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Sectional Study

Shortened running title: Prevalence of Dysmenorrhea in Adolescents in France

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- Dysmenorrhea is the most common gynecological complaint in young women.
- It is frequently overlooked by recent studies.
- Dysmenorrhea is highly prevalent in adolescents in France.
- It has a real impact on daily life activities with social repercussions.
- Dysmenorrhea should be treated as a public health problem with educational campaigns.

Journal Pre-proof

Backgrounds: Dysmenorrhea is the most common gynecological complaint in young women but is overlooked by recent studies. Our objective was to evaluate the prevalence of dysmenorrhea in adolescents in France and its impact on daily living.

Methods: It was a cross-sectional study conducted between April–May 2019, in eight randomly selected high schools in France. Participants were randomly selected post-menarche girl pupils 15–19 years who completed a 50-item questionnaire. Dysmenorrhea severity was assessed with the Numerical Rating Scale (NRS) and Verbal Multidimensional Scoring System Scale (VMSS).

Results: Questionnaires from 953 girls were analyzed (mean age: 16.9 years). The prevalence of dysmenorrhea was 92.9 % with 8.9 % describing their pain as severe. Impact on quality of life was significant: 43.3% reported school absences because of dysmenorrhea, 74.9% difficulties in attending classes and 77.2% difficulties in sports activities. Risk factors of severe dysmenorrhea in multivariate analysis were heavy menstrual bleeding (OR 2.02, 95%CI [1.12 ; 3.63] $p=0.0192$), early menarche (OR 0.68, 95%CI [0.57 ; 0.81] $p<0.0001$), chronic pelvic pain (OR 2.60, 95%CI [1.10 ; 6.11] $p=0.0274$), BMI (BMI<18, OR 1.94, 95%CI [1.03 ; 3.66] $p=0.0335$). Of the 50.4% who had consulted a physician, 45.4% had seen a general practitioner. Among the girls who had not consulted, 55.1% reported that menstruation was a “woman’s burden”.

Conclusions: Dysmenorrhea is highly prevalent in adolescents in France and has a real impact on daily living with social repercussions. As such, it should be treated as a public health problem with educational and information campaigns targeting the girls themselves, their families and healthcare professionals.

Keywords

Dysmenorrhea; Adolescent girls; Prevalence; Menstruation

Dysmenorrhea is the most common gynecological complaint linked to menstruation in young adult women and adolescents. It can either be primary (also known as functional) in the absence of pelvic pathology, or secondary if the pain is attributable to a pelvic pathology such as endometriosis. Primary dysmenorrhea is defined as cyclical pelvic pain that precedes and/or occurs during menstruation in the absence of an underlying organic pathology. It often begins in adolescence, usually within 6 months to 2 years after menarche, when the menstrual cycles become ovulatory (1,2). It is characterized by lower abdominal or lower back cramping pain, which may radiate to the inguinal region or the legs. Symptoms typically begin with the menstrual flow, or the day before, last for 2 to 3 days reaching their peak with the maximum menstrual flow, and are more or less similar from one cycle to another. Many adolescents suffering from dysmenorrhea also suffer from other menstruation-associated symptoms like headaches, nausea, vomiting, motility disorders, asthenia, irritability, and myalgia (1,3). The pathophysiological mechanisms of dysmenorrhea are well known (4,5): overproduction of uterotonic and vasoconstrictor agents and an increased level of circulatory and menstrual rates of PGF₂ induce myometrium ischemia, a perception of cramping pain and systemic symptoms (6,7).

Despite being one of the leading causes of recurrent short-term school or work absenteeism among female adolescents (1), data about dysmenorrhea is scarce and contradictory. The reported prevalence of dysmenorrhea in the literature varies considerably from an estimated 21% in the latest 1984 French study (6) to as high as 94% in a study conducted in Oman (8). Similarly, the prevalence of severe dysmenorrhea also varies ranging from 12.4 % in 2002 in Switzerland (9) to 42 % in 1998 in the United States (10). Furthermore, despite the availability of effective, easy-to-use and accessible therapeutic methods (4), many girls do not seek medical advice for dysmenorrhea and few use pharmacological treatment (6,11). Overall, given its prevalence and impact on quality of life, dysmenorrhea should be both better documented and managed (7,11).

within adolescent girls in France today. The secondary objectives were to define the prevalence of severe dysmenorrhea and identify its risk factors, to assess how girls with dysmenorrhea experience their menses, the consequences on daily living activities or at school, physical, psychological and social repercussions, how they manage their pain and what their expectations are.

MATERIALS AND METHODS

Design

The study was conducted as a multicenter quantitative cross-sectional study. The reporting of the study follows the STROBE statement (12).

