

Ergonomic tool: A way to assess musculoskeletal problems faced by children due to carrying of school bags

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■ **ABSTRACT** : School children are adolescents who experience a period of accelerated growth and development of skeletal and soft tissue. The spinal structures of the child are markedly different from those of adults. As growth of the spinal structures extends over a longer period of time than the other skeletal tissues, incongruities in rate of tissue development can pose a threat to postural integrity. The present study was conducted to assess musculoskeletal problems faced by children due to carrying of school bag by using ergonomic tool *i.e.* Standardized Nordic Musculoskeletal Questionnaire. The suggestions of the parents were also taken in this regard. The study was conducted on a sample of 120 school children from middle class (*i.e.* from vi to viii) and their mothers. Respondents were randomly selected from five government and five private schools of Ludhiana city from the age group of 11-14 years. A pre structured interview schedule was used to collect the data along with Standardized Nordic Musculoskeletal Questionnaire. Results showed that neck, shoulder and upper/lower back had significantly more problems than other body parts. It was further observed that maximum number of parents wanted that school authority should make judicious time table and lockers should be provided to avoid unnecessary loading of school bags. Moreover, need to conduct lectures on maintenance of good posture among school children was also felt by parents

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Retaining a fixed posture over long periods of times cause muscle fatigue and if this practice is consistent can eventually lead to muscle pain and injury (Smith *et al.*, 1981). School children are adolescents who experience a period of accelerated growth and development of skeletal and soft tissue. The

spinal structures of the child are markedly different from those of adults. As growth of the spinal structures extends over a longer period of time than the other skeletal tissues, incongruities in rate of tissue development can pose a threat to postural integrity. When load is positioned posterior to the body in the form of school

bags, it changes posture because of the changes to centre of gravity. The body tries to keep the centre of gravity between feet, so with a backpack, the trunk is in a more forward position, placing abnormal forces on the spine. These changes in alignment of the neck can produce strain of cervical joints also and soft tissue as well as imbalanced muscle performances. This can cause pain in cervical, upper thoracic and shoulder region (Sharan *et al.*, 2012).

In a cross sectional study to investigate association between school bag use and back pain in adolescents 1126 children participated, self administered questionnaire given. The questionnaire contained general health questions from the Child Health Questionnaire. It is seen that 74 per cent were classified as having back pain, also show significant poor general health, more body ache and more limited physical functioning. (Sheir-Neiss *et al.*, 2003). Therefore, the present study was undertaken with the following objectives:

- To assess various musculoskeletal problems faced by children while carrying school bags
- To take suggestions from parents of school children to reduce musculoskeletal problems.

■ RESEARCH METHODS

The study was conducted in Ludhiana city. Two zones were randomly selected out of four zones; further five governments and five private schools were selected randomly from these two zones. A sample of 120 students and their mothers were taken from these selected schools from class (*i.e.* vith to viiith). The age group was 11- 14 years. For first objective, Standardized Nordic Musculoskeletal Questionnaire was used and to test

significance of achieved scores, z test was applied. And to achieve second objective, pre-structured interview schedule was used.

■ RESEARCH FINDINGS AND DISCUSSION

The findings of the present study as well as relevant discussion have been presented under following heads :

Assessment of musculoskeletal problems of respondents by using Standardized Nordic Musculoskeletal Questionnaire :

The data in Table 1 revealed that respondents had trouble (ache, pain, discomfort) during last 12 month in different body parts like neck, shoulder and upper back and lower back, which are significant analyzed by z test and less pain was observed in elbow followed by wrist/hand, hips, knees and ankle/feet. Besides this respondents had trouble in their neck, shoulder and upper/lower back during last 7 days and less trouble felt in their other parts of body. Therefore, it can be concluded that though respondents were having the symptoms of pain in different body parts but not of high severity, and requires ergonomic intervention with respect to prevent and manage various risk factors caused by school bags. Whittfield *et al.* (2005) also observed musculoskeletal problems were reported by 77.1 per cent of the students in his study on weight and use of school bags. Symptoms were most prevalent in the neck, shoulder, upper back and lower back.

Three categories of low, medium and high were formed according to maximum (70) and minimum (27) Nordic possible scores, which are presented in Fig. 1. It was found that maximum number of respondents (58.00

Table 1 : Assessment of musculoskeletal problems of respondents by using Standardized Nordic Musculoskeletal Questionnaire

Body parts	I	II	III	Z(I)	Z(II)	Z(III)
Neck	95 (79.17%)	21 (17.5%)	94 (78.33%)	20.54**	4.45**	20.32**
Shoulder	90 (75.00%)	11 (9.17%)	77 (64.17%)	18.58**	2.28**	16.63**
Elbow	61 (50.83%)	5 (4.17%)	35 (29.17%)	13.15**	0.97*	7.50**
Wrist/hand	49 (40.83%)	NIL	24 (20%)	10.84**	NIL	5.10**
Upper back	83 (69.17%)	18 (15%)	60 (50%)	17.93**	3.80**	12.93**
Low back	71 (59.17%)	8 (6.67%)	25 (20.83%)	15.32**	1.63*	5.32**
One or both hips	11 (9.17%)	NIL	2 (1.67%)	2.28**	NIL	0.32*
One or both knees	54 (45.00%)	NIL	18 (15%)	11.63**	NIL	3.80**
One or both ankle feet	57 (47.5%)	11 (9.17%)	25 (20.83%)	12.28**	2.28**	5.32**

NS=Non-significant * and ** indicate significance of values at P =0.05 and 0.01, respectively

I. Have you at any time during the last 12 months had trouble (ache, pain, discomfort)?

II. Have you at any time during the last 12 months been prevented from doing your normal work (at home or away home) because of the trouble?

