

Original Research

The Trend of Increasing Primary Dysmenorrhea Prevalence in Mexican University Students

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Abstract

Background: Dysmenorrhea is a menstrual condition characterized by severe and frequent pain related to menstruation. Primary dysmenorrhea is a major problem worldwide since its prevalence ranges from 28% to 94% in some populations. Studies in specific populations of changes in the prevalence of dysmenorrhea over time have been scarce. Therefore, the aim of the present study was to compare the prevalence and characteristics of primary dysmenorrhea between two independent populations of Mexican university women over time (2010 versus 2020). **Methods:** An anonymous multiple-choice questionnaire was completed by two independent groups of students. Variables from the two studies were extracted and compared between them. The degree of dysmenorrheic pain was assessed by a 100 mm visual analog scale (VAS) ranging from “no pain” to “the worst pain imaginable”. Study A included 1539 women (published in 2010), and Study B included 2154 women (realized in 2020). **Results:** A total of 3693 students were surveyed. Dysmenorrhea prevalence was established in 62.4% (n = 961) in survey A and 78.9% (n = 1699) in survey B ($p < 0.05$). The pain means were 54.1 ± 23.4 mm and 64.0 ± 20.6 mm for Studies A and B, respectively ($p < 0.05$). Moderate-severe pain was reported by 753 (78.4%) women in Study A and 1546 (91.0%) women in Study B. Significantly more students from Study B (90.4%) had limitations in daily activities due to dysmenorrhea compared to women from Study A (65.0%) ($p < 0.05$). School absenteeism in Study B (50.6%) was significantly higher than that in Study A (27.4%) ($p < 0.05$). **Conclusions:** The prevalence of primary dysmenorrhea and the presence of symptoms in students showed statistically significant increases over time (2010 versus 2020). Similarly, due to the symptoms of dysmenorrhea, school absenteeism increased significantly, and daily activities were progressively affected.

Keywords: academic performance; Mexican; primary dysmenorrhea; school absenteeism; university student

1. Introduction

Dysmenorrhea is considered a chronic pain syndrome since it is persistent and is associated with negative cognitive, behavioral, sexual, or emotional consequences [1]. Primary dysmenorrhea is an important problem worldwide since its prevalence has been described to range from approximately 28% to 94% in some populations [2–5]. Some of the factors that affect prevalence include the population studied and the study design, among others. Three recent systematic reviews and meta-analyses found overall prevalences of dysmenorrhea ranging from 58.8% to 78.5% [6–8]. Several risk factors for the presence of primary dysmenorrhea have been determined, including early age of menarche, long or heavy menstrual periods, smoking, a family history of dysmenorrhea, and a sedentary lifestyle, among others [2–8].

Most studies of the prevalence of primary dysmenorrhea have been based on cross-sectional research designs, and longitudinal studies with the same populations have been scarce. Previous studies have shown an increase in the prevalence of nondysmenorrheal pain over time in different populations [9–11]. In the case of dysmenorrhea prevalence, this trend or change over time has been scarcely studied. However, some studies have demonstrated a progres-

sive increase in the prevalence of dysmenorrhea in some populations [8,12], while other studies have not found any changes in prevalence over time [13,14]. The prevalence of menstrual pain in the Mexican population ranges between 28% and 90% [5,15–19]. Based on previous data, it was hypothesized that the prevalence of dysmenorrhea in Mexican university students increased over time. Therefore, the general objective of this research was to compare the prevalence and impact of primary dysmenorrhea between two independent populations of Mexican college women evaluated 10 years apart.

2. Materials and Methods

This study was performed to compare the prevalence, characteristics and impact of primary dysmenorrhea between two independent populations of Mexican university students (2010 versus 2020). The first study (A) was published in 2010 [16], and its objective was to evaluate the prevalence, impact and treatment of primary dysmenorrhea among Mexican university students. The women were students of the Institute of Health Sciences, located in the municipality of San Agustín Tlaxiaca, which is one of the 84 municipalities of the state of Hidalgo, in central-eastern Mexico. The study protocol was revised and approved



Table 1. Ages and menarche ages of women from Study A (n = 1539) and Study B (n = 2154).

