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Clinical Research Article

Prevalence of chronic pain and contributing factors: a cross-sectional population-based study among 2,379 Iranian adolescents

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ABSTRACT

Background: This study aimed to determine the prevalence of chronic pain and its contributing factors among teenagers aged 12–21 years in Shiraz, Iran.
Methods: This cross-sectional study was conducted on adolescents aged 12–21 years. Demographic variables of the adolescents and their parents as well as the pain characteristics were assessed. Descriptive statistics, multinomial logistic regression, and regression models were used to describe the characteristics of the pain and its predictive factors.
Results: The prevalence of chronic pain was 23.7%. The results revealed no significant difference between the male and female participants regarding the pain characteristics, except for the home medications used for pain relief. The results of a chi-square test showed that the mother's pain, education, and occupation, and the father's education were associated significantly with chronic pain in adolescents ($P < 0.05$). Multinomial logistic regression also showed the mother's history of pain played a significant role in the incidence of adolescents' chronic pain.
Conclusions: The prevalence of chronic pain was relatively high in these adolescents. The results also provided basic and essential information about the contributing factors in this area. However, consideration of factors such as anxiety, depression, school problems, sleep, and physical activity are suggested in future longitudinal studies.

Keywords: Adolescent; Anxiety; Chronic Pain; Cross-Sectional Studies; Depression; Incidence; Iran; Prevalence.

INTRODUCTION

Chronic pain is defined as pain that lasts or recurs for more than three months and is linked with considerable emotional distress or functional impairment that interfere with activities of daily living and participation in social roles [1]. Chronic pain affects 44%–74% of adolescents, and the children who experience chronic pain are more likely to experience chronic pain as adults [2,3]. Pain during adolescence may cause short- and long-term physical and psychological problems like anxiety and depression [4–6]. Furthermore, it poses financial burdens on the affected families and healthcare systems [7].

Despite the known impacts of pediatric pain and evidence-based standards and guidelines published by the World Health Organization [8] and the International

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Association for the Study of Pain [9] for pediatric pain management, children continue to experience unrelieved pain [10]. Therefore, professionals need to understand, assess, and manage this pain according to the children's developmental characteristics [11]. Nurses, as members of this professional team, have a crucial role in pain prevention, recognition, and treatment among children and adolescents [12,13].

Students and teenagers, on the other hand, play a critical role in a country's future. Adolescence is a particularly difficult time due to the occurrence of significant physical as well as psychological changes. As a result, adolescents' physical and emotional well-being is inextricably linked to the well-being of their communities [14]. Therefore, evaluating the incidence of chronic pain and its associated characteristics may be useful in identifying at-risk adolescents, the results of which can be utilized for simple preventive interventions instead of advanced and complicated therapeutic treatments. Furthermore, a precise estimation of the prevalence of pain in the community is required for the establishment of appropriate health and social services [15].

According to the biopsychosocial model, several elements are implicated in the occurrence of pain, including chronic pain. Stress, key life events, excessive homework and tasks at school, separation from parents, frequent changes of residence, and lack of leisure time have all been identified as risk factors for chronic pain in adolescents [16–18]. However, most studies in Iran have focused on one form of pain in children and adolescents such as low back pain, musculoskeletal pain, or headache [19,20]. Furthermore, variables such as parenting characteristics, as well as pain-related outcomes such as absenteeism have not been taken into account. For example, Shaygan and Karami [21] reported the prevalence of chronic pain in adolescents but did not evaluate the impact of parents' education levels, occupation, and separation. Additionally, the studies carried out in Iran were not conducted on a significant number of samples, and the disparities between boys and girls as well as among different age groups were not taken into account.

According to the previous studies, chronic pain has a critical impact on children and adolescents. Nonetheless, there is a paucity of data regarding the prevalence of chronic pain in this age group in Iran. Furthermore, there is a significant variation in the prevalence of chronic pain among teenagers across the existing studies, which has been attributed to differences in pain measures, age variance, sample size, and pain definition [22]. Therefore, the present study aims to assess the prevalence of chronic pain and its contributing factors in teenagers aged 12–21 years in Shiraz, Iran.