Recruitment and inclusion criteria

The sample included high school girls aged 15 to 19 years old, who already had their menses, and who attended school in Ille-et-Vilaine, Brittany, France. Girls who had experienced primary or secondary amenorrhea for more than 6 months in the past year were excluded from analysis. The period of inclusion was April and May 2019. A random sampling without replacement was performed to select eight private and public high schools, all levels included. In each high school, we asked the school nurse or the director to randomly select two or three classes from each year (10th to 12th grade) to include about 100 to 150 girls. The girls and their parents received information about the study around 10 days before inclusion; only adolescents who agreed to participate were included. In each high school, the participants were gathered in a classroom or the amphitheater with the main investigator and asked to complete an anonymous questionnaire of 50 questions. No boys were present to ensure that the girls felt free and confident enough to complete the questionnaire in the most frank way. After completion, which took about 20 to 30 minutes, the main investigator immediately

to the adolescents to educate them about dysmenorrhea and how to manage it.

Outcome measures

The main outcome measure was the prevalence of dysmenorrhea, defined as painful menstruation with cramping sensation in the lower abdomen or lower back, occurring with the menstrual flow or the day before. Severity was assessed according to the intensity of pain, measured by a Numerical Rating Scale, and according to other factors by the Verbal Multidimensional Scoring System (VMSS) (13). More specifically, the VMSS assesses pain intensity, the presence of systemic symptoms, the impact on daily activities and the need for analgesic treatment. Grade 0 corresponds to the absence of dysmenorrhea, and grades 1, 2 and 3 to mild, moderate and severe dysmenorrhea, respectively. Grade 1, or mild dysmenorrhea was defined as painful menstruation which rarely required pain relief and seldom inhibited daily activities. Grade 2, was defined as moderately painful menstruation which affected daily activities, but with pain killers providing sufficient relief so that absenteeism was unusual. Grade 3, or severe dysmenorrhea, was defined as extremely painful menstruation associated with vegetative symptoms (headache, asthenia, vomiting, diarrhea), reduced daily activities, and no relief by pain killers.

Data collection

The 50-question self-assessment questionnaire collected socio-demographic information, the age of menarche, characteristics of the cycles (including length of the cycle and regularity, duration of the menses and perception of volume), the presence of dysmenorrhea, and the girls' expectations for information about menstruation and dysmenorrhea. Only the girls who suffered from dysmenorrhea were asked to complete the second part of the questionnaire about menstrual pain, its features and repercussions. The girls were also asked about the way they managed their pain, whether they sought medical advice or not, used pharmacological or

the VMSS (13).

Target number of participants

Due to the wide variation in the reported prevalence of dysmenorrhea, from 21 % to 94 % in the literature (8–10,14), the calculation of the required sample size was maximized using a prevalence of dysmenorrhea of 50%. With a precision of 5% and alpha-risk of 0.05, 385 subjects were needed. We decided to double the sample size to obtain sufficient responses for the second part of the questionnaire which was only completed by the girls who had dysmenorrhea (n=770).

Statistical analysis

The prevalences of dysmenorrhea and severe dysmenorrhea were calculated and a descriptive analysis of the population was carried out. Qualitative variables were described as numbers and percentages, and quantitative variables as numbers, means and standard deviation. For group comparisons, the Chi-square or Fisher's exact tests were used for qualitative variables, and Student's t-test or ANOVA for quantitative variables. The population was compared according to i) dysmenorrhea and ii) the severity of dysmenorrhea (grade 1, grade 2, grade 3). Chi-square or Fisher's exact tests were used to compare the distributions of qualitative variables, as well as Student's t-tests or ANOVA for quantitative variables. Risk factors for severe dysmenorrhea were identified by logistic regression and presented by Odds Ratios (OR) and their confidence intervals. Variables with a P-value lower than 0.15 in the univariate analysis were included in a multivariate model. Statistical analyses were conducted among the subgroup of adolescent girls without hormonal contraceptives. A P-value under 0.05 was considered as significant. To account for missing data (i.e., incomplete responses), percentage values were calculated according to the number of answers received for each question. All

USA).

Ethics

We obtained authorization from the relevant authorities to conduct the study within private and public high schools: Diocesan Direction of Catholic Education (February 2, 2019) and the Academy of Rennes (March 7, 2019), respectively. We also obtained approval from the Ethics Committee of Montpellier University Hospital on March 12, 2019.

RESULTS

Descriptive analysis

A total of 979 adolescent girls were invited to participate and none refused. Twenty-six girls were excluded from analysis mainly because of age or primary or secondary amenorrhea: two were under 15 years; 10 were over 19 years; two had primary amenorrhea; 10 secondary amenorrhea with progestogen-only pill; one had only 1 month of menarche; and for one the cause was unknown (Appendix 1).

