ORIGINAL ARTICLE

Prevalence of musculoskeletal pain in adolescents and its association with the use of electronic devices*

Prevalência de dor musculoesquelética em adolescentes e sua associação com o uso de dispositivos eletrônicos

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ABSTRACT

BACKGROUND AND OBJECTIVES: The use of electronic devices has reconfigured the daily life of adolescents; however, their excessive use may be associated to health problems. This study aimed at observing the prevalence of musculoskeletal pain among adolescents and its association with the use of computers and videogames.
METHODS: Sample was made up of 265 adolescents of both genders (14 to 19 years old), students of a public school, who have answered a questionnaire about the use of electronic devices, musculoskeletal pain, physical activity and demographics. Values of absolute and relative frequency, confidence intervals and mean and standard deviation were expressed for descriptive analysis. Independent *t* and Chi-square tests were used for comparison between genders, and multiple logistic regression model was used for association test. All tests had significance level of 5%.
RESULTS: The prevalence of musculoskeletal pain was 72.1%, being significantly higher for females. There has been no association between musculoskeletal pain and the use of electronic devices; however it was identified that females had 10.66 times more probability of reporting this type of pain. Cervical and thoraco-lumbar pains were associated to females (OR=1.80), and individuals attending the 2nd and 3rd year were associated to cervical pain (OR≥2.26).
CONCLUSION: There has been high prevalence of musculoskeletal pain among adolescents, especially females. Although not observing association between pain and use of electronic devices, it was noted that those attending the last years of high school and of the female gender had higher risk to develop musculoskeletal pain.
Keywords: Adolescent, Computer, Musculoskeletal pain, Technology, Videogames.

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RESUMO

JUSTIFICATIVA E OBJETIVOS: O uso de dispositivos eletrônicos reconfigurou o cotidiano dos adolescentes, porém a utilização excessiva pode estar associada a problemas de saúde. O objetivo deste estudo foi verificar a prevalência de dor musculoesquelética em adolescentes e sua associação com o uso de computador e jogos eletrônicos.
MÉTODOS: A amostra foi composta por 265 adolescentes de ambos os gêneros (14 a 19 anos), estudantes de uma escola pública, que responderam um questionário sobre uso de dispositivos eletrônicos, dor musculoesquelética, atividade física e dados sócio-demográficos. Para análise descritiva, foram expressos valores de frequência absoluta, relativa, intervalos de confiança e média e desvio padrão. Foram utilizados o teste t independente e Qui-quadrado para comparação entre gêneros, e modelo de regressão logística múltipla para teste de associação. Todos os testes tiveram nível de significância de 5%.
RESULTADOS: A prevalência de dor musculoesquelética foi de 72,1%, sendo significativamente maior no gênero feminino. Não foi encontrada associação entre dor musculoesquelética e uso de dispositivos eletrônicos. Porém, foi identificado que o gênero feminino apresenta 10,66 mais probabilidades de referir esse tipo de dor. As dores cervicais e toracolombares tiveram associação com gênero feminino (OR=1,80) e os indivíduos que cursam o 2º e 3º ano tiveram associação com dor cervical (OR≥2,26).
CONCLUSÃO: Evidenciou-se alta prevalência de dor musculoesquelética nos adolescentes, principalmente do gênero feminino. Embora não se tenha observado associação entre dor e uso de dispositivos eletrônicos, notou-se que aqueles que cursam os últimos anos do ensino médio e do gênero feminino apresentam maior risco de desenvolver dores musculoesqueléticas.
Descritores: Adolescente, Computador, Dor musculoesquelética, Jogos de vídeo, Tecnologia.

INTRODUCTION

Recent technological development has increased and made easier personal access to electronic devices. The use of such devices (computers, tablets, cell phones and videogames) is changing the daily routine of adolescents and becoming a central part of their lives, be it for socialization, entertainment, learning or working, enhancing adolescents' interest[1-3].

