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Workplace factors and care seeking for low-back pain among female nursing personnel

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Objectives Low-back pain is common among nursing personnel, and its origin is multifactorial. The present study focused on physical and psychosocial work load. The objectives of the study were to estimate the relative risk for nursing personnel, compared with other occupational groups, to seek health care for low-back pain, and to identify risk factors.

Methods This study is a part of a population-based case-referent study in the municipality of Norrtälje, situated north of Stockholm. Altogether 333 women served as cases and 733 served as referents. Eighty-one cases and 188 referents were employed in nursing work. The cases had sought health care for low-back pain during the study period, November 1993 to November 1996. The referents were randomly selected from the same population. The subjects filled out 2 questionnaires and participated in interviews about physical exposures and psychosocial factors.

Results When the female nursing personnel were compared with other employed women, no increased risk of consultation for low-back pain was found. According to a multivariate logistic regression, nursing personnel exposed to forward-bending working positions, high energetic work load, perceived physical exertion, or insufficient social support had the highest risk estimates. In univariate analyses, the combination of physical and psychosocial risk factors was associated with a particularly high risk.

Conclusions In nursing work, physical load seems to be more significant than psychosocial factors when a worker seeks health care for low-back pain. The results did not support the hypothesis that nursing work is a risk occupation for seeking care for low-back pain when compared with other occupations.

Key terms case-referent study, epidemiology, health care, physical load, psychosocial factors, women.

Low-back pain is common among nursing personnel. In a previous study, 53% of the nurses in a regional hospital reported that they had experienced low-back pain during the previous 12 months, and 16% reported current intense symptoms in the low-back region (1).

The origin of low-back pain is multifactorial, and the present study focused on workplace factors related to physical and psychosocial load (2, 3). In studies on psychosocial dimensions, physical load is often assessed at the group level (4). In studies on physical factors, the psychosocial conditions have often been ignored or crudely assessed (5, 6). When exposures are assessed

with different precision, it is difficult to estimate the relative effect of the physical and psychosocial load.

In our study, we assessed physical and psychosocial factors at the individual level. Both interview data with a descriptive focus on the work environment and questionnaire data focused on perceived work load were considered. The objectives of the study were to estimate the relative risk of nursing personnel seeking health care because of low-back pain when compared with other occupational groups and to identify risk factors for health care consultations for low-back pain among nursing personnel.

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Subjects and methods

This research was a part of the Norrtälje study, a population-based, case-referent investigation of low-back disorders in the municipality of Norrtälje, situated north of Stockholm. The study base comprised about 17 000 persons between 20 and 59 years of age, who lived and worked within the municipality. The data collection took place from November 1993 to November 1996. The cases had sought health care from any of the about 70 care givers in the region during the study period. All care givers in the region, such as physicians, physiotherapists, chiropractors, osteopaths, homeopaths and others, took part in the study, and none refused to participate. The referents were selected from the population register as a stratified random sample, taking age (5-year intervals) and gender into account. All the care givers reported patients with low-back problems to the project group. The case patients were contacted by telephone as soon as possible, and a time for the examination was reserved, usually within 1 or 2 weeks and no longer than 2 months after the first contact. The referents were contacted by letter. An inclusion criterion was that the cases and referents should not have sought care for low-back or neck and shoulder pain during the 6 months prior to the study occasion. Altogether 694 cases and 1423 referents, who were gainfully employed at least 18 hours per week for at least 2 months during the previous 12 months, were investigated.

The participation rate for all the formal cases in the study is unknown, but, according to interviews with the care givers, only a few refused to participate. Among the female referents, 31% could not or did not want to participate; the corresponding frequency was 32% for the male referents.

The classification as to occupational sectors was based on the Nordic Occupation Classification (7) at the 3-digit level. Nursing occupations included registered nurses, assistant nurses, attendants in psychiatric care, home-care workers, and assistants for the mentally retarded. The registered nurses, the assistant nurses, and the attendants in psychiatric care worked mainly in a hospital setting, in medical, surgical, psychiatric or geriatric wards. The home-care workers were employed by the local municipal authority and worked with elderly people in their private homes. Assistants for the mentally retarded were also employed by the local municipal authority and took care of the mentally retarded in nursing homes. Since there were only 7 male referents and 12 male cases working in nursing occupations, they were excluded from further analysis. In the present study, when self-employed women with occupations requiring at least 6 years of education after compulsory school were excluded, there were 333 women who formed cases and 733 women who acted as referents. Eighty-one of the cases

and 188 referents were gainfully employed in nursing work. Of the cases, 1 woman became a case twice according to the inclusion criteria, and 4 referents became cases during the study period.