The population and cycle characteristics are described in Table 1. Sixty-three percent (n=600) of the girls were enrolled in the public sector. The average age of the whole population was 16.9 years (± 1.0) and the average age of menarche was 12.5 years (± 1.4). Most (88.3%, n=835) had regular cycles, and the menstrual periods were heavy for 58.4% (n=548) of the girls. A first-degree family history of dysmenorrhea was reported by 43.2% (n=412) of the girls.

Around a third (36.6%, n=347) of the girls claimed to have had sexual relations. Contraception was used by 41.6% (n=396) and was an oral contraceptive pill (OCP) for 72.2% (n=286). Of the girls taking oral contraception, 67% (n=192) were able to say what kind they were taking and 93% (n=178) of these were using a combined OCP (COCP). Nearly

dysmenorrhea for 62% (n=165) (Table 1).

In the group of girls with dysmenorrhea, menstruation was associated with asthenia for 92.8% (n=819), headache for 77.7% (n=686), bloating for 74.9% (n=655), and nausea for 39% (n=345). Moreover, 43.3% (n=383) reported already having missed school, 74.9% (n=660) difficulties in attending school and 76.3% (n=669) poor quality sleep because of their periods (Figure 1).

Outcome measures

The prevalence of dysmenorrhea was 92.9% (n=885): mild (grade 1) for 18.8% (n=179); moderate (grade 2) for 65.2% (n=621); and severe (grade 3) for 8.9% (n=85) (Table 2).

Factors associated with severe dysmenorrhea

Body mass index (BMI) ($p = .007$), active smoking ($p = .006$), young age at menarche ($p < .001$), long ($p = .022$) and heavy ($p < .001$) periods were significantly associated with grade 3 dysmenorrhea in univariate analysis (Table 3).

Multivariate analysis showed a significant correlation between severe dysmenorrhea and BMI (leanness), young age at menarche, heavy menstruation, the presence of inter-menstrual pain and contraceptive use (Table 3).

Subgroup analysis

Statistical analyses were conducted among the subgroup of adolescent girls without hormonal contraceptives (n=644) and showed similar results: the prevalence of dysmenorrhea was 92.4% (n=595), with severe dysmenorrhea occurring in 6.8% (n=44) (Table 4). More adolescents in this group had heavier menstrual periods ($p = .042$) and inter-menstrual pain ($p < .001$) than the whole cohort of girls with dysmenorrhea.

Individual management of pain, and adolescent girls' expectations

High school girls had already taken medication as part of their dysmenorrhea, in 91% (n=804) of cases, with 86.7% (n=697) adolescents taking Paracetamol, 68.8% (n=553) antispasmodics and 52.4% (n=421) non-steroidal anti-inflammatories (NSAIDs). They reported NSAIDs as effective in 67.5% of cases (n=284), 52.4% (n=290) for antispasmodics and 46.1% (n=321) for Paracetamol. It was self-medication for 58.8% (n=471) of the sample, with treatment being taken when the pain was severe in 63.3% of cases (n=507). If a first dose of medication was ineffective, 40.3% (n=234) of young girls did not repeat the dose, and 50.2% (n=285) did not change drug class. Drug efficacy after 3 months of use was considered partial at 59.6% (n=434) and nil at 22.1% (n=161) (Table 5).

Their answers to how they managed their pain, the effectiveness of the medication, and the use of non-pharmacological treatment are reported (Table 5).

Although 77.2% (n=683) of the girls had sought advice from their parents and 52.6% (n=465) from friends, 49.5% (n=438) had never consulted a doctor about this issue even if 62.3% (n=513) believed that a doctor could help. Of those who had already sought medical advice, 45.4% (n=401) turned to a physician and 12.4% (n=110) to a gynecologist. As many as 83.3% (n= 788) expressed a desire to have access to more information (Table 5).

DISCUSSION

Mains findings

The prevalence of dysmenorrhea in our study of 953 French girls aged 15 to 19 years was high at 92.9%. Their dysmenorrhea was moderate for 65.2% and severe for 8.9%. Our findings also show that dysmenorrhea has a strong impact on daily life, as 43.3% of the girls reported school absences, 74.9% difficulties in attending classes and 77.2% difficulties in sports activities.

This high prevalence of dysmenorrhea is in accordance with Parker et al. who found a prevalence of 93% in a sample of 1,055 girls aged 15 to 19 years old in Australia in 2010 (15). However, reported prevalence of dysmenorrhea in the literature ranges from an estimated 56 % in 2012 in Italy (14), 86.6 % in 2012 in Switzerland (9), 94 % in 2011 in Oman (8), and at 21 % out of 4,203 adolescent girls in the latest French prevalence study published in 1984 (6). This wide variation is attributed to different factors, mainly methodological: different definitions of dysmenorrhea, different study populations with non-representative samples, a lack of standard methods for assessing the severity of dysmenorrhea; and sociocultural factors which may have an impact in the perception of this subjective symptom. The present study showed independent risk factors of severe dysmenorrhea – a low BMI, young age at menarche, heavy periods, inter-menstrual pain and the use of contraception – which have also been identified in previous publications (4,5,16,17). Similarly, previous studies have also found that dysmenorrhea has academic, social and professional consequences and is responsible for limitations in daily life activities, sleep disorders, concentration difficulties, reduced intellectual capacity, loss of self-confidence and social withdrawal (15,18).