It is claimed that expressive technological development, added to Brazilian economic growth, is increasing the excessive use of such devices by adolescents. In addition, digital inclusion programs might have possibly increased time spent with such technologies[2]. In 2012, one such program was implemented by the State Department of Education of Pernambuco, which has distributed tablets or notebooks for high school students, aiming at making easier the access to such communication media. However, the abusive use may generate mental overload, excess weight, sedentary habits, musculoskeletal pain and decreased sleep duration, inducing aggressiveness, irritability and tiredness symptoms among adolescents. Inadequate postures for a long time, commonly adopted during the use of the devices, may justify the presence of some of these symptoms[3-8].

In Brazil, the only study to evidence association between excessive computer use and musculoskeletal pain was carried out in 2003 and has not found such association[9]. More recent studies carried out in developed countries[10-12] have found association and with this it is possible to infer that the temporal factor, added to socioeconomic and technological development, may influence such results.

So, this study aimed at determining the prevalence of musculoskeletal pain among adolescents of a public school and its association with the use of computer and videogames.

METHODS

This is a descriptive, correlational and crossover study carried out in the Application School Professor Vande de Souza Ferreira, Petrolina. Sample was made up of 262 adolescents of both genders. For sample calculation with the WinPepi program[13], we considered the school population (n=600), bilateral statistics with α=0.05, power of 80%, estimated proportion of 50%, 5% error and sample loss of 10%.

Inclusion criteria were students aged from 14 to 19 years, with duly dated Free and Informed Consent Term (FICT) signed by them or their guardians, when minors. Exclusion criteria were adolescents with some mental or cognitive impairment to answer the questionnaire, physical disability preventing or compromising measurements, and also pregnant women, in addition to students with musculoskeletal pain or injuries due to recent infectious onco-hematologic, genetic and traumatic diseases.

The questionnaire had questions to evaluate the following variables: age, gender, school grade attended, paid activity, family income in minimum wages, use of computer and videogames, presence of musculoskeletal pain and physical activity level. For such, 46 questions of the self-applicable questionnaire *Musculoskeletal syndromes and injuries in children and adolescents and their relationship with computer and videogames* and a drawing representing the human body to locate pain, according to Jannini et al.[14], were used. This tool includes aspects of musculoskeletal painful symptoms present in the last three months and questions related to the use of computers and videogames. Some questions were adapted to help study understanding and scope, replacing laptop and videogames by Notebook/Tablet and electronic games, respectively.

Regarding the use of computers, use of computer (types), home availability, own device, age when started using, use frequency (Monday to Friday and weekends) and activities performed with the device were evaluated. With regard to videogames, the following were evaluated: use of games, home availability, own device, use frequency and time (Monday to Friday, Saturday and Sunday), use the day before the study and use time.

With regard to painful symptoms, the questionnaire has evaluated: onset time, periodicity, duration and time, modular and triggering factors, sensory features, interference on daily activities, use of analgesics, site, and intensity evaluation by the 10-point numeric visual scale. Answers to the International Physical Activity Questionnaire (IPAQ) – Short Version[15] were used to evaluate the level of physical activity.

Portable electronic scale (Camry) and portable stadiometer (Welmy) were used to collect body mass index (BMI) and height, respectively, according to International Society for the Advance of Kinanthropometry (ISAK) standardization[16]. Individuals' classification by IMC has followed criteria suggested by Cole et al.[17].

Statistical analysis

Independent variables gender, age, socioeconomic level, professional activity, physical activity level, nutritional status, time using computers, time using videogames and total device use time, and the dependent variable presence of pain were considered. To differentiate pain sites, its presence in cervical, shoulder girdle and thoracolumbar regions, and in upper and lower limbs was considered.

Data were tabulated in the Microsoft Excel program by double data entry. Statistical program SPSS (version 20) was used for data analysis. Distribution of relative and absolute frequency of categorical variables and confidence interval (CI 95%) for proportions were used for descriptive analysis. Mean and standard deviation were calculated for numerical variables.

For inferential analysis, Kolgomorov-Sminorv test was used for data distribution analysis, Pearson Chi-square test was used to check possible associations between two variables and independent *t* test was used to analyze difference between genders. Multiple logistic regression was used to express the level of association among variables, through odds ratio estimate (Odds Ratio=OR) and confidence interval of 95%. Such analysis has allowed the observation of model variables and the exploration of confounding factors, identifying possible need for analysis adjustment. It is worth mentioning that only variables with $p<0.20$ in regression were part of the final multiple model. Hosmer-Lemeshow value has described the explanatory power of the final model. Statistical significance was $p<0.05$.