MATERIALS AND METHODS

1. Design and sampling

This cross-sectional study was conducted in Shiraz (Ethics Committee of Shiraz University of Medical Sciences: IR.SUMS.REC.1396.S795), which has a population of roughly 2.5 million people and is located in southern Iran. Adolescents were included in the study if they met the following criteria: an age range of 12–21 years, being students at one of the high schools or colleges in Shiraz, and being willing and able to complete an online questionnaire. Adolescents were excluded if they had been diagnosed with a physical illness not related to pain (such as multiple sclerosis, diabetes, or cancer), had chronic mental illnesses or developmental disorders (according to the statement of the adolescent or his/her parents), or had no parental contact.

At first, a cluster sample of 24 schools was randomly selected. In doing so, all schools in Shiraz were divided into four strata based on educational districts. Then, six schools were randomly chosen from each stratum. The schools that did not respond were substituted with those that met the same criteria. After that, a class was randomly selected from each school and grade. When the schools provided their consent to participate, the adolescents were recruited. The teenagers were provided with a letter containing research information, self-report tools, and consent forms for the parents to sign. The students were required to complete the self-report questionnaires and consent forms at home and return them to their teachers. It should be noted that the information was gathered anonymously. To select college students, at first, 17 college were selected in Shiraz, and then college students were selected from each college using the same method as the one for high school students (**Fig. 1**).

2. Measures

1) Demographic factors

The collected data included the students' age, sex, and grade point average (GPA), parents' occupations and education levels, and prevalence of pain in the parents. GPA was evaluated as one of the school characteristics to determine whether pain had an impact on academic

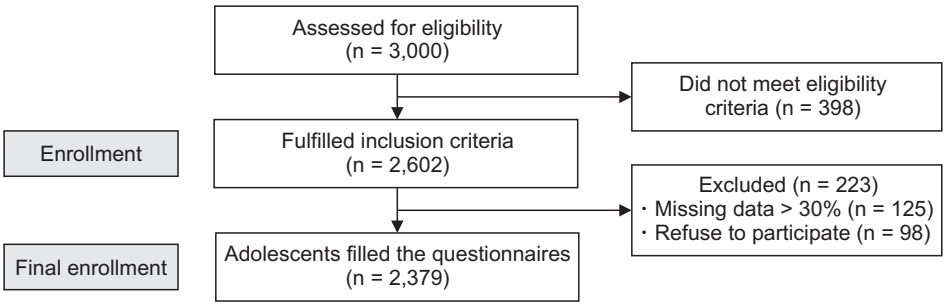

Fig. 1. The flowchart of the participants in the study.

achievement. Students were also asked about the number of children in their family. In addition, the reasons for having a single parent were divided into four categories, namely death, divorce, international travel, and domestic travel.

2) Pain characteristics

The participants were first asked whether they had ever felt pain. Chronic pain was defined as a pain that occurred at least once a week for at least three months. As a result, another option was introduced to this area (in the last month) to prevent the overestimation of the prevalence of chronic pain. Then, the locations of pain in the head, ears, eyes, face, neck, shoulders, hands, wrists, abdomen, chest, stomach, back, legs, knees, and multiple sites were asked. Afterwards, nine primary diagnoses (headache, facial pain, ischemic pain, spinal column pain, musculoskeletal pain, neuropathic pain, visceral pain, post traumatic or surgical pain, and somatic unclassifiable pain) were assigned based on body region and etiology using the widely-used and well-validated Multiaxial Pain Classification System-Somatic Dimension [23]. Due to the small number of patients with face pain, ischemia pain, visceral pain, and somatic unclassifiable pain, these diagnostic groupings were merged into one named 'other pains'. Moreover, the participants were asked to rate pain frequency on a scale of one to four (continuous, one to several times a day, one to several times a week, and one to several times a month). They were also asked how long they had been in pain using the following options: today, the previous week, for one to three months, for four to six months, and for more than six months. Furthermore, an 11-point numerical rating scale was used to assess pain intensity, with zero indicating no pain and ten indicating the most severe pain.

3) Chronic pain assessment tool

Positive responses to the three following screening questions identified the participants who suffered from chronic pain: (a) "Are you currently bothered by pain or discomfort, either constantly or intermittently?", (b) "Has this pain or discomfort lasted more than three months?", and (c) "Has it had an impact on your daily life and activities?" These questions were based on the International Classification of Diseases 11th Revision (ICD-11) criteria [1], which have been verified and utilized in several studies on chronic pain [24–27]. The content validity and test-retest reliability of the questionnaire were verified in the Persian population, as well [21].