Curricula		A	B	p value
		Years (SD)	Years (SD)	
Psychology (psy)	Age	20.4 (1.8)	20.6 (2.4)	>0.05
	MA	12.02 (1.4)	12.19 (1.5)	>0.05
Nutrition (nut)	Age	19.8 (1.7)	20.6 (2.1)	<0.05*
	MA	12.48 (1.5)	12.18 (1.4)	<0.05*
Medicine (med)	Age	20.4 (2.0)	20.4 (2.0)	>0.05
	MA	12.27 (1.4)	12.01 (1.4)	<0.05*
Nursing (nur)	Age	20.5 (1.9)	20.1 (1.8)	<0.05*
	MA	12.35 (1.5)	12.23 (1.4)	>0.05
Pharmacy (pha)	Age	20.6 (2.6)	19.9 (1.7)	<0.05*
	MA	12.14 (1.6)	11.84 (1.5)	>0.05
Dentistry (den)	Age	20.2 (1.6)	20.3 (1.8)	>0.05
	MA	12.49 (1.6)	12.18 (1.4)	<0.05*
Total	Age	20.4 (2.0)	20.4 (1.9)	>0.05
	MA	12.33 (1.5)	12.10 (1.4)	<0.05*

MA, Menarche age; *, significantly different, as determined by Student's *t*-test.

by the Servicios de Salud de Hidalgo, Pachuca, Hidalgo, Mexico (Approval number: SSH-053), and the study was performed in accordance with the Declaration of Helsinki. Women gave their informed consent for inclusion before they participated in the study, and their anonymity was assured. A 38-item questionnaire asking for information about demographics, menstrual pain and its severity, frequency and severity of symptoms, changes in daily activities, school absenteeism, and access to formal medical care was developed and validated. The questionnaire was administered in person during class hours to 1539 university students in six curricula: dentistry, medicine, nursing, nutrition, pharmacy and psychology.

The second study (B) was conducted in 2020, and its objective was to determine the prevalence of dysmenorrhea, its severity and its impact on academic performance in Mexican university students [17]. The study was performed before the stage of isolation and suspension of face-to-face activities due to the COVID-19 pandemic, which began in our town on March 23, 2020. A total of 2154 female university students from the Institute of Health Sciences (Municipality of San Agustín Tlaxiaca, in the state of Hidalgo, Mexico) participated in the study. The study protocol was approved by the Research Ethics Committee of the Institute of Health Sciences, UAEH, Pachuca, Hidalgo, Mexico (Approval number: CEEI-039-2019). The study was conducted in accordance with the Declaration of Helsinki, and informed consent was obtained from all participants. A questionnaire was developed and validated that included questions on demographic data, variations in menstrual patterns, menstrual pain and its severity, access to formal medical care, changes in daily activities, concentration on school activities, and absenteeism. The ques-

Table 2. Women with and without dysmenorrhea from Study A (n = 1539) and Study B (n = 2154).

Curricula		A	B	p value
		n (%)	n (%)	
Psychology (psy)	D	191 (67.0)	262 (83.7)	<0.05 [#]
	WD	94 (33.0)	51 (16.3)	
Nutrition (nut)	D	161 (70.0)	209 (82.0)	<0.05 [#]
	WD	69 (30.0)	46 (18.0)	
Medicine (med)	D	307 (60.4)	461 (78.9)	<0.05 [#]
	WD	201 (39.6)	123 (21.1)	
Nursing (nur)	D	123 (66.5)	392 (77.5)	<0.05 [#]
	WD	62 (33.5)	114 (22.5)	
Pharmacy (pha)	D	46 (55.4)	74 (76.3)	<0.05 [#]
	WD	37 (44.6)	23 (23.7)	
Dentistry (den)	D	133 (53.6)	179 (75.5)	<0.05 [#]
	WD	115 (46.4)	58 (24.5)	
Total	D	961 (62.4)	1699 (78.9)	<0.05 [#]
	WD	578 (37.6)	455 (21.1)	

D, Dysmenorrhea; WD, without dysmenorrhea; [#], significantly different, as determined by the chi-square test.

tionnaire was completed in person by university students in dentistry, medicine, nursing, nutrition, pharmacy and psychology. The women in the 2 studies were students at the same school (institute), but they were independent (different times, different populations). In both studies, the participants were selected by a simple random method from the different university careers of the Institute. Acceptance to participate in the research, signed informed consent, being older than 17 years of age, being enrolled in the university, and primary dysmenorrhea diagnosed by a physician (who obtained a medical history and performed a physical examination) were the inclusion criteria. Chronic degenerative diseases, secondary dysmenorrhea, pregnancy and parity were the exclusion criteria. The variables to evaluate and compare were primary dysmenorrhea presence, age, menarche age, and pain with menstruation and its severity (mild, moderate and severe). Dysmenorrhea was defined as "having painful menstruation during the previous 3 months", and the degree of pain was assessed by a 100 mm visual analog scale (VAS) ranging from "no pain" to "the worst pain imaginable". Values <39 mm on the VAS were considered mild, and ≥40 mm was considered moderate-severe pain [16,17]. Other variables were the main location of menstrual pain, other accompanying symptomatology, the beginning of the symptomatology, limitations in daily activities during the pain, school absenteeism due to pain, the effect of stress on pain, and access to formal medical care, among others. The effect of stress on dysmenorrhea pain was determined with the following question: Have you noticed that the symptoms of dysmenorrhea increase during periods of intense stress? ("yes" and "no" were the possible answers).

