Effect of Nursing Assistance Tools on Preventing Musculoskeletal Pain among Staff in Schools for Disabled Children

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Abstract: Effect of Nursing Assistance Tools on Preventing Musculoskeletal Pain among Staff in Schools for Disabled Children: Shigeki Muto, et al. Seirei Center for Health Promotion and Preventive Medicine—Objective is to clarify whether nursing assistance tools (a mat with attached handles, a pair of trousers with knee pads and a waist holding belt) prevent musculoskeletal pain, such as low back pain and upper arm pain, and depression, and improve the burden on the lower back and upper arm among staff in schools for disabled children. This study design was a non-randomized intervention trial. The subjects were 41 staff in two schools for disabled children in Japan. Nursing assistance tools were used with the intervention group to help with their nursing activities. We investigated the one-month prevalence of low back pain and the degree of burden on the lower back using a questionnaire at the baseline and at the end point 4 to 6 months later. The prevalence of low back pain did not change significantly in either group. In the intervention group, the prevalence of upper arm pain decreased from 47.6% at the baseline to 23.8% at the end point (p=0.063). The percentage of participants with a high level of burden on the lower back from excretory nursing activity decreased from 57.1% at the baseline to 33.3% at the end point (p=0.063) in the intervention group. These results suggest that nursing assistance tools may prevent upper arm pain and improve the burden on the lower back among staff in schools for disabled children; however, these tools did not significantly prevent low back pain and depression. (J Occup Health 2008; 50: 245–250)

Key words: Nursing assistance tool, Disabled children, School, Intervention, Low back pain, Upper arm pain, Depression

Low back pain had the highest frequency among occupational diseases occurring in Japan in 20021). According to policy guidelines for the prevention of low back pain at Japanese work sites, schools for physically and mentally disabled children were also included in these guidelines, which describe the special management of low back pain as being deemed necessary in such schools, due to significant burden on the lower back2). Previous studies have shown the association between low back pain and risk factors among nurses and caregivers3–8).

The high prevalence of low back pain among staff in schools for disabled children has been clarified9). Our previous study suggested that staff in such schools also had a high prevalence of upper arm pain and depression9). It was considered that ergonomic factors were risk factors for low back pain among nursing personnel3–5). Our previous study also suggested that low back pain among staff in schools for disabled children was associated with their nursing activities, such as movement, excretory functions and feeding9). It is considered that improvement of low back pain among such staff is needed.

Various tools have been developed to support nursing activities by nursing personnel, and are expected to decrease the burden on the lower back. There have been few intervention studies using nursing assistance tools6,10), and to our knowledge, such studies have not been conducted so far in Japan. Smedley et al. reported a study using nursing assistance tools such as hi/lo baths, hoists, transfer belts and sliding sheets6), and Grag et al. reported a study using walking belts and hoists10). Both studies reported that low back pain was
not improved through the use of these nursing assistance tools. Three hypotheses are proposed: (1) nursing personnel can easily transfer a disabled person by holding handles attached to a mat; (2) nursing personnel can easily protect their knees by using a pair of trousers with knee pads when they must support a disabled person on their knees; and (3) nursing personnel can easily support a standing disabled person by holding the handles of a waist-holding belt. To our knowledge, there have been no studies using these nursing assistance tools, which may be able to improve low back pain among nursing personnel.

The primary objective of this study was to clarify whether nursing assistance tools (a mat with attached handles, a pair of trousers with knee pads and a waist-holding belt) prevent musculoskeletal pain, such as low back pain and upper arm pain, and depression, and improve the burden on the lower back and upper arm among staff in schools for disabled children.

Materials and Methods

Study design

This study was a non-randomized intervention trial. We provided nursing assistance tools for participants in the intervention group, but not the control group. A baseline assessment was carried out from October to December 2004, and the effectiveness of nursing assistance tools was estimated in March 2005; thus, the follow-up period was 4 to 6 months. This follow-up period was used with reference to a previous study which used nursing assistance tools.

Subjects

All 19 prefectoral schools for disabled children in Shizuoka prefecture, Japan were asked to participate in this study. Of these schools, two schools gave consent. Physically and mentally disabled children attend these schools and the staff are engaged in nursing activities such as assisting movement, excretion, feeding, and getting on and off the school bus. Almost all of these staff were teachers, and some were nursing staff. Of these staff, 21 gave consent to participate as the intervention group, and 22 participants for the control group from these schools were selected. The disabled children cared for by the intervention group were different from those in the control group. Frequency matching was conducted for demographic characteristics of the control group, such as gender, age, body weight, work duties regarding nursing activity and level of disability and body weight of the disabled children with the intervention group. This study was approved by the Ethics Committee of Japan Society of Occupational Health. All participants gave their written informed consent for this study.

