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The prevalence of musculoskeletal pain among school students and its association with physical fitness in Guwahati urban society: a cross sectional study

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Abstract

Introduction and background The musculoskeletal pain (MSK) develops at an early age and pains in adolescence dispose to subsequent pain episodes in adulthood. High physical fitness levels in childhood and adolescence are linked to favorable health outcomes.

This study has evaluated the prevalence of musculoskeletal pain among school students. Additionally, it examines the existing physical fitness of those children and explores potential associations between musculoskeletal pain and physical fitness.

Methods A cross sectional study was conducted in the Guwahati urban area, a capital city of North East India, in different schools. The mean and standard deviation of age was 9.49 ± 2.53. Prevalence of MSK pain was determined by the Faces Pain Scale–Revised and pediatric Gait Arm Leg Spine (pGALS) assessment, whereas physical fitness was assessed by Fitnessgram test battery.

Statistical analysis Paired "*t*" test and logistic regression analysis were used. The level of significance was set at 0.05 for all tests performed, and 95% confidence intervals (CIs) were used in all cases.

Results The percentage of musculoskeletal pain is 38.28% where female school students have 40.33% and the male students have 36.52%. The odd ratio of 0.934 (CI = 0.916–0.972) was found between pain occurrence and aerobic capacity. The odd ratio of 0.72 (CI = 0.704–0.761) was found between the chances of pain onset and abdominal strength and endurance. The odd ratio of 0.859 (CI = 0.831–0.899) was found between pain occurrence and trunk extensor muscle strength and endurance.

Conclusion The prevalence of the musculoskeletal pain in school students is found to be 38.28%. The incidence of musculoskeletal pain and the physical fitness of a child has a significant relationship, with children who have poor physical fitness being more likely to develop musculoskeletal pain.

Keywords Prevalence, Musculoskeletal pain, Physical fitness, Fitnessgram, School students

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Introduction

Musculoskeletal (MSK) pain is the pain that originates from the musculoskeletal system which is pronounced in the young and adolescent school-going children [1]. MSK pain in school-going children is quite common with 7 to 15% reporting complaints [2]. In a prospective study, it was found that 6% of the children older than 3 years who visit a pediatric primary care clinic (PPCC) suffer from MSK pain [3]. A number of previous studies have documented the association between musculoskeletal pain in childhood and the development of musculoskeletal disorders in adulthood [4–6]. Evidence shows that MSK pain develops at an early age, and pain in adolescence dispose to subsequent pain episodes in adulthood [7–9].

Children with musculoskeletal pain-related syndromes show a significant decrease in maximal exercise capacity [10]. Physical fitness characteristics and participation in physical activity predict musculoskeletal pain symptoms and injuries, with baseline muscular strength, flexibility, and physical activity associated with future low back pain or tension neck in adults [11]. High physical fitness levels in childhood and adolescence are linked to favorable health outcomes, including a reduced risk for obesity, cardiovascular disease, skeletal issues, and mental health problems [12]. Physical inactivity leads to a decline in exercise capacity in children.

Careful performance of a competent musculoskeletal examination is necessary for the diagnosis of MSK pain because musculoskeletal symptoms are not always easily volunteered by children, requiring parental observations that may be nonspecific [13, 14]. The children face difficulty understanding rating scales to describe their pain on a visual analogue scale (VAS), so a series of faces depicting different levels of pain in Faces Pain Scale–Revised (FPS-R) is used [15]. Faces Pain Scale–Revised (FPS-R) is self-report measure of pain intensity developed for children [15]. It was adapted from the Faces Pain Scale [16] to make it possible to score the sensation of pain on widely accepted 0 to 10 metric. The scale shows a closed linear relationship with the visual analog pain scales across the age range of 4–16 years. It is easy to administer and requires no equipment except for the photocopied faces. A validated pediatric musculoskeletal screening test named pediatric Gait Arm Leg Spine (pGALS) based on adult Gait, Arms, Legs, Spine (GALS) was introduced to find abnormal musculoskeletal findings which need to be interpreted in the global clinical context and assessment [17]. In the presence of various widely accepted fitness tests which were employed in schools and colleges for evaluating and monitoring the physical fitness, only those that promote enjoyment and intrinsic motivation for physical activity should be encouraged [18, 19]. The Fitnessgram test has become one of the most widely used programs in the USA for assessing fitness [19], though its use in India is not popular. The program focuses on health-related fitness and includes protocols for the assessment of aerobic capacity, muscular strength, muscular endurance, flexibility, and body composition [20]. The correlation between musculoskeletal pain and physical fitness remains insufficiently explored, particularly lacking prevalence data for Indian school children. Furthermore, there is a gap in the study of musculoskeletal pain prevalence among children in the urban society of Guwahati, North East India. Additionally, no definitive assessment tools have been established for evaluating the physical fitness of children in this context.