Table 3. Visual analog scale (VAS) scores and intensity of pain in dysmenorrheic women from Study A (n = 961) and Study B (n = 1699).

Curricula	VAS scores in mm		<i>p</i> value	Pain intensity				<i>p</i> value
	Study A	Study B		Study A		Study B		
	Mean (± SD)	Mean (± SD)		Mild n (%)	MS n (%)	Mild n (%)	MS n (%)	
Pharmacy (pha)	56.0 (19.3)	67.0 (20.8)	<0.05*	5 (10.9)	41 (89.1)	6 (8.1)	68 (91.9)	>0.05
Nutrition (nut)	54.5 (23.2)	65.4 (20.4)	<0.05*	34 (21.1)	127 (78.9)	13 (6.2)	196 (93.8)	<0.05 [#]
Psychology (psy)	53.9 (23.4)	65.0 (20.7)	<0.05*	44 (23.0)	147 (77.0)	22 (8.4)	240 (91.6)	<0.05 [#]
Nursing (nur)	60.0 (24.5)	64.1 (21.0)	>0.05	22 (17.9)	101 (82.1)	40 (10.2)	352 (89.8)	<0.05 [#]
Medicine (med)	52.3 (23.1)	62.6 (19.7)	<0.05*	68 (22.1)	239 (77.9)	38 (8.2)	423 (91.8)	<0.05 [#]
Dentistry (den)	51.8 (23.6)	60.4 (22.0)	<0.05*	35 (26.3)	98 (73.7)	26 (14.5)	153 (85.5)	<0.05 [#]
All groups	54.1 (23.4)	64.0 (20.6)	<0.05*	208 (21.6)	753 (78.4)	153 (9.0)	1546 (91.0)	<0.05 [#]

*, significantly different, as determined by Student's *t*-test; [#], significantly different, as determined by the chi-square test; MS, moderate-severe.

Data were entered into a computerized database. SPSS software, version 24.0 for Windows (SPSS Inc., Chicago, IL, USA), was used for descriptive and inferential statistical analyses. We performed exploratory analysis using Student's *t*-test and Pearson's chi-square test. Statistical significance was considered to be achieved when $p < 0.05$.

3. Results

A total of 3693 women were included in the analysis (1539 women from Study A and 2154 women from Study B). The mean \pm standard deviation ages were 20.4 ± 2.0 years old (range 17–35 years) and 20.4 ± 1.9 years old (range 18–33 years) from Studies A and B, respectively ($p > 0.05$). The mean ages of menarche were 12.33 ± 1.5 years old (range 9–19 years) and 12.10 ± 1.4 years old (range 8–18 years) in Studies A and B, respectively. There was a statistically significant difference ($p < 0.038$) between the mean menarche ages of the two groups. The ages and menarche ages of the women from the two studies according to their university careers are shown in Table 1.

The dysmenorrhea prevalence was significantly higher in Study B (78.9%; $n = 1699$) than in Study A (62.4%; $n = 961$). The prevalence of dysmenorrhea in all academic groups was significantly higher in Study B than in Study A ($p < 0.05$; Table 2).

The mean VAS pain score was significantly higher in the women with dysmenorrhea in Study B (64.0 ± 20.6 mm) than in the women in Group A (54.1 ± 23.4 mm) ($p < 0.030$). VAS scores and pain intensities are shown in Table 3. The VAS scores of pharmacy, nutrition, psychology, medicine and dentistry students, but not nursing students, in Study B were significantly higher than the VAS scores in Study A ($p < 0.05$). Similarly, nutrition, psychology, nursing, medicine and dentistry students, but not pharmacy students, had pain intensities significantly higher in Study B than in Study A ($p < 0.05$). On the questionnaire, the participants were asked about the presence of dysmenorrheal

pain in a range of 12 cycles per year. Menstrual pain was present in 7.7 ± 3.2 menstrual cycles per year in women from Study A and in 7.7 ± 3.0 cycles per year in Study B ($p > 0.05$).