The participants were also asked to pinpoint the sources of their discomfort. The mentioned reasons included arthritis, heart disease, cancer, congenital disorders, diabetic neuropathy, spinal diseases, trauma, cysts, lupus, migraine, vascular diseases, drug allergies, multiple sclerosis, osteoporosis, surgery, asthma, kidney disease, and acne. In addition, therapeutic approaches included chemotherapeutic pharmaceuticals, traditional and herbal remedies, non-pharmaceutical treatment, and a combination of these methods. Furthermore, there were two questions about the constraints imposed by pain and the resulting isolation. Absenteeism from school, inability to exercise, inability to move, inability to leave home, and a combination of these constraints were among the limitations imposed by pain.

3. Data analysis

The data analysis was performed at three levels. At the first level, employing univariate analysis, an assessment of the prevalence of chronic pain and a sample description was performed. Descriptive statistics included frequency for categorical variables and mean ± standard deviation for continuous variables. The prevalence of pain and chronic pain, pain severity, pain location, pain qual-

ity, pain sequence, cause of pain, pain reduction strategies, isolation, and limitations associated with pain were all reported for this purpose. Additionally, age range was classified into two groups of 11–15 and 16–21 years. Then, these age groups as well as the two sexes were compared with regard to the pain characteristics using Fisher and chi-square tests.

The second level applied bivariate analysis which focused on establishing the unadjusted relationship between the explanatory variables and the outcome variable–chronic pain. This way a preliminary assessment of chronic pain characteristics could be performed across the participants' explanatory variables. The third level of analysis, multivariate analysis, assessed adjusted association of the explanatory variables with chronic pain. Binary logistic regression was used because the outcome variable for chronic pain was dichotomous.

Chronic pain as the dependent variable and the other demographic variables as covariate factors were entered into binary logistic regression to assess the determinants of pain amongst adolescents. The logistic regression model allowed for the statistical evaluation of a variable's behavior to determine whether the presence of a risk factor increased the likelihood of a given outcome by a certain percentage. In this analysis, 0 and 1 indicated the existence or non-existence of chronic pain, respectively. The model's adjustment was assessed using the Hosmer–Lemeshow test, which is extensively used in risk prediction models. The variables were entered hierarchically, that is, first age, sex, and GPA, then mother's education, job, and history of pain, and finally father's education, job, and history of pain were entered. This way 3 models were formed for predicting the chronic pain the participants.

Afterwards, a multinomial logistic regression test was used to predict the effects of other variables. In fact, by performing this regression, multinomial logistic regression can estimate a separate binary logistic regression model for each of the other dummy variables. The result is M-1 binary logistic regression models, each one telling the effect of the predictors of risk on the probability of success in that category, in comparison to the reference category.

In this model, adolescents' chronic pain was considered the dependent variable and the characteristics related to parents, such as occupation, education level, and history of pain, were considered factors. The model's results were expressed as an odds ratio (OR) and confidence interval (CI). All data analyses were carried out using the SPSS 22 software (IBM Co.), considering a two-tailed significance level of $P < 0.05$.

4. Ethical considerations

This study was approved by the Ethics Committee of Shiraz University of Medical Sciences (IR.SUMS.REC.1396.S795). Permission for data collection was obtained from the participants' parents and the authorities of the study setting. Informed consent was also obtained from the participants and their parents. It should be noted that participation in the study was voluntary, and the participants were allowed to withdraw from the study at any stage. They were also assured about the confidentiality of their information.

RESULTS

The mean age of study participants was 15.6 ± 1.7 years, and more than half of them were female (57.4%).

1. Prevalence of pain, pain characteristics, and their relationships with demographic features

The results of univariate analysis showed that out of the 2,379 adolescents, 855 (35.9%) suffered from pain (non-chronic and chronic) and 565 (23.7%) suffered from chronic pain (for more than three months). Then, the demographic characteristics of participants with non-chronic and chronic pain were compared. The results showed that, in adolescents with chronic pain, there were significantly higher frequencies of pain in different locations of the body, home medications, and pain-related limitations ($P = 0.004$, $P = 0.004$, and $P = 0.017$, respectively) (**Table 1**).

The participants' chronic pain characteristics have been presented in **Table 2**. Accordingly, except for the home medications used for pain relief, other characteristics were not significantly different between the female and male students.

