Multi- and interdisciplinary evaluation of cervical and lumbar spine problems in hospital nurses, with the development and application of a primary prevention programme.

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Introduction

Low Back Problems (LBP) and Neck Problems (NP) are, according to the literature, related to many variables, though evidence for some is equivocal. These differences in results may be due to differences in the definition of LBP, in the selection criteria applied, and/or in the interpretation and/or use of the terms "prevalence" and "incidence".

Most of these studies use straightforward statistics such as ANOVA or chi-square tests or calculate Pearson's or Spearman's correlations to analyse differences or relationships between populations with and without LBP or NP for certain variables in a certain discipline. More recent epidemiological studies make use of odds ratios in an attempt to weigh the importance of the variable. Few studies make use of discriminant analysis to predict the development of LBP or NP.

Since the nursing profession is generally considered a profession at high risk of LBP and NP, the purpose of this study was to set up a multidisciplinary and interdisciplinary research project, the final goal being to develop a primary prevention model for LBP and NP for the nursing profession.

Materials and methods

The materials and methods used in previous parts of the project (construction of a database, measuring spinal shrinkage, continuous measurement of spinal motion, measuring isokinetic and iso-inertial strength, measuring the level of fitness, task analysis by survey and video images, lifting simulation, effect study of back schools and the synchronised simultaneous study by 2-dimensional movement analysis, electromyography (EMG), force platform and spinal motion registration) are discussed extensively in the final report of the impulse programme HH/03/004. In this summary we will focus on the epidemiological questionnaire and the anthropometric battery because these studies form the basis for the development of the primary prevention model.

1216 nurses in 4 Flemish (Belgian) hospitals agreed to participate in the study. Their mean age was 34 (± 7.8) years, their mean weight 64.5 (±10.9) kg, and their mean height 168.5 (± 8.2) cm. The overall response rate was 68.2%. They were asked to fill in a booklet of different validated questionnaires. Questions were asked regarding professional activities, daily work, general health, smoking and drinking habits, gynaecological problems, depression (Modified Zung Depression Index), other musculoskeletal problems, controlling pain (Pain Locus of Control questionnaire), fear avoidance (Fear Avoidance Beliefs Quest), coping (Coping Strategies Quest), work satisfaction (Work Apgar), work circumstances, use of lifting techniques or lifting aids, kind of clothing and shoes worn during work, sleeping habits, recreational activities, family composition, and time spent at activities relating to the household. The booklet thus covered many of the variables previously mentioned in the literature as being related to the prevalence or incidence of LBP or NP.

Separately from the questionnaire we found 699 nurses who where willing to participate in an extensive anthropometric survey involving measurement of different height parameters, skinfolds, girths, and breadths. Calculations were dome to determine the somatotype and body composition.

Prevalence groups were defined for LBP and NP (lifetime, year, and point prevalence) and differences between these experimental groups and the control groups without LBP were calculated using ANOVA, Kruskall-Wallis, and Chi-square tests where appropriate. The significance level for all statistical tests was set at 5%.

All variables (from the epidemiological questionnaire and the anthropometric survey) found to be significant were subjected to factor analysis to reduce the variables. A discriminant analysis of the factors then provided the necessary information to develop a primary prevention program.

Results

For LBP, the recorded lifetime prevalence was 53%, the year prevalence was 41%, and the point prevalence was 28%. These, according to the literature, are rather low values for the nursing profession. The prevalence values for NP were respectively 27%, 22%, and 15%. These values are similar to results of other studies.

Of the 237 investigated variables, 111 showed a significant difference between one of the experimental groups (lifetime, year, or point prevalence for LBP or NP) and the control group. In summary, the experimental groups showed a lower education level, poorer general health, older age, longer time working as a nurse, more pregnancies; they smoked more, were more depressed, had more musculoskeletal problems, experienced more severe pain in all circumstances, feared and avoided more work and physical activity, had higher scores on all coping strategies, and were less satisfied with their work.

They did not differ in sleeping habits, recreational activities, work circumstances, use of alcohol, working tasks, department where they worked, or kind and number of working shifts. The results for the NP-populations are similar to the results of the LBP groups. In this summary we will only discuss the LBP results.

The next step involved incorporating all statistically significant variables into a factor analysis. This procedure failed, however, to determine factors of related variables. The Kaiser-Meyer-Olkin (KMO) value is a variable describing sample accuracy and should ideally be 1. On the base of our variables the KMO value was 0.06, meaning that no strong correlations between these variables could be detected.

It was then decided to put all variables (111) into a discriminant analysis. This resulted after 47 steps in a discriminant function of 43 variables. This discriminant function succeeded in 83.2% of the cases in classifying them correctly as having LBP or not. A similar procedure was used for the nurses with NP, with similar results. Cases misclassified by the discriminant function were mostly cases with no LBP classified as with LBP, in other words this function slightly overestimated LBP. Though a discriminant function of 43 variables is complex, it was noticed that already after step 1 a classification coefficient of 80.76% had been reached. This could be due to the fact that this variable (fear avoidance of work) is the only strong discriminating variable or that all the other variables have a similar discriminating power. By performing a step-by-step discriminant analysis, each time eliminating the selected variable, we found that the latter explanation to be true. The next variables were all the different coping aspects. These were able to discriminate correctly in 79.5% of cases, followed by pain levels in different situations, with discrimination in 74 and 78% of cases respectively.

It was concluded that these variables are, among those investigated, the most important variables in the development of LBP. It would be wrong, however, to conclude that these variables are solely responsible for LBP. The failure of the factor analysis and the high odds ratios found show that LBP can have a wide range of different, uncorrelated causes. It can be compared with the "bucket/drop" model.

Each variable having a statistically different value in the experimental groups compared with the control group is a drop. The fear avoidance of work variable is the biggest drop, the coping strategies are somewhat smaller, and the variables not mentioned in the discriminant function are the smallest drops. Each drop will fill the bucket and eventually one drop will be responsible for the overflow of the bucket. Which drop will cause the overflow is impossible to predict. This is why primary prevention actions should focus on the "big drops" first, but without neglecting the "smaller drops".

Conclusions

These data suggest that psychosocial aspects are more important in primary prevention of LBP or NP then ergonomic interventions. However, a prevention model solely based on psychosocial aspects will not satisfy. Therefore we believe that primary prevention actions in the hospital should consist of psychosocial interventions, ergonomic interventions (material and education), interventions to improve general health, and interventions to improve work satisfaction. To decide whether these theoretical results bear out in practice, it is necessary to translate this theoretical prevention model into a practical intervention programme followed by an evaluation. The basis of this translation into practice can be found in the previous sub-projects of this investigation programme. It was shown that fitness levels in nursing staff are rather low, that their spinal movements frequently enter “risk zones” of disc compression, that they had better use beds adjustable in height because these reduce compression and shear forces on the discs, because muscle activity is lower, and because the nurses' movements enter less frequently the above-mentioned “risk zones”. Furthermore, this study proves that more time should be spent on lifting education in the nursing schools and the information collected in the literature database provides us with the necessary information about which interventions used in the past have been successful or less successful.