Intervention

A mat with attached handles (Big Yuji Kun, Sukoyaka Seisaku Co. Ltd, Fig. 1A), a pair of trousers with knee pads (Sukoyaka Seisaku Co. Ltd, Fig. 1B) and a waist-holding belt (Flexibelt®, Romedic Co. Ltd, Fig. 1C) were used as nursing assistance tools for the intervention.
Our study protocol and directions for using the nursing assistance tools were explained to the staff in the two schools, and the intervention group was recruited from these staff. Figure 2 shows the number of participants to whom the different assistance tools were assigned. The control group worked without these nursing assistance tools during the study period.

Measurement

The health status of the participants was investigated using a questionnaire at the baseline and 4 to 6 months after the start of intervention. Our own health questionnaire, which included demographic characteristics such as age, gender, occupation and body weight, presence or absence of low back pain within the past month, paralysis of legs, upper arm pain and paralysis of the upper arms within the past month, Center for Epidemiologic Studies Depression Scale (CES-D)\(^{11}\), level of burden on the lower back and upper arms, work breaks, working years, working hours, type and time of nursing activity, use or not of a support belt, body weight of the disabled children and so on\(^{9}\). Sixteen or more points on the CES-D were regarded as depression\(^{12}\).

The level of burden on the lower back and upper arms was divided into ‘no burden,’ ‘presence of burden but absence of problems,’ ‘presence of burden and difficulty.’ The ‘presence of burden and difficulty’ was regarded as ‘burden,’ and the other two levels of burden as ‘no burden.’

Statistical analysis

The primary outcome was the change in the prevalence of musculoskeletal pain, such as low back pain and upper arm pain, and depression from the baseline to the end point, and the secondary outcome was the change of the degree of burden on the lower back and upper arm from the baseline to the end point. Student’s or Welch’s \(t\)-test was used for continuous variables and the chi-square test for categorical variables at the baseline. The prevalence of morbidity at the baseline was compared with the end point value using the McNemar test. The degree of burden on the lower back and upper arm at the baseline was compared with the end point value using the McNemar test. A \(p\) value less than 0.05 was regarded as significant and SPSS Version 12.0 was used for all statistical analyses.

Results

Figure 2 shows the flow chart of this study. Of the 41 participants, two participants in the control group did not return the questionnaire at the end point, so 39 participants were followed up (21 in the intervention group and 18 in the control group).

Table 1 shows the comparison of demographic characteristics and the prevalence of morbidity between the intervention group and control group at the baseline. No significant differences in demographic characteristics were found between the intervention group and control group. No significant differences of the prevalence of morbidity was found between the intervention group and control group; however, the prevalence (57.1%) of low back pain in the intervention group was somewhat higher than that (27.8%) in the control group (\(p=0.063\)).

Table 2 shows baseline assessment regarding nursing activity between the intervention group and control group. No significant differences were found between the intervention group and control group in occupation, working time, work duties and the mean body weight of children cared for by the participants.

The prevalence of morbidity at the end point was compared with the baseline value (Table 3). In the intervention group, the prevalence of low back pain
increased from 57.1% at the baseline to 61.9% at the end point, however, the change in the prevalence of low back pain was not statistically significant ($p=1.000$). In the control group, the prevalence of low back pain increased from 27.8% at the baseline to 55.6% at the end point ($p=0.063$). The change in the prevalence of upper arm pain was not statistically significant in either group; however, in the intervention group, the prevalence of upper arm pain decreased from 47.6% at the baseline to 23.8% at the end point ($p=0.063$). The change in the prevalence of depression was not statistically significant in either group.

The percentage of participants with a high level of burden on the lower back or upper arm at the end point increased from 57.1% at the baseline to 33.3% at the end point ($p=0.063$). We confirmed the compliance of use of the nursing assistance tools in the intervention group by interviewing staff in the two schools. The tools were used by participants in the intervention group for almost all nursing activities.