The study aims to evaluate the prevalence of musculoskeletal pain among school students in the urban area of Guwahati in North East India. Additionally, it seeks to examine the existing physical fitness of these children and explore potential associations between musculoskeletal pain and physical fitness. The hypothesis suggests a positive correlation between the incidence of musculoskeletal pain and poor physical fitness in school students. Additionally, the research aims to identify potential risk factors associated with the development of musculoskeletal pain later in life.

Materials and methods

This was a cross sectional study conducted in the Guwahati urban society. Guwahati, the capital city of Assam, is the most important city in North East India. Ethical approval has been taken from Gauhati Medical College & Hospital, Human Ethical Committee (Approval no. MC/108/2012/15), Guwahati, Assam, India.

The sample size was determined as per the prevalence rate which was 24.46% [21].

On the basis of this considering, E (margin of error) = 10% × 24.46% and assuming 95% confidence interval and 5% level of significance, we used the sample size calculation formula [22], i.e., $Z^2_{\alpha/2} \times \mathrm{P} \times (1-\mathrm{p}) \times \mathrm{D}/\mathrm{E}^2$, WHERE, $Z_{\alpha/2}$ = NORMAL DEVIATE (1.96), $p = 24.46\%$, $E = 0.025$, $D = 2$ (design effect reflects the sampling design). Here, it was considered 2 as stratified sampling method used to compensate for deviation from the simple random sampling procedure. The sample size calculated is 2334.72 ~ 2335 students.

We included children aged 5–14 studying in schools within the Guwahati urban area, encompassing both genders. Prior consent was obtained from parents or school authorities, and only children capable of responding to verbal instructions were considered. Exclusions comprised children with acute illnesses, recent injuries, those excluded by teachers in inclusive schools, attendees of special schools, those unwilling to participate, absentees on the testing day, and children with severe physical disabilities (such as severe spasticity/deformity or loss of balance hindering sports participation). Additionally, children who had experienced a seizure in the last 6 months were excluded [23]. Outcome measures were.

a) Faces Pain Scale – Revised (FPS-R): Faces Pain Scale-Revised (FPS-R) consist of self-report faces scale for acute pain which has six cartoon faces that range from neutral to high pain expression [15].
b) Pediatric gait arms legs spine (pGALS) screening: Pediatric Gait Arm Leg Spine is an assessment screen which was derived from the adult gait arm leg spine (Adult GALS) screen [17].
c) Fitnessgram test battery [20].

Selection of schools and study population

School selection for the study was conducted encompassing both private and government schools in the urban area. The schools were categorized into 31 groups for administrative convenience, with randomization used for screening and recruiting school children. Schools were chosen based on student enrollment, with a minimum criterion of 100 students, and alternative schools of the same category were approached if the desired sample size could not be achieved. The presence of a playground for field tests to assess aerobic capacity was also taken into account. Out of the total schools, 153 were selected where a total of 88,073 students were present. The schools were divided into 29 strata based on criteria for school selection. Each stratum represents schools that are homogeneous, with children of the same age group, located near each other, and consisting of both private and government schools (Fig. 1).

