13	3	14±12(12.52:15.48)	0.0000000002
%Use drug and relieve pain	73	78	59	70±9.84(68.79:71.21)	
%Use drug and does not relieve pain	0	9	38	16±19.85(13.55:18.45)	

Data are the mean ± standard deviation (95% CI). Variables were compared between dysmenorrhea categories (light pain, moderate pain, and severe pain) using the Kruskal-Wallis H test.

The menstrual cycle was found to be regular in severe pain and without relation to moderate and light pain (Figure 1.a). The intensity of menstrual flow was directly associated with pain; light pain was related to a light menstrual flow, while severe pain was related to severe menstrual flow (Figure 1.b). The variable Medical Seek Assistance was also statistically sig-

nificant, revealing that only females with moderate and severe pain sought medical assistance (Figure 1.c). The last variable, use of drug, was related to light and moderate pain, showing that females with light pain use drug and relieve pain and that females with severe pain use drug and do not relieve pain (Figure 1.d).

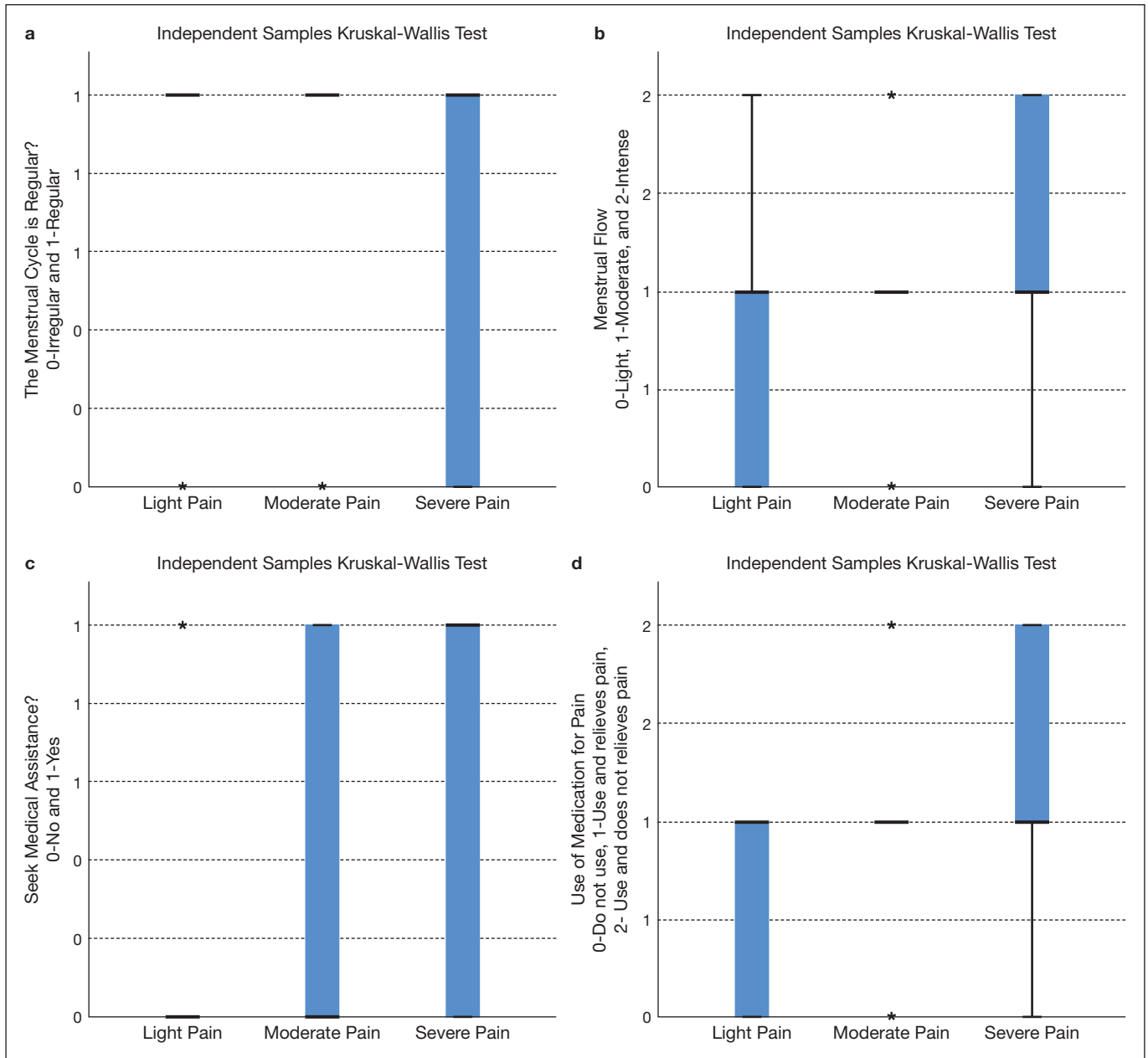


Figure 1.a- Menstrual cycle regularity x Pain intensity; **Figure 1.b-** Menstrual flow x Pain intensity; **Figure 1.c-** Seek medical assistance x Pain intensity; **Figure 1.d-** Use of drug x Pain intensity