Symptoms of menstrual distress, the main location of menstrual pain, descriptions of the beginning, inability to perform activities and school absenteeism are shown in Table 4. On the questionnaire, the participants were asked whether the dysmenorrheal symptoms prevented them from performing their activities or missing school in a range of 12 cycles per year. Women from Study A reported that menstrual distress limited their daily activities in 4.2 ± 2.9 menstrual cycles per year versus women from Study B with 4.4 ± 3.3 cycles per year ($p > 0.05$). School absenteeism was present in 2.6 ± 2.1 menstrual cycles per year in women from Study A versus 4.4 ± 3.3 cycles per year in women from Study B ($p < 0.05$).

The limitations of daily activities and school absenteeism in dysmenorrheic women from both studies according to college career are shown in Table 5. Significantly more students from Study B had limitations of daily activities due to dysmenorrhea than students from Study A ($p < 0.05$; Table 5). Medicine, nutrition, and psychology students from Study B reported significantly greater school absenteeism due to dysmenorrhea than did nursing, pharmacy and dentistry students ($p < 0.05$; Table 5).

Only 249 (25.9%) women consulted a physician for their dysmenorrhea in Study A versus 556 (32.7%) women from Study B ($p < 0.05$; Table 6). Finally, a significantly larger proportion of women had increased symptomatology due to stress in Study B (71.1%) than in Study A (62.2%) ($p < 0.05$). Table 6 shows the results of the effects of stress on menstrual symptoms and access to formal medical care for the dysmenorrheic women from both studies according to their university careers.

Table 4. Characteristics of symptomatology and activity limitations in dysmenorrheic women from Study A (n = 961) and Study B (n = 1699).

	Study A	Study B	p value
	n (%)	n (%)	
Symptomatology			
Swollen abdomen	647 (67.3)	1507 (88.7)	<0.05 [#]
Irritability	480 (49.9)	1134 (66.7)	
Sadness	465 (48.4)	1407 (82.8)	
Painful or tender breasts	436 (45.4)	682 (40.1)	
Gastrointestinal disturbances	240 (25.0)	551 (32.4)	
Headache	220 (22.9)	487 (28.7)	
Others	24 (2.5)	26 (1.5)	
Beginning of the symptomatology			
1–2 days before menses	376 (39.1)	795 (46.8)	<0.05 [#]
First day of menstruation	313 (32.6)	426 (25.1)	
2–3 days after menses	272 (28.3)	478 (28.1)	
Main location of menstrual pain			
Belly, lower abdomen	894 (93.0)	1277 (75.2)	<0.05 [#]
Lumbar area	414 (43.1)	911 (53.6)	
Genitals	91 (9.5)	294 (17.3)	
Inner thighs	129 (13.4)	231 (13.6)	
Others	110 (11.4)	76 (4.5)	
Inability to participate in daily activities			
Yes	625 (65.0)	1536 (90.4)	<0.05 [#]
1–6 menstrual cycles per year	498 (79.7)	1189 (77.4)	>0.05
7–13 menstrual cycles per year	127 (20.3)	347 (22.6)	
Incapacitating			
30 min–6 h	553 (88.5)	1405 (91.5)	<0.05 [#]
>6–24 h	72 (11.5)	131 (8.5)	
School absenteeism			
Yes	263 (27.4)	859 (50.6)	<0.05 [#]
1–6 menstrual cycles per year	245 (93.2)	809 (94.2)	>0.05
7–13 menstrual cycles per year	18 (6.8%)	50 (5.8%)	

[#], significantly different, as determined by the chi-square test.

4. Discussion

In the present study, the prevalence of dysmenorrhea was 62.4% in Study A and 78.9% in Study B. The prevalence in both groups significantly increased by 16.5% ($p < 0.05$). Similarly, the values of the mean pain score (64.0 ± 20.6 mm), limitations of general daily activities (90.4%), and school absenteeism (50.6%) in Study B were higher than the values reported in Study A ($p < 0.05$).

The dysmenorrhea prevalence in Study B was larger than the prevalence rates of 52.5% and 63.8% observed in Mexican women (15–24 years old) in a study from 1998 [19]. However, the prevalence rates of 66.5% (Study A) and 77.5% (Study B) found in the nursing students from the two studies evaluated differed from the 90% prevalence reported for similar students from a study from 2006 [18]. This last difference might be due to the use of different methodologies. Velasco-Rodríguez *et al.* [18] determined the prevalence of menstrual pain based on the participants' choices of three possible responses: never, always and generally. In Studies A and B, the prevalence was obtained

according to the reported presence of pain in the previous three months.