The proportionate allocation method was used to determine the number of students (ni) in each stratum for both age groups (5–9 and 10–14 years) using the formula ni = n/N × ni, where "n" is the total number of students and "N" is the total number of schools. Simple random sampling was then applied to select ni school children from each age group within each stratum, ensuring that the cumulative sum of ni for both age groups equaled "n." Informed consent was obtained from guardians or the school head, and after random selection of a school, students were selected from each class using a random table from the class attendance register.

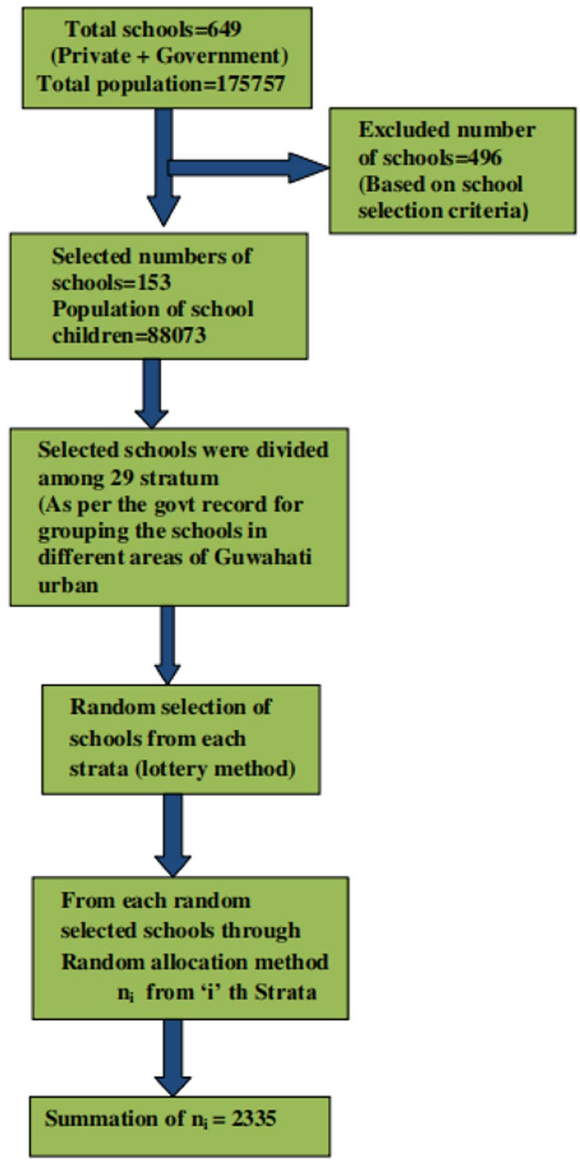

Fig. 1 Flowchart of sampling method

Procedure of the data collection

The study involved assessing the demographic characteristics of students, including age, height, and weight. Pain evaluation utilized two measures: the Faces Pain Scale–Revised for pain intensity and the pGALS musculoskeletal screen. The Faces Pain Scale–Revised was translated into Assamese to accommodate students with difficulty in English. A pilot study with 30 subjects validated the Assamese translation. pGALS screening inquired about joint, muscle, or back pain, with the Faces Pain Scale administered for pain quantification. All students underwent the pGALS screening, imitating examiners in groups of up to five. The examination ceased if students faced difficulties or experienced severe symptoms.

The students were prepared for the physical fitness test using the FitnessGram test battery. Initial assessments included measuring skin folds at the triceps and medial calf using specialized calipers. Measurements were taken in millimeters, and percent body fats (% BF) was calculated with the Slaughter-Lohman equations [24]—for boys: % Body Fat = 0.735 (Triceps + Calf) + 1.0 and for girls: % Body Fat = 0.610 (Triceps + Calf) + 5.1.

Under the examiner's supervision, students carried out the curl up, trunk lift, push up, and shoulder stretch, with instructions to stop in case of discomfort. The Progressive Aerobic Cardiovascular Endurance Run (PACER) was used to measure aerobic capacity, involving six participants simultaneously on the playground, with individual scores recorded by peers. Performance results were shared with students for feedback and raise awareness of their physical fitness. Any severe illness or symptoms identified during the pGALS examination were communicated to parents and school authorities.