Our study also highlights ineffective use of drugs by adolescents with dysmenorrhea: waiting for too long before intake (when the pain was severe) to be effective; not taking a second dose when the first failed to relieve the pain; and not changing the drug class if the first one was ineffective. In our population, nearly 60% of the girls were self-medicating. Overall, 91% had already taken a pharmacological treatment, mainly acetaminophen and antispasmodics, and half had taken an NSAID. This erratic self-medication behavior reflects a lack of knowledge of therapeutic solutions. Numerous studies have shown that NSAIDs alone have an efficacy of 70 - 100% to relieve dysmenorrhea (9,19,20). In our study, although a large majority of the girls asked their parents for advice, almost half of them had never consulted a doctor for their dysmenorrhea, illustrating reticence as has previously been shown (6,9,10,15,21,22). Among those who did consult a doctor, almost 80% only did so after being advised by someone close to them and not on their own initiative. Despite this, more than 80% expressed a real desire for information about dysmenorrhea, and more than 60% would have liked the subject to be brought up spontaneously by their doctor. General practitioners are often the first doctors seen and play a crucial role in the detection and management of dysmenorrhea. Therefore, it is essential for them to be more aware and better trained to screen their adolescent girl patients for cycle disorders (5), and not to misdiagnose secondary dysmenorrhea (23).

Furthermore, among the obstacles to medical consultation, adolescents reported believing that dysmenorrhea was a normal part of the menstrual cycle and that there was no effective solution. Suffering from menstrual pain seems to be accepted as "normal" in our society as reflected in literature reporting studies from around the world (6,7,9,22). However, given the simple and effective therapies available, this currently held belief deserves to be challenged. Beyond the monthly pain experienced by girls individually on a collective scale, it is difficult to accept the consequent negative socio-professional impact in our society in this day and age, when parity constitutes a major challenge worldwide.

health education in order to improve the management of dysmenorrhea. Adolescent girls should be better informed through the media, large-scale information campaigns, and collective actions in schools carried out by school nurses. It has recently been shown that a brief information campaign targeting adolescent girls providing simple self-medication advice significantly reduces the prevalence and severity of dysmenorrhea, with a benefit on quality of life (24).

Strengths and limitations

Our study of the prevalence of dysmenorrhea represents a major update of French data on the subject, the last one dating from 1984. The high number of participants (953 girls) with an excellent participation rate (none of the selected girls refused to participate), and the methodology are all parameters that ensure the accuracy of the sample. However, there remain a few limitations to our study. As it was a cross-sectional study, the girls were only asked about their cycles during the past year and our results do not describe the progression of dysmenorrhea over time. Finally, we also had to deal with memory bias that was difficult to overcome, as many girls did not know, or even remember, which pharmacological treatment they had used for their dysmenorrhea.

In our population of 953 adolescent girls in France aged 15 to 19 years, 92% suffered from dysmenorrhea, 8.9% of whom experienced severe dysmenorrhea. The factors associated with severe dysmenorrhea identified in multivariate analysis were heavy menstruation, young age at menarche, inter-menstrual pain and a low BMI. The girls often sought symptom-relief through ineffective self-medication and were often of the opinion that menstrual pain was a “womanly burden”.

Underdiagnosed, undertreated, trivialized and insufficiently taken into consideration, dysmenorrhea is nevertheless the cause of physical, educational, social and psychological repercussions and can sometimes be an obstacle to the educational and professional progress of the young girls affected. It is therefore essential that this symptomatology be considered a public health issue.

Better information provided to adolescents, as well as to their families and school nurses, could encourage them to consult a physician for access to an effective therapeutic option. Furthermore, general practitioners, the primary care providers, should be trained to actively screen their adolescent girl patients to improve dysmenorrhea management and not to misdiagnose secondary dysmenorrhea.

Conceptualisation: OKH, MB

Methodology: OKH, MB, ME, AJ

Data collection: OKH

Statistical analysis: ME

Data interpretation: OKH, MB, ME

Manuscript draft: OKH, MB, VL, AJ

Manuscript review and editing: OKH, MB, VL, JL, ME, AJ

Details of ethics approval

This cross-sectional study required the authorization from the relevant authorities to conduct the study within private and public high schools: Diocesan Direction of Catholic Education (February 2, 2019) and the Academy of Rennes (March 7, 2019), respectively. We also obtained approval from the Ethics Committee of Montpellier University Hospital on March 12, 2019 (ID-RCB: 2019-A00302-55, Clinical trial number: NCT04007471)

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Declaration of Competing Interest

The authors declare no conflict of interest.