The study was approved by the Research and Ethics Committee UPE CAAE: 13598313.5.0000.5207.

RESULTS

Participated in the study 262 adolescents, aged between 14 and 19 years. Socio-demographic and anthropometric features,

nutritional status, physical and professional activity level are presented in Table 1. In comparing genders, male adolescents had higher height, BMI and physical activity level (Table 1).

With regard to the use of devices, mean computer use time was 228.75 min per week and 3.83 h per day; while for videogames, mean was 52.07 min per week and 3.83 h per day. Mean total time was 4.69 h.

In comparing between genders, there has been no statistically significant difference in computer use (p=0.947). However boys used videogames for a longer period (p=0.001) and had longer total time (p=0.007) (Figure 1).

Data regarding musculoskeletal complaints are shown in table 2. Girls had more painful complaints, especially in the thoracolumbar region, and tiredness sensation at wake-time and during the day. In addition, they have reported more use of analgesics (Table 2).

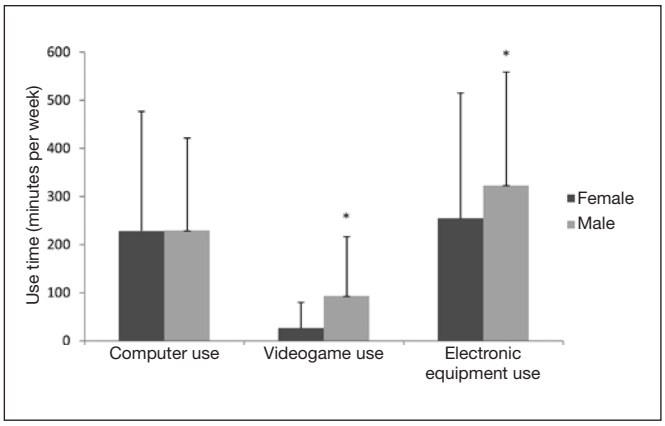

Figure 1. Comparison between genders of computer and videogame use time and total time in minutes per week

*p<0.05.

Table 1. Socio-demographic, anthropometric features, nutritional status, physical and professional activity level of adolescents, stratified by gender

Variables	Total (n=262)	Male (n=101)	Female (n=161)	p value
Age *	15.36±1.56	15.49±1.55	15.27±1.56	0.292
Body mass index*	56.61±11.21	58.91±10.93	55.16±11.18	0.001
Height*	165.45±8.41	171.03±8.14	161.95±6.47	0.001**
Family income				
1 to 2 MW	120(47.4%)	40 (40%)	80 (52.3%)	0.074
Above 2 MW	133 (52.6%)	60 (60%)	73 (47.7%)	
Nutritional status				
Eutrophic	70 (26.7%)	28 (27.7%)	42 (26.1%)	0.882
Overweight/obesity	192 (73.3%)	73 (72.3%)	119 (73.9%)	
Physical activity level				
Active	160 (61.1%)	72 (71.3%)	88 (54.7%)	0.011*
Inactive	102 (38.9%)	29 (28.7%)	73 (45.3%)	
Professional activity				
Yes	90 (34.5%)	39 (39%)	51 (31.7%)	0. 282
No	171 (65.5%)	61 (61%)	110 (68.3%)	

MW = minimum wage; Values in Mean±SD; ** p<0.05.

Table 2. Absolute and relative frequencies of painful symptoms, tiredness sensation at wake-time and along the day, difficulty to sleep, pain intensity and site in adolescents, stratified by gender

Variables	Total n (%)	Male n (%)	Female n (%)	p value
Pain symptoms				
Yes	189 (72.1)	62 (61.4)	127 (78.9)	0.003*
No	73 (27.9)	39 (38.6)	34 (21.1)	
Cervical and shoulder girdle pain				
Yes	94 (36.2)	29 (29.3)	65 (40.4)	0.094
No	166 (63.8)	70 (70.7)	96 (59.6)	
Upper limb pain				
Yes	37 (14.2)	14 (13.9)	23 (14.4)	0.999
No	224 (85.8)	87 (86.1)	137 (85.6)	
Thoracolumbar pain				
Yes	110 (42.1)	34 (34.0)	76 (47.2)	0.049*
No	151 (57.9)	66 (66.0)	85 (52.8)	
Lower limb pain				
Yes	110 (42.5)	35 (35.4)	75 (46.9)	0.090
No	149 (57.5)	64 (64.6)	85 (53.1)	
Under analgesics				
Yes	184 (70.2)	59 (58.4)	125 (77.6)	0.002*
No	78 (29.8)	42 (41.6)	36 (22.4)	

*p<0.05.