Among the participants who suffered from pain, the prevalence of chronic pain was higher in the girls aged 16–21 years (58.6%) and the boys aged 12–15 years (56.1%). The mean pain intensity (non-chronic and chronic in total) was 5.07 ± 2.85 in the adolescents: 4.44 ± 2.72 in boys and 5.52 ± 2.85 in girls. Accordingly, the girls had a significantly higher pain intensity compared to the boys ($P < 0.001$).

The results also showed no significant difference between the children aged 12–15 years and the adolescents

Table 1. Demographic characteristics of the participants according to their pain type (non-chronic *vs*. chronic)

Variable	Non-chronic pain	Chronic pain	*P* value
Sex			0.349
Male	119 (41.2)	242 (42.8)	
Female	170 (58.8)	323 (57.2)	
Isolation			0.490
Yes	37 (25.3)	109 (30.2)	
No	83 (74.7)	252 (69.8)	
Location			0.004
Headache	35 (12.1)	89 (15.8)	
Facial	7 (2.4)	11 (1.9)	
Chest/ischemic	8 (2.8)	17 (3.0)	
Spinal/back/neck	17 (5.9)	64 (11.3)	
Musculoskeletal	8 (2.8)	29 (5.1)	
Visceral/gastric	21 (7.3)	59 (10.4)	
Multisite	193 (66.8)	296 (52.4)	
Quality			0.321
Shooting	45 (36.3)	117 (30.1)	
Sharp	16 (12.9)	69 (18.3)	
Dull	29 (23.4)	113 (29.9)	
Radiating	15 (12.1)	44 (11.6)	
Point	19 (15.2)	34 (9.3)	
Referral for treatment			0.258
General physician	42 (39.3)	87 (27.4)	
Specialist	44 (41.1)	140 (44.0)	
Nursing services	1 (0.9)	5 (1.6)	
Traditional healers	2 (1.9)	8 (2.5)	
Multimode	13 (12.1)	52 (16.3)	
None	5 (4.7)	26 (8.2)	
Home medications for pain relief			0.004
Chemical drugs	43 (14.9)	110 (19.5)	
Herbal drugs	40 (13.8)	81 (14.3)	
No drugs	5 (1.7)	27 (4.8)	
Multimode	211 (69.6)	347 (61.4)	
Limitations			0.017
Absence from school	26 (9.0)	63 (11.1)	
In exercise	12 (4.1)	43 (7.6)	
In movement	20 (6.9)	67 (11.9)	
In going out of the house	4 (1.4)	14 (2.5)	
Reading	2 (0.7)	3 (0.5)	
Multiple simultaneous restrictions	225 (77.9)	375 (66.4)	

Values are presented as number (%).

aged 16–21 years in terms of non-chronic and chronic pain (P = 0.321). Nonetheless, the number of the participants who experienced pain was higher in the 12–15 age group compared to the 16–21 age group (P = 0.001), suggesting an increase in perceived pain during adolescence. Moreover, the girls experienced more chronic pain in comparison to the boys in both age groups (107 *vs*. 86 in the 12–15 age group and 136 *vs*. 76 in the 16–21 age

Table 2. Chronic pain characteristics of the participants according to their sex

Pain characteristics	Female	Male	*P* value
Isolation			0.098
Yes	65 (33.3)	44 (26.5)	
No	130 (66.7)	122 (73.5)	
Quality			0.995
Shooting	64 (30.9)	53 (31.2)	
Sharp	37 (17.9)	32 (18.8)	
Dull	66 (31.9)	47 (27.8)	
Radiating	28 (13.5)	16 (9.4)	
Point	12 (5.8)	22 (12.9)	
Location			0.091
Headache	50 (15.5)	39 (16.1)	
Facial	4 (1.2)	7 (2.9)	
Chest/ischemic	7 (2.2)	10 (4.1)	
Spinal/back/neck	33 (10.2)	31 (12.8)	
Musculoskeletal	15 (4.6)	14 (5.8)	
Visceral/gastric	43 (13.3)	16 (6.6)	
Multisite	171 (53.0)	125 (51.6)	
Referral for treatment			0.089
General physician	58 (32.9)	29 (20.4)	
Specialist	76 (43.2)	64 (45.1)	
Nursing services	1 (0.6)	4 (2.8)	
Traditional healers	3 (1.7)	5 (3.5)	
Multimode	25 (14.2)	27 (19.0)	
None	13 (7.4)	13 (9.2)	
Home medications for pain relief			< 0.001
Chemical drugs	67 (20.7)	43 (17.8)	
Herbal drugs	45 (13.9)	36 (14.9)	
No drugs	5 (1.6)	22 (9.1)	
Multimode	206 (63.8)	141 (58.3)	
Limitations			0.119
Absence from school	36 (11.1)	27 (11.2)	
In exercise	18 (5.6)	25 (10.3)	
In movement	42 (13.0)	25 (10.3)	
In going out of the house	5 (1.6)	9 (3.7)	
Reading	1 (0.3)	2 (0.8)	
Multiple simultaneous restrictions	221 (68.4)	154 (63.6)	