Journal Pre-proof

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Variable	Overall (n= 953)
Age (n= 953), mean, y	16.9 ± 1.0
BMI (n= 951) (group) ^a	
<18	179 (18.8%)
18-25	662 (69.6%)
25-30	90 (9.5%)
>30	20 (2.1%)
Smoking (n= 950)	159 (16.7%)
Physical activity (n= 937)	468 (49.9%)
Age at menarche (n= 952), mean, y	12.5 ± 1.4
Regular cycles (yes) (n= 946)	835 (88.3%)
Menstrual duration > 7 days (n= 952)	256 (26.9%)
Heavy menstrual bleeding (yes) (n= 938)	548 (58.4%)
Inter-menstrual pain (n= 946)	
Never	324 (34.2%)
Sometimes	533 (56.3%)
Most of the time	89 (9.4%)
First degree family history of dysmenorrhea (n= 953)	
Don't know	317 (33.3%)
No	224 (23.5%)
Yes	412 (43.2%)
Family history of endometriosis (n= 951)	
Don't know	463 (48.7%)
No	442 (46.5%)
Yes	46 (4.8%)
Sexual relations (yes) (n= 947)	347 (36.6%)
Contraception (yes) (n= 953)	396 (41.6%)
Kind of contraception: (yes) (n= 396) ^b	
OCP	286 (72.2%)
Contraceptive implant	17 (4.3%)
Contraceptive patch	1 (0.3%)
Vaginal ring	0
Intrauterine system device	4 (1.0%)
Intrauterine system	1 (0.3%)
Male condom	162 (40.9%)
Female condom	5 (1.3%)
Non-contraceptive purpose: (yes) (n= 396) ^b	
Decrease dysmenorrhea	165 (41.7%)
Decrease acne	73 (18.4%)
Decrease menstrual bleeding	98 (24.7%)
Regularize periods	174 (43.9%)

Qualitative variables: global (NA), counts (percentages) for each variable.

Quantitative variables: global (NA), means ± standard deviations.

N may vary for each question due to missing data. Percentage values are calculated according to the number of answers received for each question (valid %).

Abbreviations: BMI, body mass index. OCP, oral contraceptive pill

^aCalculated as weight in kilograms divided by height in meters squared

^bMore than one answer was possible, resulting in a total that could be over 100 %

Variable	Grade 1 ^a	Grade 2 ^b	Grade 3 ^c	p-value
	179 (18.8%)	621 (65.2%)	85 (8.9%)	
Age, mean, y	16.8 ± 0.9	16.9 ± 1.0	17.0 ± 1.0	.210
BMI (group) ^d	n= 179 (0)	n= 619 (2)	n= 85 (0)	.043
<18	33 (18.4%)	113 (18.3%)	18 (21.2%)	
18-25	127 (70.9%)	440 (71.1%)	48 (56.5%)	
25-30	17 (9.5%)	53 (8.6%)	14 (16.5%)	
>30	2 (1.1%)	13 (2.1%)	5 (5.9%)	
Smoking (yes)	n= 179 (0)	n= 618 (3)	n= 85 (0)	.006
	22 (12.3%)	107 (17.3%)	24 (28.2%)	
Number of cigarettes per day	n= 179 (0)	n= 618 (3)	n= 85 (0)	.001
0	157 (87.7%)	511 (82.7%)	61 (71.8%)	
< 10	17 (9.5%)	78 (12.6%)	12 (14.1%)	
10 - 15	2 (1.1%)	27 (4.4%)	10 (11.8%)	
> 15	3 (1.7%)	2 (0.3%)	2 (2.4%)	
Physical activity (yes)	n= 177 (2)	n = 611 (10)	n = 82 (3)	.295
	94 (53.1%)	306 (50.1%)	35 (42.7%)	
Age at menarche, mean, y	n= 179 (0)	n= 621 (0)	n= 85 (0)	< .001
	12.9 ± 1.3	12.4 ± 1.3	11.7 ± 1.4	
Regular cycles (yes)	n= 178 (1)	n= 615 (6)	n= 85 (0)	.269
	160 (89.9%)	548 (89.1%)	71 (83.5%)	
Menstrual duration > 7 days (yes)	n= 178 (1)	n= 621 (0)	n= 85 (0)	.011
	36 (20.2%)	171 (27.5%)	32 (37.6%)	
Heavy menstrual bleeding (yes)	n= 176 (3)	n= 612 (9)	n= 84 (1)	< .001
	75 (42.6%)	381 (62.3%)	66 (78.6%)	
Onset of dysmenorrhea after menarche	n= 167 (12)	n= 600 (21)	n= 85 (0)	.365
< 1 year	63 (37.7%)	268 (44.7%)	39 (45.9%)	
1 year	50 (29.9%)	174 (29.0%)	27 (31.8%)	
> 2 years	54 (32.3%)	158 (26.3%)	19 (22.4%)	
Peak pain intensity ^e	n= 178 (1)	n= 620 (1)	n= 85 (0)	< .001
	6.0 ± 2.1	7.9 ± 1.4	9.3 ± 0.8	
Mean pain intensity ^e	n= 178 (1)	n= 620 (1)	n= 85 (0)	< .001
	4.8 ± 2.2	7.0 ± 1.6	8.7 ± 1.1	
Duration of pain	n= 174 (5)	n= 613 (8)	n= 85 (0)	< .001
First days of periods	156 (89.7%)	457 (74.6%)	39 (45.9%)	
Whole periods	15 (8.6%)	146 (23.8%)	46 (54.1%)	
At the end of periods	3 (1.7%)	10 (1.6%)	0 (0.0%)	
Among adolescent using contraception	n= 179 (0)	n= 621 (0)	n= 85 (0)	
	65 (36.3%)	256 (41.2%)	54 (63.5%)	< .001
Among adolescent using OCP	n= 65 (0)	n= 256 (0)	n= 54 (0)	.874
	48 (73.8%)	181 (70.7%)	39 (72.2%)	