Statistical methods

The statistical significance was set at 0.05 for all tests performed, and 95% confidence intervals (CIs) were used in all cases. Statistical analyses were undertaken using SPSS 20 version and SAS version 9.3 (SAS Institute Inc., Cary, NC, USA).

Physical fitness estimation among school students was expressed as mean and standard deviation. The profiles of the children with and without pain were compared by "*t*" test. The differences between the groups of school children with pain and without pain related to their physical fitness were assessed by the Student "*t*" test. The mean and standard deviation of physical fitness components were calculated and assessed for their differences between the two groups. The logistic regression analysis was used to determine association of the musculoskeletal pain with age, BMI, and existing physical fitness of school-going children. Additionally, logistic regression analysis was used to determine the odd ratio between musculoskeletal pain and difficulties in dressing, stair climbing, gait problem, and problems in the arms, legs, and spine. The comparison of physical fitness between both genders was done using the "*t*" test.

Result

This study included 2335 schoolchildren from 16 government schools and 21 private schools, which were randomly selected from the strata. The demographic characteristics of the school children from 5 to 14 years are described in Table 1. The prevalence of musculoskeletal pain among school students in Guwahati urban area is 38.28%. The prevalence rate of MSK pain in female schoolchildren is 40.33%, whereas for the male schoolchildren, it is 36.52%. Among 1134 schoolchildren in the age group of 10–14 years, 498 children exhibited musculoskeletal pain (% = 43.91) which is greater than the children in the age group of 5–9 years (396 children, 32.97%) (Table 2). The specific site for musculoskeletal pain has been found to be more common in the lower limb with 348 children (14.90%) affected, where knee joint involvement is maximum (203 children, 8.69%) followed by the neck (67 children, 2.86%). The prevalence of multiple-site pain in the children was greater compared to single-site pain, which is 10.49%. The physical fitness of male children is significantly better, as the mean values of aerobic capacity, number of curl ups, and number of pushups are higher. In male children, the aerobic capacity (mean ± SD, 41.51 ± 3.15) is more than that of female students (mean ± SD, 37.26 ± 2.54) (Table 3). A significant association was found between musculoskeletal pain and aerobic capacity, abdominal strength and endurance, trunk extensor strength, upper body strength and endurance, and flexibility. The chances of pain occurrence in children with greater aerobic capacity are 6% lower than those

Table 2 Prevalence of musculoskeletal pain

	Category	Total no	*N* (pain (%))
Sex	Male + females	2335	894(38.28)
	Males	1254	458(36.52)
	Females	1081	436(40.33)
Age	5–9	1201	396(32.97)
	10–14	1134	498(43.91)

Table 1 Demographic characteristics of the school children

Age in years (mean ± SD)	Height (mean ± SD)		Weight (mean ± SD)		BMI (mean ± SD)	
	Male	Female	Male	Female	Male	Female
5–9 years (7.25 ± 1.01)	1.28 ± 0.09	1.27 ± 0.09	27.37 ± 6.76	26.31 ± 6.37	16.44 ± 2.61	16.14 ± 2.45
10–14 years (11.86 ± 1.11)	1.49 ± 0.13	1.47 ± 0.11	39.77 ± 10.64	38.55 ± 10.11	17.58 ± 2.95	17.67 ± 3.05
Total 5–14 years (9.49 ± 2.53)	1.39 ± 0.15	1.36 ± 0.14	33.57 ± 10.85	32.09 ± 10.34	17.01 ± 2.84	16.86 ± 2.85