**Discussion**

We conducted a non-randomized intervention trial to clarify whether nursing assistance tools, such as a mat with attached handles, trousers with knee pads and a waist holding belt, can prevent musculoskeletal pain, such as low back pain and upper arm pain, and depression, and improve the burden on the lower back and upper arm among staff in schools for disabled children. There have been few interventional studies using nursing assistance tools.
tools\textsuperscript{6, 10}; furthermore, the nursing assistance tools used in previous studies were different from those used in this study\textsuperscript{6, 10}. Although the nursing assistance tools used in this study did not significantly prevent low back pain and depression, our study suggests that they may prevent upper arm pain and improve the burden on the lower back in such staff. We considered that such nursing assistance tools were useful for staff engaging in nursing activity.

Previous studies have suggested an association between low back pain and ergonomic factors in nursing personnel\textsuperscript{3–8}. Low back pain did not improve in some intervention studies focusing on ergonomic factors\textsuperscript{6, 10, 13, 14} or in previous studies using nursing assistance tools\textsuperscript{6, 10}. In this study, low back pain was not prevented. As the causality of low back pain is multifactorial, its prevention may be difficult by using only nursing assistant tools\textsuperscript{3–10, 13–17}.

The level of burden on the low back of excretion assistants decreased slightly. Grag et al. evaluated the burden on the lower back using a subjective method, and indicated that nursing assistance tools decreased the level of burden\textsuperscript{10}. In this study, the burden on excretion assistants might have decreased for the following reasons: the participants might have been able to use a mat with handles to transfer the disabled children; and they might have been able to exchange a diaper on their knees wearing a pair of trousers with knee pads. The burden on assistants’ lower back when assisting with movement, and getting on and off the school bus did not improve, contrary to our expectations. The number of participants might not have been sufficient to produce a statistically significant result. As feeding assistants had less burden on the lower back, the effect of using the nursing assistance tools was not confirmed.

Our previous study clarified that there is a high prevalence of upper arm pain among staff in schools for disabled children\textsuperscript{9}. Other previous studies also suggested a high burden on the upper arms among nursing personnel\textsuperscript{13, 15}. In this study, the prevalence of upper arm pain in the intervention group decreased, although there was no change in the burden on their upper arms after intervention. Horneij et al. indicated that neck and shoulder symptoms among nursing personnel did not change between pre- and post- intervention using nursing assistance tools\textsuperscript{13}. We consider that the ergonomic effect on the upper arms of nursing assistance tools is not high, and that further investigation may be necessary.

We have suggested an association between low back

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<th>Table 3. Change in the prevalence (%) of morbidity from baseline to end point</th>
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<td>Intervention group</td>
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<tr>
<td>Baseline</td>
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<td>Low back pain</td>
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<td>Paralysis of legs</td>
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<td>Upper arm pain</td>
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<td>Depression</td>
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<td>a: The McNemar test was conducted to compare the prevalence (%) between baseline and end point in each group.</td>
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<th>Table 4. Change of burden on the low back and upper arm from baseline to end point</th>
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<td>Intervention group</td>
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<tr>
<td>Baseline</td>
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<td>Burden on the low back : %</td>
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<td>Movement</td>
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<td>Excretory function</td>
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<td>Burden on the upper arm: %</td>
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<td>Movement</td>
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pain and depression among staff in schools for disabled children. Previous studies suggested an association between low back pain and depression or psychosocial factors. No previous intervention study has investigated whether depression was improved by using nursing assistance tools. There was no significant change in the prevalence of depression after the intervention. A previous study indicated that low back pain causes depression and conversely, depression causes low back pain. We consider that depression may not be prevented if low back pain exists.

There are some limitations of this study. First, at baseline, the prevalence of low back pain between the intervention group and control group was different, and weakness of the lower back between the groups might be different. Furthermore, because this study was a non-randomized intervention trial, selection bias could not be avoided. We could not find a reason why the prevalence of low back pain in the control group markedly increased in the course of 4 to 6 months. Second, all outcomes were evaluated in a subjective manner, so the objectivity of the results might be lacking; however, many previous intervention studies evaluated the outcomes using similar subjective methods. Third, this study might not have sufficient statistical power to show the effectiveness of nursing assistance tools because there were not enough participants or a sufficiently long study period. Finally, in this study, the participants were recruited from a limited area and the sample size was not so large, so the generalizability of results in this study might be limited. To confirm the generalizability, a large sample size from various regions and institutes is needed.

Conclusion

Some nursing assistance tools may prevent upper arm pain and improve the burden on the lower back among staff in schools for disabled children; however, there is no evidence that these nursing assistance tools prevent low back pain and depression.

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References