Values are presented as number (%).

group) (**Fig. 2**).

The most prevalent type of pain was 'shooting pain' in both sexes. In addition, the most common types of chronic pain were headache and gastric pain among the girls and headache and back pain among the boys. Medical drugs were the most common treatment used by the adolescents with chronic pain, and the most common limitation associated with pain was absence from school in both sexes. In most participants, however, chronic pain did not lead to isolation.

The majority of the adolescents under the present investigation lived with both parents (506 out of the 565 participants, 89.6%). The prevalence of chronic pain was higher in the adolescents who lived with one of their

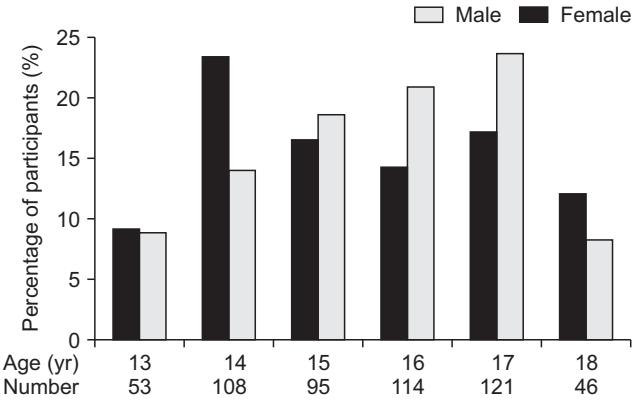

Fig. 2. The prevalence of chronic pain by the participants' sex and age. Chi-square test was applied.

parents (P = 0.011). Divorce was the most common reason for living with one parent (16 out of 59 participants, 35.6%), and single parenthood had a significant impact on the prevalence of chronic pain among the adolescents (P = 0.005). Furthermore, the majority of the adolescents with chronic pain were the first or only adolescents in their families (252 out of 551 participants, 45.7%). However, the adolescents' birth rank did not have any significant effects on the prevalence of chronic pain (P = 0.402).

The results of the Fisher and chi-square tests revealed no significant difference between the girls and boys in terms of pain location, cause and history of chronic pain, pain frequency, referral for treatment, chronic pain-induced limitations, or isolation (P = 0.090, P = 0.070, P = 0.502, P = 0.070, P = 0.821, P = 0.122, and P = 0.212, respectively). However, the two groups were significantly different in terms of the intensity of the last experience of chronic pain and the method used to reduce pain (P = 0.042 and P = 0.003). Accordingly, the girls experienced a higher pain intensity and used chemical or herbal remedies more, compared to boys.

2. Predictors of pain

In the bivariate analysis, before assessing the predictors of chronic pain, the association between the demographic variables and the existence of chronic pain in adolescents were evaluated using a chi-square test. The results showed that the mother's pain, education and occupation, and the father's education and chronic pain were significantly associated in adolescents (**Table 3**).

Then, at the third level of analysis (multivariate analysis), binary logistic regression was performed. Between the three binary logistic regression models presented, the third model, with variables which included the mother's pain, education and occupation, and the father's education, could predict the chronic pain in the adolescents better than the other models (accuracy = 65.8%), and the model fitness was approved by the Hosmer–Lemeshow test (P = 0.994). In this model, chronic pain was positively associated with the mother's pain, education and occupation, and the father's education (OR = 0.523, 95% CI: 0.206–1.326; OR = 1.046, 95% CI: 0.57–1.92; OR = 1.021, 95% CI: 0.358–2.909; and OR = 1.512 , 95% CI: 0.874–2.614; respectively).