Multiple logistic regression analysis has shown that variables gender and school grade were maintained in the final model, being that females were more likely to have musculoskeletal pain (p=0.001). However, adolescents of the 8th grade had lower probabilities of complaints (p=0.036) (Table 3). Hosmer-Lemeshow value was 98%.

With regard to different anatomic regions and painful symptoms, adolescents and students of the second and third year were almost twice more likely to report cervical and shoulder girdle pain (p<0.021) (Table 4).

For the thoracolumbar region, just the variable gender was kept in the final model, showing that female adolescents are more likely to report pain complaints in this region (p=0.035) (Table 5).

No association was observed between independent variables and upper and lower limbs pain (Table 6).

Table 3. Association of independent variables and the presence or absence of musculoskeletal pain among adolescents

Independent variables	Presence of pain n (%)	Absence of pain n (%)	OR [CI 95%]	OR Multiple Model [CI 95%]
Gender				
Female	127 (67.2)	34 (46.6)	2.35 [1.35 – 4.08]*	10.66 [1.37 – 82.62]*
Male	62 (32.8)	39 (53.4)		
Age (years)				
14 to 15	97 (51.3)	38 (52.0)	0.97 [0.57 – 1.67]	
16 to 19	92 (48.7)	35 (48.0)	1	
Education				
8th grade	85 (45.2)	41 (56.2)	0.78 [0.37 – 1.65]*	0.41 [0.23 – 0.73]*
1st year	23 (12.2)	1 (1.4)	1	
2nd year	55 (29.3)	16 (22.0)	10.82 [1.41 – 83.00]*	
3rd year	25 (13.3)	15 (20.5)	1.59 [0.31 – 3.11]	
Socioeconomic level				
Up to 2 MW	91 (50.3)	29 (40.3)	1.50 [0.86 – 2.61]	
Above 2 MW	90 (49.7)	43 (59.7)	1	
Professional activity				
Works	66 (35.1)	24 (32.9)	1.11 [0.62 – 1.96]	
Does not work	122 (64.9)	49 (67.1)	1	
Nutritional status				
Overweight/obesity	133 (70.4)	59 (80.8)	0.56 [0.29 – 1.09]	
Eutrophic	56 (29.6)	14 (19.2)	1	
Physical activity level				
Inactive	74 (39.2)	28 (38.4)	1.03 [0.59 – 1.80]	
Active	115 (60.8)	45 (61.6)	1	
Computer use				
High time (>3h/day)	111 (58.7)	39 (53.4)	1.24 [0.72 – 2.14]	
Low time (<3h/day)	78 (41.3)	34 (46.6)	1	
Videogames use				
High time (>1h/day)	65 (34.4)	33 (45.2)	0.63 [0.37 – 1.10]	
Low time (<1h/day)	124 (65.6)	40 (54.8)	1	
Total time				
High	92 (48.7)	40 (54.8)	0.78 [0.45 – 1.34]	
Low	97 (51.3)	33 (45.2)	1	

*p<0,05. MW = minimum wage.