Qualitative variables: global (NA), counts (percentages) for each variable. The chi-square test or the Fisher test were used. Quantitative variables: global (NA), means ± standard deviations. The Student's t-test was used.

N may vary for each question due to missing data. Percentage values are calculated according to the number of answers received for each question (valid %).

Abbreviations: BMI, body mass index. OCP, oral contraceptive pill

^aGrade 1: menstruation is painful but seldom inhibits daily activities. Pain killers are rarely required

^bGrade 2: menstruation is moderately painful and it affects daily activities. Pain killers are required; however, they give sufficient relief so that absence from class is unusual

^cGrade 3: menstruation is extremely painful and associated with vegetative symptoms (headache, asthenia, vomiting, diarrhea). Daily activities are clearly inhibited. Pain killers provide no relief.

^dCalculated as weight in kilograms divided by height in meters squared

^eNumerical Rating Scale

Variables	Univariate analysis				Multivariate analysis			
	Overall	Severe dysmenorrhea	OR [95% CI]	p-value	Overall	Severe dysmenorrhea	OR [95% CI]	p-value
BMI (groups) ^a (n= 883)	883	85			859	83		
18-25	615	48	1	.007	600	48	1	.034
<18	164	18	1.46 [0.82 ; 2.58]		162	17	1.94 [1.03; 3.66]	
25-30	84	14	2.36 [1.24 ; 4.50]		79	13	1.98 [0.97; 4.01]	
>30	20	5	3.94 [1.37 ; 11.31]		18	5	3.03 [0.96; 9.55]	
Smoking (n= 882) (yes vs no)	153	24	2.04 [1.23 ; 3.39]	.006	-	-	-	-
Physical activity (n=870) (yes vs no)	435	35	0.72 [0.46 ; 1.14]	.165	-	-	-	-
Age at menarche (n= 885)	885	85	0.65 [0.55 ; 0.77]	< .001	859	83	0.68 [0.57; 0.81]	< .001
Irregular cycles (n=878) (yes vs no)	99	14	1.64 [0.89 ; 3.04]	.114	-	-	-	-
Menstrual duration (n=884) (≥ 7 days vs <7 days)	239	32	1.73 [1.08 ; 2.75]	.022	-	-	-	-
Heavy menstrual bleeding (n=872) (yes vs no)	522	66	2.67 [1.56 ; 4.58]	< .001	512	65	2.02 [1.12; 3.63]	.019
Inter-menstrual pain (n= 878) (ref=never)	878	83			859	83		
Never	281	14	1	.009	275	14	1	.027
Sometimes	508	57	2.41 [1.32 ; 4.41]		496	57	2.26 [1.20; 4.24]	
Most of the time	89	12	2.97 [1.32 ; 6.69]		88	12	2.60 [1.10; 6.11]	
Contraception (n=885) (yes vs no)	375	54	2.60 [1.63 ; 4.13]	< .001	365	53	2.60 [1.63; 4.13]	< .001
Family history of dysmenorrhea (n=593) (yes vs no)	389	46	1.47 [0.82 ; 2.63]	.192	-	-	-	-
Family history of endometriosis (n=452) (yes vs no)	45	12	5.56 [2.56 ; 12.06]	< .001	-	-	-	-

Abbreviations: CI, confidence interval. OR, Odds ratio. BMI, body mass index, Ref, reference.