Afterwards, the multinomial logistic regression test demonstrated that by including the aforementioned variables as predictors, the overall model fitted considerably better compared to an empty model (with no predictors) (P < 0.001). The results of this test revealed that despite the significant association of the mother's occupation and the parent's education with the chronic pain in adoles-

Table 3. Association between chronic pain status and contributing factors in study participants

Factors	Chronic pain status		Chi square/ Fisher exact value	*P* value
	Yes	No		
Sex				
Male	242	119	0.215	0.661
Female	323	170		
Mother pain				
Yes	129	65	0.419	< 0.001
No	259	147		
Father pain				
Yes	116	50	4.466	0.072
No	263	156		
Mother's education				
Under diploma	175	120		
Diploma	247	114	12.209	0.007
BS degree	94	36		
Higher degrees	36	10		
Mother's occupation				
Home-maker	407	228	7.685	0.017
Employed	143	51		
Father's education				
Under diploma	159	98		
Diploma	210	116	12.076	0.007
BS degree	127	46		
Higher degrees	49	12		
Father's job				
Unemployed	32	18		
Self-employed	246	118	0.694	0.913
Employed	264	138		
Retired	1	1		

BS: Bachelor of Science.

Table 4. The results of multinomial logistic regression for the predictors of chronic pain in the study participants

Variable	B	S.E.	*P* value	OR	CI
Mother's pain	0.905	0.144	< 0.001	2.472	1.865–3.276
Mother's occupation					
Home-maker	–0.266	0.164	0.104	0.767	0.556–1.056
Employed	Ref.				
Mother's education level					
Below diploma	–0.382	0.322	0.236	0.683	0.363–1.283
Diploma	–0.299	0.292	0.306	0.742	0.419–1.314
BS degree	–0.406	0.287	0.157	0.666	0.379–1.169
Higher degrees	Ref.				
Father's education level					
Below diploma	–0.068	0.278	0.808	0.935	0.542–1.612
Diploma	–0.096	0.253	0.705	0.909	0.553–1.492
BSc degree	–0.063	0.249	0.801	0.939	0.576–1.531
Higher degrees	Ref.				

S.E.: standard of error, OR: odds ratio, CI: confidence interval, BS: Bachelor of Science.

cents using the chi-square test, when they were entered in the regression model, the impact of the history of pain in the mother was so significant that it suppressed the effect of other variables. Accordingly, a one-unit increase in maternal pain was associated with a 0.664-unit increase (OR = 1.943) (**Table 4**).

DISCUSSION

The present study aimed to determine how common chronic pain was in Iranian adolescents and to assess the features and certain contributing factors of pain. The results indicated that pain was prevalent in 35.9% of the population, with chronic pain accounting for 23.7%. Similar results were obtained in a number of other studies conducted around the world as well as in Iran. Yet, the forms of pain experienced by adolescents in Iran and around the world varied statistically [19,20,28–30]. These variations mainly resulted from methodological differences rather than population differences, including research design (cross-sectional or longitudinal), data collection method (questionnaire, interview, or examination), localization and definition of the pain (*e.g.*, back pain), different definitions of point prevalence, and different age groups.

According to the present study findings, pain was more common in girls as they became older. In addition, the prevalence of chronic pain was higher in girls than in boys in both the 12–15 and 16–21 age groups, which was in line with the findings of other studies conducted on the issue [31–33]. This can be supported by the fact that girls are more likely to experience teenage pains like menstrual cramps, which can be severe and long-lasting. Therefore, they can make a substantial difference in terms of chronic pain among girls. Another reason is that adolescent girls are more emotionally sensitive compared to boys [34]. Moreover, girls' pain threshold and tolerance are lower compared to boys of the same age [35].

The results of the present investigation revealed no significant differences between the girls and boys as well as between the two age groups in terms of isolation and pain limitations. This indicated that despite experiencing pain, the adolescents were not isolated. Although the symptoms of anxiety and depression were not explored, the absence of isolation might be a sign of not having psychological problems in the study participants. These results were consistent with those of some other studies, which might be related to the supportive culture of adolescents' families and friends in Iran [36]. On the other hand, no significant difference was observed between the girls and boys regarding absenteeism from school. Additionally, there were no significant difference between the two age groups concerning the methods used to control the pain symptoms. Nonetheless, a significant difference was observed between the girls and boys in this respect. Accordingly, the girls used more treatments such as medications and herbal medicines, while boys tried to control their pain without using medications. This may be attributed to the differences in the expression and experience of pain by males and females during the process of socialization. In other words, social and cultural norms can reduce males' response to pain.