III. Have you had trouble at any time during the last 7 days?

%) was having low Nordic pain score followed by medium (37.00%). Only 5.00 per cent of respondents were having high Nordic pain score range of 55-70.

Suggestions given by parents to reduce musculoskeletal problems of children due to carrying of school bags :

Data in Table 2 show that maximum number of parents (23.33%) suggests that school authority should follow the judicious time table to avoid unnecessary loading of school bags and conducting lectures on maintenance of good posture of children. These suggestions had significant z value (p<0.01). Other significant suggestions (p<0.01) were provision of lockers in schools and provision of outdoor games (21.67%) each, counseling of students regarding ill effects of junk food (21.67%) and organizing of yoga and exercise in schools (20.00%). Besides this

sensitization of parents and teachers regarding long term effects of carrying heavy school bags (16.67%), avoiding of unnecessary school material and to avoid carrying multiple reference books (12.50%) were other suggestions given by parents. Less number of parents (p<0.05) were in favour of giving homework for more than two or three subjects on a particular day (8.33%) and provision of double sets of heavy books and notebooks for school and home (8.33%) were the suggestions given by the parents of respondents.

Conclusion :

There is a growing concern these days that children are carrying too much weight on their backs. It has been reported that students carrying more than 10-20 per cent of the body weight are more susceptible to back pain. Moreover, heavy school bags are carried by only one shoulder. Children tend to bend forward to compensate

Table 2 : Suggestions given by parents for school authority regarding school bags

Suggestions to school authority by parents*	Total (n=120)	Z	
To plan a judicious time table to avoid unnecessary loading of school bags	28	23.33	5.97**
Lecture on maintenance of good posture	28	23.33	5.97**
Provision of outdoor games	26	21.67	5.54**
Counseling of students regarding ill effects of junk food	26	21.67	5.54**
Provision of lockers in the school	26	21.67	5.54**
Organizing of yoga and exercise in school	24	20.00	5.10**
Sensitization of parents and teachers regarding long term effects of carrying heavy school bags	20	16.67	4.23**
Avoiding of unnecessary school material	15	12.5	3.15**
To avoid carrying multiple reference books	15	12.5	3.15**
Not giving homework for more than two-three subjects on a particular day	10	8.33	2.06*
Double sets of heavy books and notebooks for school and home	10	8.33	2.06*
Multiple responses*			

NS=Non-significant

* and ** indicate significance of values at P=0.05 and 0.01, respectively

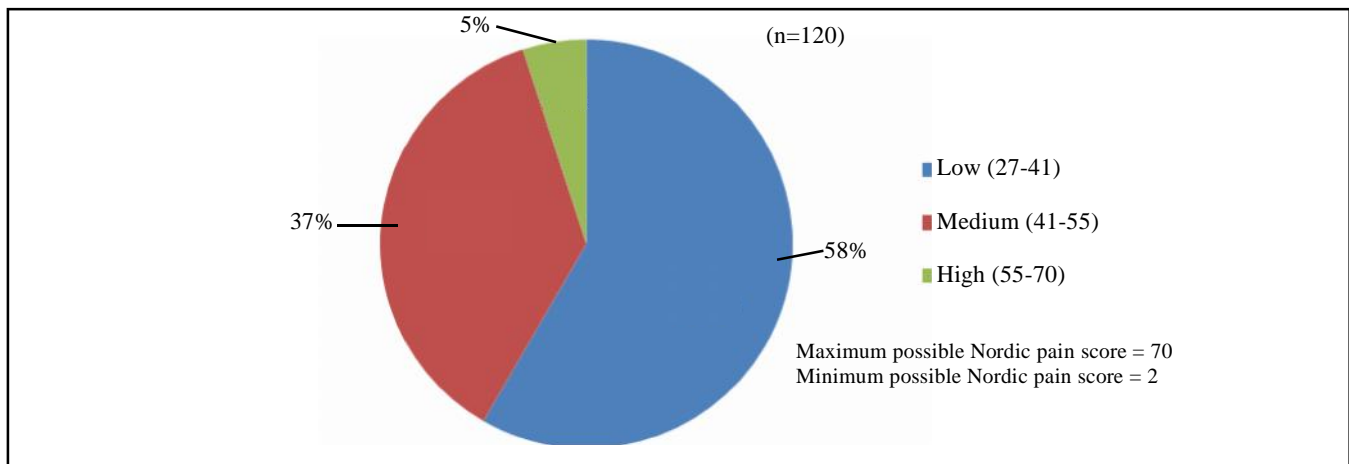


Fig. 1 : Distribution of respondents according to Nordic pain score

for the heavy load, which throw off their central of gravity out of alignment. This significantly alters the posture and gait of children. Results showed that neck, shoulder and upper/lower back had significantly more problems than other body parts. It was further observed that maximum number of parents wanted that school authority should make judicious time table and lockers should be provided to avoid unnecessary loading of school bags. Moreover, need to conduct lectures on maintenance of good posture among school children was also felt by parents

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