The increase in the dysmenorrheic pain prevalence found in the present study (A versus B) agrees with previous studies in which an increase in the prevalence of pain over time has been demonstrated in different populations [9–11,20]. Our results are in agreement with the increase in the frequency of dysmenorrhea from 30% in 1942 to 50% in 1949 in a group of American nursing students and up to seven percent overall in American women in seven decades from 1879 to 1948 [12]. Similarly, a recent meta-analysis demonstrated an increase in dysmenorrhea prevalence over the last ten years [8]. However, our findings are inconsistent with the lack of change over time in the prevalence of dysmenorrhea in Australian women and American nurses [13,14].

Economic status, residence, type of school, age, race, family communication, language, general health, drug use, body weight, physical activity, and mental health are factors involved in the presence or absence of pain [3,6,8,12–

Table 5. Limitations of daily activities and school absenteeism in the dysmenorrheic women from Study A (n = 961) and Study B (n = 1699).

	Limitation of daily activities			School absenteeism		
	Study A	Study B	p value	Study A	Study B	p value
	n (%)	n (%)		n (%)	n (%)	
Medicine (med)	183 (59.6)	429 (93.1)	<0.05 [#]	69 (22.5)	286 (62.0)	<0.05 [#]
Nutrition (nut)	113 (70.2)	191 (91.4)	<0.05 [#]	53 (32.9)	151 (72.2%)	<0.05 [#]
Nursing (nur)	82 (66.7)	353 (90.1)	<0.05 [#]	39 (31.7)	128 (32.7%)	>0.05
Psychology (psy)	134 (70.2)	232 (88.5)	<0.05 [#]	57 (29.8)	141 (53.8)	<0.05 [#]
Pharmacy (pha)	32 (69.6)	65 (87.8)	<0.05 [#]	13 (28.3)	33 (44.6)	>0.05
Dentistry (den)	81 (60.9)	153 (85.5)	<0.05 [#]	32 (24.1%)	60 (39.2)	>0.05
All groups	625 (65.0)	1536 (90.4)	<0.05 [#]	263 (27.4)	859 (50.6)	<0.05 [#]

[#], significantly different, as determined by the chi-square test.

Table 6. Effects of stress on menstrual symptoms and access to formal medical care for dysmenorrheic women from Study A (n = 961) and Study B (n = 1699).

	Stress increases the symptoms			Access to formal medical care		
	Study A	Study B	p value	Study A	Study B	p value
	n (%)	n (%)		n (%)	n (%)	
Medicine (med)	196 (63.8)	307 (66.5)	>0.05	62 (20.2)	125 (27.1)	<0.05 [#]
Nutrition (nut)	99 (61.5)	147 (70.3)	>0.05	40 (24.8)	80 (38.3)	<0.05 [#]
Nursing (nur)	80 (65.0)	297 (75.8)	<0.05 [#]	35 (28.5)	128 (32.7)	>0.05
Psychology (psy)	110 (57.6)	190 (72.5)	<0.05 [#]	64 (33.5)	79 (30.2)	>0.05
Pharmacy (pha)	32 (69.6)	59 (79.7)	>0.05	14 (30.4)	30 (40.5)	>0.05
Dentistry (den)	81 (60.9)	123 (68.7)	>0.05	34 (25.6)	53 (29.6)	>0.05
All groups	598 (62.2)	1219 (71.7)	<0.05 [#]	249 (25.9)	556 (32.7)	<0.05 [#]

[#], significantly different, as determined by the chi-square test.

14,16,20]. A previous study demonstrated that the intensity of dysmenorrhea in medical students was associated with psychological distress [21]. Recent data have demonstrated an increase in psychological distress in girls in the UK between 2003 and 2018 and in Norwegian students (2010 versus 2018) [22,23]. Similarly, the prevalence of neck-shoulder-arm pain with concurrent psychological distress rose from 4.4% to 8.5% among women between 1990 and 2002 [24]. In the present study, the number of women who reported that psychological distress increased dysmenorrheic symptoms in survey B was significantly larger than that reported in survey A. Conversely, the prevalence rates of menstrual problems, dysmenorrhea and premenstrual syndrome were significantly higher in participants with sleep disturbances than in those without sleep disturbances (all $p < 0.05$) [25]. The prevalence of insomnia or trouble sleeping significantly increased from 2002 to 2012 in men, women, whites, Hispanics, patients with diabetes, and patients with joint pain [26]. A study of Mexican medicine students found that stress, anger, worry, cognitive hyperarousal and hypervigilance are associated with sleep difficulties [27]. Therefore, the sleep characteristics of Mexican women with dysmenorrhea must be studied in detail. Due to all of the above, it is very likely that the increasing trends in the prevalence and intensity of dys-

menorrheic symptoms over time are due to multifactorial changes that are currently occurring in the new generations of student women. However, these variations in students over time are difficult to explain without additional data or with other experimental designs (longitudinal studies with the same cohort).