Table 3 Physical fitness of children in relation to the gender

Physical fitness variables	Females			Males			*P*-value
	Mean ± SD	Min–Max	95% CI	Mean ± SD	Min–Max	95% CI	
Aerobic capacity	37.26 ± 2.54	26.58–47.23	37.11–37.41	41.51 ± 3.15	28.96–51.80	41.34–41.69	0.0001
Skin fold test	10.38 ± 6.80	5.10–36.21	9.97–10.79	14.30 ± 7.32	4.67–54	13.90–14.71	0.01
Curl up	10.53 ± 4.70	0–32	10.25–10.81	12.78 ± 6.15	0–55	12.44–13.12	0.0001
Trunk lift	8.29 ± 2.81	2–14	8.12–8.46	8.63 ± 3.05	2–21	8.46–8.80	0.004
Push up	3.14 ± 3.09	0–19	2.96–3.33	6.47 ± 5.27	0–30	6.18–6.77	0.0001
Shoulder stretch* % of students failed to complete the test	5.36%*			11.16%*			

Table 4 Logistic regression analysis for determination of probable factors for onset of musculoskeletal pain

Effect	Odd ratio	95% confidence limits	*P*-value
Age	1.633	1.344–1.985	0.0001
Gender	0.844	0.694–1.027	0.090
Aerobic capacity (PACER)	0.943	0.916–0.972	0.0001
Skin fold test (body fatness)	1.010	0.997–1.022	0.131
Curl up (abdominal strength and endurance)	0.722	0.704–0.761	0.017
Trunk lift (trunk extensor strength)	0.859	0.831–0.899	0.0001
Pushup (upper body strength and endurance)	1.021	0.998–1.045	0.07
Shoulder stretch (flexibility)	1.413	1.041–1.919	0.08
Difficulty with dressing yourself	3.364	1.191–9.497	0.022
Difficulty during stair up and down	4.103	2.258–7.455	0.0001
Abnormality in spine	1.960	1.548–2.481	0.09
Abnormality in legs	4.899	3.905–6.147	0.03
Abnormality in arms	1.727	1.283–2.325	0.06

Odds ratios (OR) and 95% confidence intervals (CI) for 1 unit increase in each predictor

with lesser aerobic capacity (OR = 0.934 [CI = 0.916–0.9721]. The chances of pain onset in children with better abdominal strength and endurance are 28% lower than those with reduced abdominal strength and endurance [OR = 0.72 (CI = 0.704–0.761)]. The probability of pain occurrence decreases in children with improved trunk extensor muscle strength and endurance [OR = 0.859 (CI = 0.831–0.899)] (Table 4).

A significant association exists between musculoskeletal pain and other musculoskeletal abnormalities in children. There are 4 times greater chances of developing musculoskeletal pain in children with leg abnormalities (OR = 4.899, CI = 3.905, 6.147)(Table 4). Any problems and abnormalities in the spine (OR = 1.960, CI = 1.548–2.481) have a positive association with the onset of pain. A significant positive association is present where the chances of the onset of musculoskeletal pain in children increase with the increase of problems and abnormalities in the arms. Schoolchildren without musculoskeletal pain have better physical fitness compared to those with musculoskeletal pain (Table 5). There are marked differences

Table 5 Comparison of the physical fitness of children with presence of pain and absence of pain

		Mean (standard deviation)		*P*-value
		No pain	Pain	
Aerobic capacity	5–9	38.99 ± 2.85	38.49 ± 2.74	0.008
	10–14	40.46 ± 3.91	39.95 ± 4.39	0.0451
Body fatness (skin fold)	5–9	10.38 ± 6.37	11.69 ± 5.60	0.0015
	10–14	14.32 ± 8.04	14.47 ± 7.86	0.75
Curl up	5–9	9.79 ± 3.93	9.86 ± 3.99	0.81
	10–14	14.21 ± 6.37	13.05 ± 6.37	0.0029
Trunk lift	5–9	9.02 ± 2.74	7.71 ± 2.68	0.0001
	10–14	8.622 ± 3.17	7.60 ± 2.86	0.0001
Push up	5–9	3.87 ± 3.23	4.01 ± 3.54	0.53
	10–14	6.15 ± 5.47	5.82 ± 5.86	0.33
Shoulder stretch*	5–9	5.59%	9.59%	
% of students who failed to complete the test	10–14	11%	8.83%	

*Dichomatous variable: mean and standard deviation not calculated in the physical fitness characteristics of children in both age groups (5–9 years and 10–14 years). The aerobic capacity in the higher age group (40.27 ± 4.11) is greater than in the lower age group (38.87 ± 2.84). The body fat content, as measured by the skin fold test, is higher in the higher age group (14.38 ± 7.97) than in the lower age group (10.71 ± 6.21).