Table 4. Association of independent variables and presence and absence o cervical and shoulder girdle pain among adolescents

Independent variables	Presence of pain n (%)	Absence of pain n (%)	OR [CI 95%]	Adusted OR [CI 95%]
Gender				
Female	65 (69.1)	96 (57.8)	0.61 [0.35 – 1.04]	1.80 [1.02 – 3.17]*
Male	29 (30.9)	70 (42.2)	1	
Age (years)				
14 to 15	50 (50.5)	85 (51.2)	0.92 [0.56 – 1.53]	
16 to 19	44 (49.5)	81 (48.8)	1	
Education				
8th grade	39 (41.9)	87 (52.4)	0.56 [0. 24 – 1.32]	2.52 [1.02 – 6.22]*
1st year	13 (14.0)	11 (6.6)	1	2.26 [1.21 – 4.22]*
2nd year	33 (35.5)	36 (21.7)	2.64 [1.10 – 6.40]*	
3rd year	8 (8.6)	32 (19.3)	2.05 [1.12 – 3.74]*	
Socioeconomic level				
Up to 2 MW	46 (50.0)	73 (46.0)	0.84 [0.51 – 1.42]	
Above 2 MW	46 (50.0)	86 (54.0)	1	

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Table 4. Association of independent variables and presence and absence o cervical and shoulder girdle pain among adolescents – continuation

Independent variables	Presence of pain n (%)	Absence of pain n (%)	OR [CI 95%]	Adusted OR [CI 95%]
Professional activity				
Works	33 (35.5)	55 (33.1)	0.90 [0.53 – 1.54]	
Does not work	60 (64.5)	111 (66.9)	1	
Nutritional status				
Overweight/obesity	63 (67.0)	129(77.7)	1.72 [0.98 – 3.02]	
Eutrophic	31 (33.0)	37 (22.3)	1	
Physical activity level				
Inactive	42 (44.7)	60 (36.1)	0. 70 [0.42-1.17]	
Active	52 (55.3)	106 (63.9)	1	
Computer use				
High time (>3h/day)	57 (60.6)	92 (55.4)	0.81 [0.48 – 1.35]	
Low time (<3h/day)	37(39.4)	74 (44.6)	1	
Videogame use				
High time (>1h/day)	33 (35.1)	63 (38.0)	1.13 [0.67-1.92]	
Low time (<1h/day)	61 (64.9)	103 (62.0)	1	
Total time				
High	47 (50.0)	84 (50.6)	1.02 [0.62 – 1.70]	
Low	47(50.0)	82 (49.4)		

*p<0.05; MW = minimum wage.

Table 5. Association of independent variables and the presence and absence of thoracic and lumbar pain among adolescents

Independent variables	Presence of pain n (%)	Absence of pain n (%)	OR [CI 95%]	Adjusted OR [CI 95%]
Gender				
Female	76 (69.1)	85 (56.3)	0.58 [0.34-0.97]	1,80 [1,06 – 3,04]*
Male	34 (30.9)	66 (43.7)	1	
Age (years)				
14 to 15	57 (51.8)	78 (51.7)	0.99 [0.61-1.62]	
16 to 19	53 (48.2)	73 (48.3)	1	
Education				
8th grade	53 (48.6)	73 (48.4)	0.59 [0.28 – 1.27]	
1st year	12 (11.0)	12 (7.9)	1	
2nd year	32 (29.4)	38 (25.2)	1.38 [0.57 – 3.30]	
3rd year	12 (11.0)	28 (18.5)	1.16 [0.64 – 2.09]	
Socioeconomic level				
Up to 2 MW	55 (51.4)	64 (44.1)	0.75 [0.45 – 1.23]	
Above 2 MW	52 (48.6)	81 (55.9)	1	
Professional activity				
Works	41 (37.6)	48 (31.8)	0.77 [0.46 – 1.30]	
Does not work	68 (62.4)	103 (68.2)	1	
Nutritional status				
Overweight/obesity	76 (69.1)	116 (76.8)	1.48 [0.85 – 2.58]	
Eutrophic	34 (30.9)	35 (23.2)	1	
Physical activity level				
Inactive	47 (42.7)	55 (36.4)	0.77 [0.47 – 1.27]	
Active	63 (57.3)	96 (63.6)	1	
Computer use				
High time (>3h/day)	67 (61.0)	83 (55.0)	0.78 [0.48 – 1.29]	
Low time (<3h/day)	43 (39.0)	68 (45.0)	1	
Videogame use				
High time (>1h/day)	41 (37.3)	56 (37.1)	0.99 [0.60 – 1.65]	
Low time (<1h/day)	69 (62.7)	95 (62.9)	1	
Total time				
High	56 (50.9)	76 (50.3)	0.98 [0.60 – 1.60]	
Low	54 (49.1)	75 (49.7)	1	

*p<0.05; MW = minimum wage.