DISCUSSION

This study aimed to establish relationships between PD variables and categories of pain (light, moderate, and severe) among 252 women with an average age of 31 years. The main findings of the study were that the regularity of the menstrual cycle, intensity of menstrual flow, seeking medical assistance, and use of drugs for pain showed statistical significance among the different pain categories. On the other hand, factors such as smoking, alcohol consumption, daily diet, physical activity, regular menstrual cycle, previous pregnancy, active sex life, family history of PD, pain site, and the time of appearance of PD after the first menstrual cycle were found to have no statistical significance within

the pain categories. Although no statistical significance was observed, some observations can still be made by comparing this work to similar studies.

The risk factors associated with PD were examined in a previous reference study⁵. The present study analyzed similar variables related to pain categories; however, emotional and psychological aspects associated with PD were not included. Some of the variables we studied have not been exclusively analyzed in previous literature and have only been occasionally mentioned in prior studies. According to study⁶, although dysmenorrhea is more common in young women, it can affect women of any age group and is one of the causes of absenteeism among women, negatively impacting their academic/work commitments and productivity.

The present study revealed that 29% of women aged between 26 and 32 years experienced light menstrual pain, 27.7% of women with an average age of 26 to 29 years had moderate menstrual pain, and 26.41% of women aged between 25 and 28 years reported severe pain during their menstrual period. Findings herein were consistent across different age groups, indicating a homogeneous relationship between age and the occurrence of PD. These results align with a study conducted in 2021, which found that 91% of 385 Irish students in their third academic level reported experiencing pain during their menstrual period⁷. Similarly, a study in Ecuador reported that 8.9% of 2397 women of reproductive age suffered from PD⁸.

A systematic review conducted in 2019 highlighted the significant academic impact of PD, with 20% of women suffering from PD reporting absences or withdrawal from academic environments and 41% reporting reduced performance and/or communication skills due to the condition⁹.

PD typically begins after the establishment of ovulatory cycles, appearing between six months and two years after menarche.¹⁰ In the present study, we found that the ages of menarche ranged from 11.77 to 12.65 years old, and the occurrence of dysmenorrhea within one month after menarche was reported by 27%, 36%, and 49% of women with light, moderate, and severe pain, respectively. The corresponding percentages for dysmenorrhea occurring between one month and six months after menarche were 45%, 33%, and 20%, and for dysmenorrhea occurring between six months and one year after menarche were 10%, 10%, and 6%. Moreover, 18%, 21%, and 25% of women with light, moderate, and severe pain, respectively, experienced dysmenorrhea more than one year after menarche. These findings provide a new literary datum regarding the relationship between pain intensity and the timing of dysmenorrhea after menarche.

A study identified several potential risk factors for the development of PD, including nonmodifiable factors such as age under 20 years, menarche before 12 years, menstrual flow lasting more than 7 days, and nulliparity. The present study also found that women with a moderate flow of bleeding were more likely to experience light and moderate pain, while those with a high flow were more likely to experience severe pain⁵. According to the same study, the prevalence of dysmenorrhea in women with menarche before the age of 12 is more significant during the second and third decades of life⁵, which corroborates present results. However, no studies relating to the age of menarche to the occurrence of PD were found.

A meta-analysis suggested a strong correlation between smoking and the risk of PD, with smoking increasing the risk by 56% in women of reproductive age¹¹. However, the study did not find a significant difference between pain intensity and smoking, indicating that smoking is not related to the intensity of pain when PD is already present.

Regarding alcohol consumption a study found that women who do not consume alcoholic beverages are more likely to develop severe dysmenorrhea¹². In contrast, this study did not find any difference between the severity of dysmenorrhea and alcohol consumption, with 58% experiencing light pain, 39% experiencing moderate pain, and 44% experiencing severe pain.

While a healthy daily diet, including fruits, vegetables, fish, milk, and dairy products, has been positively associated with less menstrual pain¹³, the present authors did not observe any difference between pain intensity and the overall healthiness of the daily diet in the results. However, the study revealed a behavioral pattern of healthy eating habits that correlated with a higher incidence of PD. Among this study's sample, participants with considered healthy eating habits exhibited a higher prevalence of PD.

Several studies have indicated that exercise and physical activity are associated with a decrease in PD¹⁴. Although the present authors did not find a significant difference between the severity of PD and the practice of regular physical activity (defined as engaging in regular exercise at least three times per week), a higher incidence of light pain among women who engaged in physical activity was observed.