Discussion

In this cross sectional study, the mean BMI of the school students in the age group of 5–9 years is in the 23 adult equivalent, which is the cut off line for the risk of being overweight as per the Indian Academy of Pediatrics (IAP) BMI growth chart [25]. The school students in the age group of 5–9 years of both genders are at risk of being overweight. This result is similar to a previous study where the prevalence of overweight and obesity in Guwahati city was found to be 5.8% and 2.8%, respectively [26]. The reported overall pain percentage found in this study was 38.28%, which is comparable and similar to some of the previous studies where 25 to 40% of children and adolescents reported musculoskeletal pain [27–29]. Two Indian studies used pGALS as a tool to find the prevalence of musculoskeletal pain and problem in children [21, 30]. With reference to these two previous studies and the present study, it is clear that a developing country like India may have a wide variation of pain prevalence, which is acceptable as the studies were conducted in different geographical areas. The percentage of pain prevalence among female is higher, which is in line with previous findings [3]. An epidemiological study with similar result has confirmed that musculoskeletal complaints are more common as children grow older, being particularly frequent in adolescents [3]. The probable aetiology for this change in the prevalence rate relative to changes in age may be due to the difference in the timing of pubertal development and hormonal changes, characterized by changes in body structure, sexual maturation, and rapid skeletal growth. The possible explanation could be that in this delicate period of life, several physical, psychological, social, and emotional components act as possible risk factors to develop or amplify pain status [31]. This study also pointed out the knee joint as the commonest site for the musculoskeletal problems. The lower limb being the most common site for traumatic pain in children was already confirmed by a previous study [1, 32]. There is variation of physical fitness among the gender, age group and the prevalence of MSK pain. The aerobic capacity was found to be higher in older students.This increase value of aerobic capacity in our study may be because of a higher number of laps completed by individuals of higher age, which shows a similar result to a previous study [33]. At puberty, boys generally have greater muscle mass, and girls have greater body fat, resulting in higher VO2 max for boys. Some studies have reported that genetics and maturation have a strong influence on fitness during childhood and early adolescence [31, 34, 35]. As per the Fitnessgram manual for percent body fat in children, the findings of this study are within healthy fitness zone [20], though the percent body fat in the higher age group is more compared to the lower age group. The abdominal strength and endurance are greater in the higher age group which may be due to the growth and development of the muscles as the child grows and attains the puberty. There is no previous literature similar to the findings of the present study, though the standards given in the fitnessgram test manual can be used to interpret the results. Flexibility, as measured by the shoulder stretch test for upper body flexibility, is reduced in higher age, group, and also, the females have a lesser percentage of failure to complete the test than the males. A study, where subjects were tracked for the developmental changes over a period of 3 years and checked the flexibility of the hamstrings, found decreased scores with the follow-ups [36]. Male students have better physical fitness, with all components of physical fitness showing higher values. According to the Fitnessgram standards for healthy fitness zone, the mean value of aerobic capacity in females falls into the zone called Needs Improvement-Some Risk (NI-Some Risk), whereas the male students are in healthy fitness zone (HFZ) [20]. The mean value of percent body fat in both female and male students is in healthy fitness zone (HFZ), though the male students have a higher percentage of body fat, which is similar to a previous study [26]. In the present study, the mean BMI value of male and female students, as given in the demographic characteristics, does not show much difference. In a similar study, it was found that the BMI provides an idea of the weight in relation to height for age and sex but may not always give the idea of the adiposity of the individual, potentially misclassifying those with a normal percent of body fat (BF%) as overweight [37]. Reports from other studies in terms of differences in motor performance indicate that the boys have superiority over girls in tests of aerobic capacity and muscular strength [38], and many factors determine the difference between the boys and girls in cardio-respiratory fitness [39]. The percent body fat (%BF) is higher in the children with musculoskeletal pain, with a significant difference observed in early age. Probable risk factors associated with the development of musculoskeletal pain among school students were aerobic capacity, abdominal strength and endurance, and trunk extensor strength. There is growing concern about the harmful effects of childhood unfitness, which may affect the health in adulthood [40]. In this study, it was found that the prevalence of MSK pain is greater in the higher age group, though it was not clear whether the pain detected in the higher age group is the first presentation without any past history or if it got worsen with increasing age. The aerobic capacity was found to be a major factor in both age group, which may be a probable risk factor for the onset of musculoskeletal pain in future. The findings of this study suggest that lower limb problems lead to a lower level of aerobic capacity since progressive aerobic cardiovascular endurance run (PACER) requires a good activity of lower limb. Abdominal strength and endurance were found to be probable risk factors that may determine whether a child can develop musculoskeletal pain in the near future, particularly pain which develops in and around the lower back region. The stability of the spine requires support from abdominal muscles, which are recruited through eccentric and concentric contractions. Back extensor muscles develop with an increase in height and weight as per age, thereby increases the strength of the trunk. A previous study demonstrated that age, height, and weight are all important predictors of trunk strength in children, and the effects of these factors are further controlled by the gender of children [41]. Opposing the trunk flexor strength, good endurance of isometric trunk extensors was protective against the development of low back pain in adult males [42]. There are fourfold chances of developing MSK pain with abnormalities in the legs. The term "Growing Pain" was coined by French physician Duchamp, referring to a common syndrome of recurring discomfort in children [43]. Growing pain in children is often resolved and does not have any lasting sequelae, but since it occurs in skeletally immature children, it may affect the musculoskeletal system as a whole. Abnormalities in the leg may lead to pain in weight-bearing structures due to a greater joint overloading, which may cause distraction of the capsuloligamentous structures and muscle contractures. The persistence of pain until the pubertal stage may result in a risk of suffering in adulthood. A few limitations have been acknowledged. First, the present study did not consider the psychological and nutritional status or the level of physical activity assessment, which could reflect other probable factors that can affect children's physical fitness. Second, the study did not include the assessment of smartphone use and its potential addiction among school students, which is a relevant factor in the present context [44, 45]. Third, the study was conducted with a special reference on the pediatric population of the urban region, excluding schools residing in the rural region, which limited the understanding of the entire pediatric population in this region. However, further studies are recommended with an emphasis on demographic profile and a larger sample from different geographical regions to analyze pain prevalence and its association with the physical fitness of the pediatric population.