Regarding the factors related to pain, birth rank had no

significant effects on the incidence of pain. However, not living with both parents was associated with an increased incidence of pain, which was confirmed in another study [18]. Therefore, parents can play a key role in preventing chronic pain among their children [31]. In this context, the presence of both parents seems necessary.

According to the results of the multinomial logistic regression test, increase in maternal pain was accompanied by an increase in the pain reported by the adolescents. Other studies also emphasized that the incidence of low back pain in a family member increased the risk of low back pain in adolescents [30,37] that means parents play a vitally important role [38]. Nonetheless, other studies have shown that pain catastrophizing and behavioral responses to pain differ between mothers and fathers. Thus, maternal and paternal experiences may have different effects on children's and adolescents' pain experiences [17,39,40]. The existing literature has mainly focused on a single aspect of sex (*e.g.*, masculinity), does not reflect modern sex norms, and has not considered sex identity. Hence, studies using qualitative methodologies are required to better understand the gendered experiences of young adults suffering from chronic pain. Moreover, longitudinal studies covering a wide age range of children and adolescents, population-level data, and meta-analyses can help address the effects of the exaggerated parental expressions of pain [41,42].

The present study results revealed that parents' education and maternal occupation were associated with the existence of chronic pain in adolescents. These results were in agreement with previous studies which demonstrated that parents' cognitive, behavioral, and affective factors might affect the behavioral outcomes, adaptation, and distress of chronic pain among children and adolescents [16,43–46]. These findings supported the inclusion of parent-related factors in the assessment of pain and the related interventions among adolescents [39], which is in line with the findings of another study [45].

One of the strengths of the present study was its large sample size, which confirmed the findings related to pain changes in both age ranges as well as in both sexes. Another important strength of the study was that, in addition to assessing the prevalence of chronic pain in the adolescents, the factors contributing to the incidence of pain were evaluated in terms of age and sex. Nonetheless, the study variables could explain 15% of the changes in pain. Therefore, assessment of other variables such as the psychological and physical health of adolescents and their parents, in other words, their quality of life, might help in understanding other contributing factors.

The results of the present study provided basic and essential information about the contributing factors in this area. These findings can be used by physicians, nurses, psychologists, physiotherapists, pharmacists, child life specialists (play specialists), and other allied health professionals that have important roles in providing pain management. As physiological, psychological, and social factors contribute to pain experience, a biopsychosocial management model involving multiple disciplines is widely acknowledged to be important. In other words, professionals in all disciplines have to understand all the factors in a biopsychosocial approach to addressing pediatric pain. Overall, the researchers emphasize the need for future interdisciplinary training to improve the effectiveness of pain management in adolescents, focusing on effective therapies and patient–clinician communication.

This study failed to evaluate psychological factors such as anxiety, depression, school problems, sleep, and physical activity as the factors associated with the occurrence of pain among adolescents [47–49]. Additionally, some factors such as sitting time, sitting straight, and using assisting devices during reading in school, assessed in previous studies [50], were not taken into account in the present study. Moreover, some studies have shown that chronic pain could affect the academic achievement of children and adolescents [33]. Since this relationship was not investigated in the present study, it is suggested that it should be evaluated in cohort studies in order to identify the effective factors and apply appropriate interventions. As another study limitation, menstrual pain was not considered a separate option in the study questions and, consequently, the girls might mistakenly place this pain in the group of chronic pains (more than one month). Therefore, the results related to chronic pain and their differences with boys could not be shown accurately. Finally, one of the limitations of all studies on pain is the use of self-report tools, in which participants may report their pain to be higher or lower than the real levels.

In conclusion, considering the somewhat high prevalence of chronic pain in the participants, this issue should be taken into account by healthcare teams, school nurses, parents, and school teachers. Moreover, such factors as anxiety, depression, school problems, sleep, and physical activity are suggested for consideration in future studies, especially in longitudinal ones. Furthermore, since school-related outcomes were only assessed using self-reported school attendance with a single item in the "limitations" section, the Pediatric Quality of Life Inventory-41 or the Harter Self-Perception Profile for Adolescents-15 are recommended for use in future studies as a

broader or more standardized assessment of school performance.

DATA AVAILABILITY

The datasets supporting the findings of this study are available from the corresponding author upon reasonable request.

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CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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AUTHOR CONTRIBUTIONS

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