^aCalculated as weight in kilograms divided by height in meters squared

Table 4: Population description and cycle characteristics among the subgroup of adolescent girls without hormonal contraceptives

Variable	Overall (n= 644)
Age (n= 644), mean, y	16.6 ± 0.9
BMI (n= 643) (group) ^a	
<18	142 (22.1%)
18-25	433 (67.3%)
25-30	52 (8.1%)
>30	16 (2.5%)
Smoking (n=641)	69 (10.8%)
Physical activity (n=634)	330 (52.1%)
Age at menarche (n=643), mean, y	12.6 ± 1.4
Regular cycles (yes) (n=638)	558 (87.5%)
Menstrual duration < 7 days (n=643)	458 (71.2%)
Heavy menstrual bleeding (yes) (n=632)	377 (59.7%)
Inter-menstrual pain (n=640)	232 (36.3%)
Never	352 (55.0%)
Sometimes	56 (8.8%)
Most of the time	
First degree family history of dysmenorrhea (n=644)	
Don't know	231 (35.9%)
No	144 (22.4%)
Yes	269 (41.8%)
Family history of endometriosis (n=643)	
Don't know	323 (50.2%)
No	295 (45.9%)
Yes	25 (3.9%)
Severity of dysmenorrhea (n=644)	
Grade 0	49 (7.6%)
Grade 1	126 (19.6%)
Grade 2	425 (66.0%)
Grade 3	44 (6.8%)
Onset of dysmenorrhea after menarche (n= 571)	
< 1 year	239 (41.9%)
1 year	179 (31.3%)
> 2 years	153 (26.8%)
Duration of pain (n=589)	
First days of periods	451 (76.6%)
Whole periods	130 (22.1%)
At the end of periods	8 (1.4%)
Mean pain intensity (n=594) ^b	6.6 ± 2.1

Qualitative variables: global (NA), counts (percentages) for each variable. The chi-square test or the Fisher test were used. Quantitative variables: global (NA), means ± standard deviations.

N may vary for each question due to missing data. Percentage values are calculated according to the number of answers received for each question (valid %).

Abbreviations: BMI, body mass index.

^a Calculated as weight in kilograms divided by height in meters squared

^b Numerical Rating Scale

Pharmacological treatment^a	Global n= 885)
Already taken pharmacological treatment (yes) (n= 884) (1)	804 (91 %)
Acetaminophen	697 (86.7%)
Judged as effective	321 (46.1%)
Antispasmodics	553 (68.8%)
Judged as effective	290 (52.4%)
NSAIDs	421 (52.4%)
Judged as effective	284 (67.5%)
Self-medication, n= 801 (3)	471 (58.8%)
Treatment taken when the pain was severe, n= 801 (3)	507 (63.3%)
Treatment was not taken a second time if the first one was ineffective, n= 581 (223)	234 (40.3%)
Second drug class was not tried if the first one was ineffective, n= 568 (236)	285 (50.2%)
Pharmacological treatment efficacy after 3 months of use, n= 728 (76)	
Not at all	161 (22.1%)
Partially	434 (59.6%)
Completely	133 (18.3%)
Non-pharmacological treatment	
Rest, n= 885 (0)	675 (76.3%)
Heat application, n= 885 (0)	590 (66.7%)
Hot showering, n= 884 (1)	517 (58.5%)
Distraction, n= 884 (1)	290 (32.8%)
Tea consumption, n= 884 (1)	250 (28.3%)
Physical activity, n= 884 (1)	134 (15.2%)
Homeopathy, n= 884 (1)	87 (9.8%)
Yoga, n= 884 (1)	28 (3.2%)
Phytotherapy, n= 884 (1)	8 (0.9%)
Acupuncture, n= 884 (1)	4 (0.5%)
Non-pharmacological treatment efficacy after 3 months of use, n= 799 (86)	799 (86)
Not at all	95 (11.9%)
Partially	552 (69.1%)
Completely	152 (19.0%)
Advice from ...	
Parents, n = 885 (0)	683 (77.2%)
Friends, n= 884 (1)	465 (52.6%)
Internet, n= 884 (1)	250 (28.3%)
Sisters, n= 884 (1)	211 (23.9%)
Pharmacist, n= 885 (0)	133 (15%)
School nurse, n= 884 (1)	92 (10.4%)
Medical consultation	
Already sought medical advice, n= 885 (0)	447 (50.5%)
Physician, n= 884 (1)	401 (45.4%)
Gynecologist, n= 884 (1)	110 (12.4%)
Pediatrician, n= 884 (1)	10 (1.1%)
Motivated by a completely different reason, n= 447 (0)	346 (77.4%)
From the own initiative of the adolescent girl, n= 447 (0)	98 (21.9%)
Never sought medical advice, n= 885 (0)	438 (49.5%)
Dysmenorrhea considered as a normal part of menses, n= 438 (0)	242 (55.1%)
Modesty, n= 438 (0)	134 (30.6%)
Belief that there is not effective solution, n= 438 (0)	126 (28.8%)
No second medical consultation if treatment was ineffective, n=490 (0)	394 (80.4%)
Girls' expectations	
Belief that doctor can help, n= 823 (62)	513 (62.3%)
Desire to have access to more information, n= 946 (7)	788 (83.3%)
By their physician, n= 788 (0)	341 (43.3%)
Discussed spontaneously by their physician without their explicit request, n= 924 (29)	595 (64.4%)