Conclusion

In this study, the prevalence of the musculoskeletal pain in school-going children was found to be 38.28%. It also concluded that the incidence of musculoskeletal pain and the physical fitness of a child has a significant relationship; children with poor physical fitness have a higher chance of developing musculoskeletal pain. This study also indicates that factors such as reduced aerobic capacity, poor abdominal strength, and endurance, as well as lower strength and endurance of trunk extensor muscles, may be probable risk factors for the development of musculoskeletal pain later in life.

Abbreviations

BF%	Percent body fat
BMI	Body mass index
CI	Confidence interval
FRS-R	Facial pain scale—revised
HFZ	Healthy fitness zone
IAP	Indian Academy of Pediatrics
MSK	Musculoskeletal
NI	Needs improvement
OR	Odd ratio
PACER	Progressive aerobic cardiovascular endurance run
pGALS	Pediatric Gait Arm Leg Spine
PPCC	Pediatric primary care center
VAS	Visual analogue scale
VO_2 MAX	Maximal oxygen consumption

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Authors' contributions

All authors contributed to the manuscript writing. All authors have read and approved the final version of the manuscript.

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Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

The study has been approved by Institutional Ethics Committee of Gauhati Medical College & Hospital with reference no. MC/108/2012/15.

Consent for publication

Not applicable.

Competing interests
The authors declare that they have no competing interests.

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