Table 6. Association of independent variables and presence and absence of upper and lower limb pain among adolescents

Independent variables	Upper limb			Lower limb		
	Presence of pain n (%)	Absence of pain n (%)	OR [CI 95%]	Presence of pain n (%)	Absence of pain n (%)	OR [CI 95%]
Gender					85 (57.0)	
Female	23 (62.2)	137 (61.2)	0.96 [0.47-1.96]	75 (68.2)		0.62 [0.37-1.04]
Male	14 (37.8)	87 (38.8)	1	35 (31.2)	64 (43.0)	1
Age (years)						
14 to 15	22 (59.5)	112 (50.0)	0.68 [0.34-1.38]	56 (51.0)	78 (52.3)	1.06 [0.65-1.73]
16 to 19	15 (40.5)	112 (50.0)	1	54 (49.0)	71 (47.7)	1
Education						
8th grade	16 (43.3)	109 (48.9)	0.76 [0.24 - 2.41]	53 (48.2)	72 (48.7)	1.29 [0.63 – 2.65]
1st year	6 (16.2)	18 (8.1)	1	9 (8.2)	15 (10.1)	1
2nd year	11 (29.7)	60 (26.9)	2.27 [0.79 - 6.57]	29 (26.4)	41 (27.7)	0.82 [0.33 – 2.00]
3rd year	4 (10.8)	36 (16.1)	1.25 [0.55 - 2.86]	19 (17.2)	20 (13.5)	0.96 [0.53 – 1.74]
Socioeconomic level						
Up to 2 MW	15 (44.1)	104 (47.9)	1.09 [0.53 – 2.24]	55 (54.5)	64 (44.4)	0.74 [0.45 – 1.23]
Above 2 MW	19 (55.9)	113 (52.1)	1	51 (45.5)	80 (55.6)	1
Professional activity						
Works	9 (25.0)	81 (36.2)	1.70 [0.76 – 3.79]	37 (33.6)	52 (35.1)	1.07 [0.64 – 1.80]
Does not work	27 (75.0)	143 (63.8)	1	73 (66.4)	96 (64.9)	1
Nutritional status						
Overweight/obesity	26 (70.3)	165 (73.7)	1.18 [0.55 – 2.54]	81 (73.6)	109 (73.2)	0.98 [0.56 – 1.70]
Eutrophic	11 (29.7)	59 (26.3)	1	29 (26.4)	40 (26.8)	1
Physical activity level						
Inactive	17 (46.0)	84 (37.5)	0.71 [0.35 – 1.42]	37 (33.6)	64 (43.0)	1.50 [0.89 – 2.48]
Active	20 (54.0)	140 (62.5)	1	73 (66.4)	85 (57.0)	1
Computer use						
High time (>3h/day)	23 (62.2)	127 (43.3)	0.80 [0.39 – 1.63]	65 (59.0)	83 (55.7)	0.87 [0.53 – 1.43]
Low time (<3h/day)	14 (37.8)	97 (56.7)	1	45 (41.0)	66 (44.3)	1
Videogame use						
High time (>1h/day)	17 (46.0)	81 (36.2)	0.67 [0.33 – 1.34]	33 (30.0)	64 (43.0)	1.76 [0.94 – 2.96]
Low time (<1h/day)	20 (54.0)	143 (63.8)	1	77 (70.0)	85 (57.0)	1
Total time						
High	20 (54.0)	112 (50.0)	0.85 [0.42 – 1.71]	52 (47.3)	78 (52.3)	1.23 [0.75 – 2.01]
Low	17 (46.0)	112 (50.0)	1	58 (52.7)	71 (47.7)	1

MW = minimum wage.

DISCUSSION

This study was encouraged by the lack of Brazilian studies evaluating musculoskeletal pain prevalence in adolescents and its possible association with the use of computers and videogames. There has been high prevalence (72.1%) of musculoskeletal complaints, especially among females. Lower rates (4-40%) were found in a systematic review[18], and its authors justify that such disparity is due to methodological and sample criteria of evaluated studies.