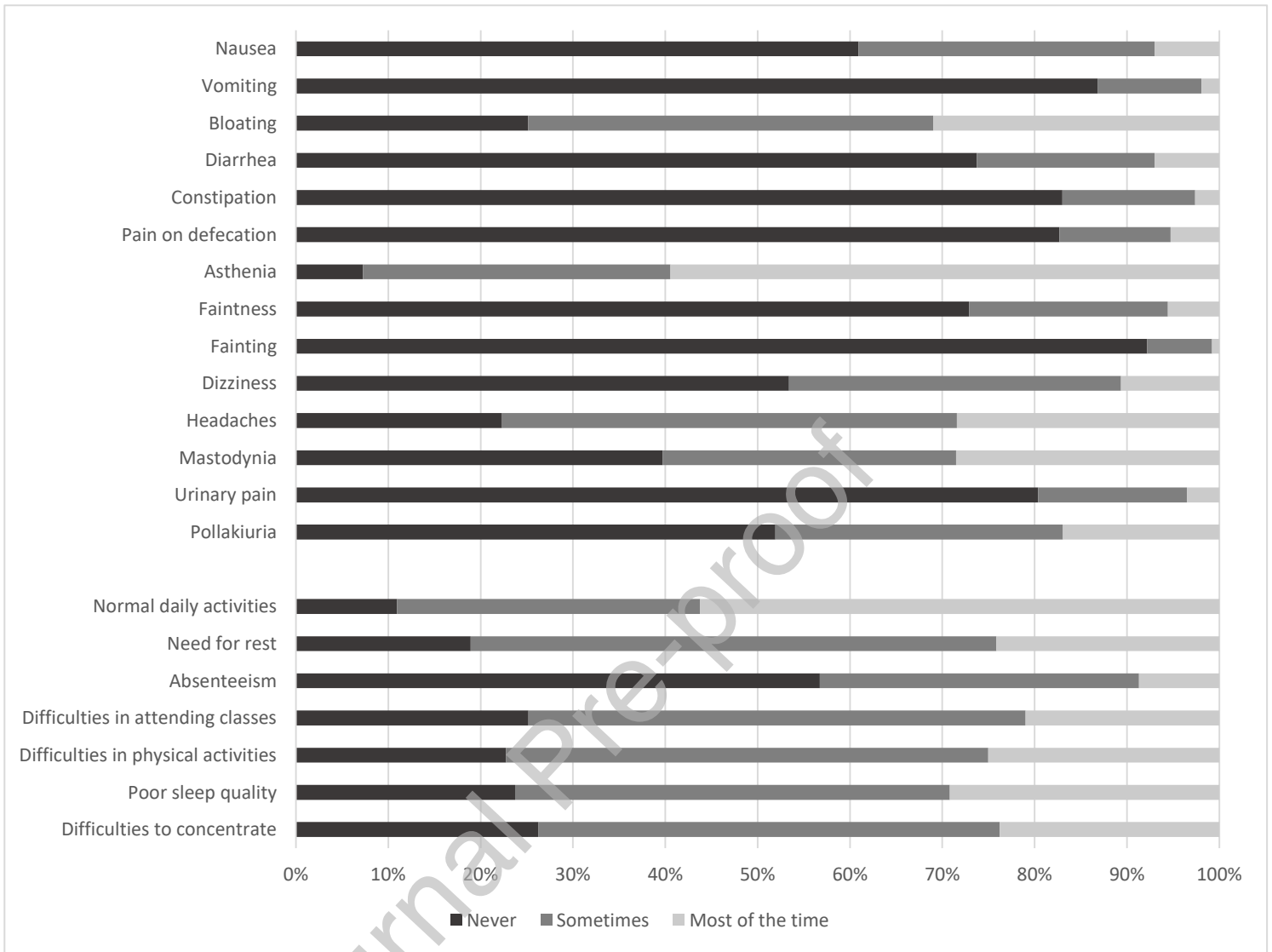
Qualitative variables: global (NA), counts (percentages) for each variable.

N may vary for each question due to missing data. Percentage values are calculated according to the number of answers received for each question (valid %).

Abbreviations: NSAIDs, Nonsteroidal anti-inflammatory drugs

^aMore than one answer was possible, resulting in a total that could be over 100 %

Figure 1: Systemic symptoms associated with dysmenorrhea and consequences on daily life activities



Appendix 1: Flow-chart of inclusion in the study of prevalence of dysmenorrhea



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