To the best of the present author's knowledge, no previous study has investigated risk factors such as menstrual flow regularity, flow intensity, sexual activity, and pain location. The present study appears to be the first to examine the relationship between these variables and pain intensity in PD. Findings also indicated that 76% of women with light pain, 83% with moderate pain, and 62% with severe pain had a regular menstrual cycle, suggesting an association between dysmenorrhea severity and menstrual flow regularity ($p=0.0016$). Additionally, a significant difference in pain intensity based on the intensity of menstrual flow, with pain being directly proportional to flow intensity ($p=0.000002$) was found.

PD may lead to sexual dysfunction¹⁵ but regarding sexual activity and pain location, the present study did not find any significant differences, indicating that an active or nonactive sex life does not relate to the intensity of PD. However, the incidence of local pain in the uterine region appeared to be higher in light pain cases, while referred pain in other parts of the body seemed to be more common in severe pain cases.

Nulliparity was found to be significantly associated with a higher likelihood of experiencing weak PD^{3,12}. However, the present study did not find any association between nulliparity and pain intensity. There is a strong relationship between a family history of dysmenorrhea and the risk of developing PD, suggesting genetic susceptibility³. However, it is important to consider behavioral and cultural aspects since the relationship with pain can be passed from mother to daughter. The data did not show any significant difference, but among women experiencing light pain, 70% had a family history of PD, while 80% of those with moderate pain and 67% of those with severe pain reported the same family history.

In the present study, a notable finding is that many women may have normalized their pain and condition, with 85% of those experiencing light pain and 60% of those with moderate pain not seeking medical assistance for treatment. Only the majority of women with severe pain (62%) reported seeking medical help ($p=0.0000045$).

Although there are alternative nondrug treatments that are still under study and scientific validation, nonsteroidal anti-inflammatory drugs (NSAIDs) are considered the first-line treatment for dysmenorrhea^{16,17}. This study confirmed this fact, as

women with light pain did not use drug, while those with severe pain resorted to drug ($p=0.00$).

Physiotherapy assumes a pivotal role in the comprehensive management of PD, aiming to alleviate pain, enhance functional outcomes, and improve the overall quality of life for individuals afflicted by this condition. This therapeutic approach encompasses a diverse range of interventions and techniques, incorporating both active and passive strategies. Active interventions involve targeted exercises that address the pelvic floor muscles, abdominal muscles, and core stability, yielding benefits such as pain reduction, muscle strengthening, and the promotion of improved posture and body mechanics. Passive treatments encompass modalities like heat therapy, transcutaneous electrical nerve stimulation (TENS), and manual therapy, which contribute to pain reduction, muscle relaxation, and enhanced circulation. Moreover, education and counseling serve as vital components of physiotherapy, enabling individuals to effectively manage their pain and adopt healthy lifestyle practices¹⁸⁻²¹. Intriguingly, the present study's findings unveiled a startling lack of awareness among approximately 99% of women regarding the potential benefits of physiotherapy for PD. This warrants further investigation into the underlying factors contributing to this knowledge gap, allowing for the development of targeted strategies to reach and educate women about the potential benefits of physiotherapy interventions for PD.

While there are several methods for reducing dysmenorrhea, many require further research for confirmation. It is also important to study the mechanisms of different therapies, such as physical activity, manual therapies, or physiotherapy, and their impact on inflammatory factors in the pathogenesis of PD. A better understanding of the causes of dysmenorrhea can lead to more effective and individualized therapies, ultimately improving the comfort of women worldwide.

Limitations

Despite the findings of this study, there are limitations that should be acknowledged. First, the study's findings may not be generalizable to women from different cultural backgrounds or geographic locations, and the difference may be seen across divergent findings among the cited studies. Second, although the data relied on self-reported validated questions, they are still subject to recall bias and may be prone to subjectivity. Longitudinal studies would be beneficial for capturing temporal associations and exploring the dynamics of PD over time. Moreover, the study did not assess emotional and psychological aspects associated with PD, which could have provided a more comprehensive understanding of the condition. These limitations should be considered when interpreting the results and applying them to clinical practice.

CONCLUSION

This study provided valuable insights into the risk factors, pain intensity, menstrual flow patterns, and treatment-seeking behavior associated with PD. By addressing these factors and improving general understanding of PD, it will be possible to enhance the well-being and quality of life of women affected by this common gynecological condition.

AUTHORS' CONTRIBUTIONS

Flávia Rezende Moura Mesquita Rafael

Data Collection, Conceptualization, Research, Writing - Preparation of the original

Natalia Oliveira Bertolini

Data Collection, Project Management, Writing - Preparation of the original, Validation

Samuel Silva

Statistical Analysis, Writing - Review and Editing, Visualization

Renato Carvalho Vilella

Statistical Analysis, Conceptualization, Project Management, Methodology, Writing - Review and Editing, Supervision

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