However, a previous study[9] with adolescents of a private school of São Paulo, using similar methodological procedure as our study, has observed 39.4% prevalence of musculoskeletal complaints. It is believed that the difference in prevalence might be justified by issues regarding type of teaching (public and private), which directly impacts socioeconomic status, by regional issues (Brazilian Northeastern and Southeastern regions), by the type of questionnaire (associated or not to the use of electronic devices) and by temporal analysis of answers (pain in the last 3 months and in the last 6 months). In addition, possible lifestyle changes along the years seem to influence results, fact which reinforces the importance of such investigation about factors associated to this problem, making indispensable the evaluation and total health attention for such individuals.

With regard to gender, it was observed that the prevalence of musculoskeletal pain among adolescents was significantly higher (78.9%) among females as compared to males (61.4%) with pain complaint likelihood 10.66 higher for females. Confirming this finding, other studies[3,6,9,18] have also observed that musculoskeletal pain was more common among girls. However, factors which may influence this difference between genders in the prevalence of musculoskeletal pain are still not fully defined[18].

It is argued that such issue could be explained by social and educational aspects, since females in general are more attentive to health-related issues and as a consequence would more frequently report possible complaints or symptoms. In addition, the presence of hormonal changes in girls during puberty may influence results[19]. On the other hand, Costigan et al.[20] have reported that girls have lower physical activity levels and longer time spent with sedentary behaviors

which, associated to described factors, negatively contribute to different health indicators, including musculoskeletal pain complaints.

Our study has observed mean computer use of 3.83 hours/day and total time of 4.69 hours/day. In the literature, values used as reference points to characterize long electronic devices use time vary between 2 and 5 hours/day[21]. With this, it may be inferred that time spent with computers and total use time found among evaluated adolescents are high. According to previous studies, total time spent by adolescents during one week using computers may vary from 80 to 840 min[1,2], which confirms our study results.

This variation might be explained by the level of technological and economic development of a certain country or region. In this sense, excessive hours using such equipment by the studied sample, are possibly due to a higher number of activities which may be performed by means of electronic devices, as well as to broader availability of such equipment in the most different places[21]. Furthermore, this result might be a reflex of the program implemented by the State Department of Education, which has distributed such equipment to all high school students of public schools and has contributed for increased access to this technology, otherwise available only to families with higher socioeconomic levels[2]. The number of hours spent by adolescents of this study translates the excessive use of such devices and may be a warning sign for possible pain complaints.

The grade attended by adolescents was a relevant factor to trigger musculoskeletal pain. This study has identified that students of the 8th grade had lower possibilities of pain complaints (OR=0.41) and those attending the 2nd and 3rd year of high school had, respectively, 2.52 and 2.56 more probabilities of reporting cervical and shoulder girdle pain. Such result might be due to the fact that students are preparing for college entrance examination, with high levels of stress due to professional choice issues, which may increase the likelihood of pain onset, especially musculoskeletal pain[22].

Finally, there has been no association between musculoskeletal pain and the use of computers and videogames. This result is different from the international literature[10-12], but confirms a Brazilian study[9]. Such findings portray the reality of two States of a still developing country. In developed countries, it is evident that time using electronic devices is very high and increases the risk for musculoskeletal pain[3,5]. Notwithstanding our results, this study has evaluated just one public school of a city in the countryside of Pernambuco, restricting both generalization of results to public school students and the extrapolation to private school students. In addition, the self-applied questionnaire may admit memory bias of respondents, over or undervaluing their answers.

Longitudinal studies, based on representative samples, with public and/or private school students, may offer significant contributions for the study of the relationship between the use of electronic devices and musculoskeletal pain. In spite of the limitations of this study, results found are a warning sign for possible pain onset based on adolescents' gender and age. Our results suggest the follow up of adolescents excessively using such devices, to decrease as much as possible negative repercussions related to this use.

CONCLUSION

Our results have evidenced high prevalence of musculoskeletal pain among adolescents, especially among females. In spite of the excessive use of computers and videogames, it was not possible to observe associations with musculoskeletal pain. It was only observed that pain is associated to gender and to the attended grade, being that females and students of the last school years are more exposed to musculoskeletal pain risks.

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