The subjects took part in a clinical examination, an interview by a physiotherapist about physical exposures, and an interview by a behavioral scientist about psychosocial factors. Furthermore, the participants filled out questionnaires about living conditions, occupational exposure, and general health. The physiotherapist and the behavioral scientist did not know the case-referent status of the subject during the interviews. The assessed exposures and the cut-off points between the exposed and unexposed subjects were determined on the basis of experience, the results of previous studies, knowledge of risk factors and work conditions, and the exposure distribution in the reference group.

Physical factors

As an overall proxy for the energetic work load, an estimate of the energy expenditure was used. For each task the energy expenditure, expressed as multiples of the resting metabolic rate (MET), was estimated by the physiotherapist. A coding scheme, modified from 2 review articles (8, 9), was used for classifying physical activities by rate of energy expenditure. A time-weighted MET (TWA MET) was calculated for a typical workday. A TWA MET of 2.9 or more was the cut-off point for a relatively high energetic load. An energy expenditure of 2.9 MET for an average middle-aged woman represented around 30% of her maximal aerobic power (10). An upper general limit of around 30–35% of the maximal aerobic power has been recommended for an 8-hour workday for mixed physical work (11).

A rating of perceived exertion (RPE) was used as an item assessing perceived physical exertion during a normal workday in the questionnaire (12). The RPE scale was set as 6 (resting) to 20 (maximal exertion). Nursing personnel who reported physical exertion higher than "somewhat hard" (score ≥ 14), approximately the highest tertile among the female referents in the Norrtälje study, were categorized as exposed.

Manual lifting of 10 kg during at least 5 minutes of a typical workday and lifting of at least 30 kg once a week were considered to be exposure criteria. In addition working in forward-bent positions with the hands below knee level for 1 hour during a typical workday was considered to be high-level exposure; work in the same positions for 1–59 minutes was regarded as medium exposure.

Psychosocial factors

The occupational tasks, the duration of each task, and the mental requirements of the work were assessed from the description in the interview. The interviewer calculated

the time spent in routine work, the active application of knowledge, and problem solving for a typical workday (13). The underlying hypothesis was that work requiring little thinking and planning has negative consequences on health in the long-term (14). "Mainly routine work" was defined as 50% of the workhours spent in routine work and no tasks requiring problem solving (13).

According to the job-strain model, the combination of high psychological demands, low intellectual discretion, and low authority over decision making was considered to be a job-strain situation and a potential risk factor (15). The index for psychological demands included the following 5 items: excessive work, conflicting demands, time to do work, fast work, and hard work. The score variation was 5 to 20: the higher the score, the higher the demands. Intellectual discretion included the following 4 items: learning new things, high levels of skill, high levels of creativity, and repetitious job. The score variation was from 4 to 16: the lower the score, the less the skill discretion. The index of authority over decisions included the 2 items of questions about influence over what to do and how to perform the work. The score variation was 2—8: the lower the score, the less the authority over decisions. The indices were divided into tertiles according to the distribution among the male and female referents in the Norrtälje study. A score of 14—20 for psychological demands, a score of 4—10 for intellectual discretion, and a score of 2—5 for authority over decisions were considered potential risk factors. A sum score of 6—16 for low intellectual discretion and authority over decisions (approximately the lowest tertile) combined with high psychological demands (approximately the highest tertile) was categorized as a job-strain situation. The possibilities for social support and satisfying social relations at work were assessed both in the interview (2 questions) and by questionnaire (6 items). The possible score variation was from 8 to 32: the higher the score, the more satisfied with the social support. A score of 8 to 22 was considered a potential risk factor. The internal consistency of the psychosocial indices was considered acceptable, the Cronbach alpha values were between 0.72 to 0.87 when calculated for the reference nursing personnel (16, 17).

Terms of employment, living conditions, family situation, and the amount of domestic work were also considered both in the interview and in the questionnaire.