Dysmenorrhea can lead to truancy and decreased academic performance in students at all levels [2,4,7,15,16,28]. In the present study, the percentages of women with limitations in general daily activities (90.4%) and school absenteeism (50.6%) in Study B were higher than the percentages (65.0% and 27.4%, respectively) reported in Study A ($p < 0.05$). Absenteeism and limitations of daily activities rates have been higher with greater levels of dysmenorrheic pain [2,4,7,15,16]. There are several methodologies and scales to measure the presence and intensity of pain. The VAS was employed in both studies (A and B) in the present analysis. The mean score of 54.1 in Study A was significantly lower than the mean score of 64.0 in Study B ($p < 0.05$). In general, school absenteeism and limitations in daily activities are associated with the level of pain in dysmenorrheic women. These problems could be related to the presence and ineffective management of the symptoms. Ineffective treatment of dysmenorrheic pain could be due to misuse of self-medication, resistance to nons-

teroidal anti-inflammatory drugs (NSAIDs), use of ineffective home remedies, refusal to receive any pain relief treatment by the patients themselves and the lack of doctor visits [6,7,15,16]. This last factor was evaluated in the present study. In this sense, access to formal medical care was realized by 25.9% of women in survey A and 32.7% in survey B ($p < 0.05$). Therefore, school-based education and health care providers should routinely provide young girls, parents and society with accurate information regarding the presence of dysmenorrhea and its treatment.

Several limitations of the present study can be mentioned. The results are representative of university women with an age range of 18 to 35 years old. The foregoing must be considered since it has been shown that dysmenorrhea begins a few months or years after menarche (underage), and the symptoms decrease or disappear as age increases. In this sense, it is likely that the data from this study are only representative of the age range of the women studied. Another limitation was the lack of recording of the probable use of pharmacological and nonpharmacological treatments by the women included in Study B. Therefore, a comparison of the use of therapeutic treatments between the two studies could not be conducted. Another limitation was the lack of a better assessment of stress for the participants in the two studies. Therefore, it is advisable to use specific tests to measure stress and anxiety in women with dysmenorrhea, such as the Generalized Anxiety Disorder 7 (GAD-7) or the Depression Anxiety Stress Scales (DASS 42) [29,30].

5. Conclusions

In conclusion, the prevalence of primary dysmenorrhea and the presence of symptoms in university students showed statistically significant increases over time (2010 versus 2020). Similarly, due to the symptoms of dysmenorrhea, school absenteeism progressively increased, and daily activities were significantly affected over the years.

Abbreviations

D, Dysmenorrhea; MA, Menarche age; MS, Moderate-severe; NSAIDs, Nonsteroidal anti-inflammatory drugs; VAS, Visual analog scale; WD, Without dysmenorrhea.

Availability of Data and Materials

Data from both studies (Study A and Study B) are repositied in a database available at https://drive.google.com/file/d/1DYqhzct8vtWHamA8znGoz4drbERjf70L/view?usp=share_link.

Author Contributions

MIO designed the research study, performed the research, provided help and advice on all of the manuscript, analyzed the data, wrote the manuscript, contributed to editorial changes to the manuscript, and read and approved the final manuscript.

Ethics Approval and Consent to Participate

Study A: The study protocol was revised and approved by the Servicios de Salud de Hidalgo, Pachuca, Hidalgo, Mexico (Approval number: SSH-053), and the study was performed in accordance with the Declaration of Helsinki. Women gave their informed consent for inclusion before they participated in the study, and their anonymity was assured. Study B: The study protocol was approved by the Research Ethics Committee of the Institute of Health Sciences, UAEH, Pachuca, Hidalgo, Mexico (Approval number: CEEI-039-2019). The study was conducted in accordance with the Declaration of Helsinki, and informed consent was obtained from all participants.

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Conflict of Interest

The author declares no conflict of interest.

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