Data analysis

When nursing personnel with occupations requiring the same level of education were compared, the categorization was based on the Swedish socioeconomic index classification (7). Risk analyses, stratified into 2 age groups by the Mantel-Haenszel method, and a logistic regression analysis were conducted. In the logistic regression factors with an odds ratio (OR) of 1.5 or greater in the

univariate analysis were included, along with age and smoking. The stability of the logistic regression analysis was tested by the Hosmer & Lemeshow test (18). The highest correlated exposure variables included in the multivariate analysis were workhours/week and night-shift work (Spearman rank correlation coefficient of -0.37). In the multivariate analysis all the variables were dichotomized except age, which was treated as a continuous variable. In the Norrtälje study the data were frequency-matched for age to increase the efficiency of the study. In the analyses, age was considered to be a potential confounder or effect modifier (19).

Results

The majority of the nursing personnel was always or almost always satisfied with the support from their workmates and supervisors, and only 6 reported mainly routine work and no problem solving. The median number of workhours per week was 34 for the referents in nursing work and 30 for the cases in nursing work. Part-time (15—29 hours/week) work was associated with night shifts. Seventy-seven percent of the referents and 93% of the cases on night shift were employed part-time.

A comparison of nursing personnel with the other occupational groups did not show any increased risk of consultation for low-back pain (table 1). On the contrary, the risk was lower for the registered nurses than for the other employed women in occupations requiring the same level of education (table 1).

High energetic work load, work in forward-bent positions, low intellectual discretion, low authority over decisions, part-time work, temporary employment, and night shifts were less frequent among the registered nurses than among the other nursing groups (table 2).

Table 1. Risk estimates for seeking care for low-back problems for female nursing personnel in a comparison with employed women not working as nurses but in occupations requiring the same level of education. In the analysis the subjects were stratified into 2 age groups (<45 years, ≥ 45 years), and risk estimates were calculated by the Mantel-Haenszel method.

Different categories of nursing personnel (potential risk of exposure)	Nursing personnel ("exposed groups")		Employed women not working as nurses (comparison group)		OR	95% CI
	Cases	Referents	Cases	Referents		
Registered nurses	3	41	79	204	0.2	0.1—0.5
Assistant nurses, attendants in psychiatric care	30	67	69	146	1.0	0.6—1.6
Home-care workers and assistants for the mentally retarded	48	80	104	195	1.1	0.7—1.8

Table 2. Distribution of exposure factors among the referents. The differences between the registered nurses and the other nursing personnel (assistant nurses, attendants in psychiatric care, home-care workers and assistants for the mentally retarded) in proportion exposed (proportion of exposed registered nurses minus proportion of other exposed nursing personnel) and 95% confidence intervals (95% CI) of the differences.

Exposure factors	Registered nurses (%)	Other nursing personnel (%)	Differences in proportion (%)	95% CI
Working in forward-bent positions	66	86	-20	-36 — -5
Heavy manual lifting ^a (weekly)	27	18	9	6 — 24
Manual lifting ^b (daily)	7	13	-6	-4 — 15
High energetic work load	0	16	-16	-22 — -10
High perceived physical exertion	18	32	-14	-29 — 0
High psychological demands	41	20	21	5 — 38
Low intellectual discretion	7	39	-32	-44 — -25
Low authority over decisions	24	39	-15	-30 — 0
Job strain	0	8	-8	-13 — -3
Insufficient social support	12	7	5	-6 — 16
Mainly routine work	0	3	-3	-6 — 0
Part-time work	10	33	-23	-35 — -12
Night shifts	7	13	-6	-15 — 4
Temporary employment	5	24	-19	-28 — -9
Current smoking	12	31	-19	-31 — -6

^a ≥30 kg at least once a week.

^b ≥10 kg at least 5 minutes/day.

However, high psychological demands were more frequent among the registered nurses (table 2). The assistant nurses, attendants in psychiatric care, home-care workers, and assistants for the mentally retarded were compared with the registered nurses, and the risk estimate for seeking care for low-back disorders was 7.2 (95% CI 2.5–21).

The highest risk estimate for the nursing personnel was found for those highly exposed to work in forward-bent positions (table 3). Except for low intellectual discretion, the increased relative risk estimates for different exposure factors in the univariate analyses were confirmed in the multivariate analysis (table 3).

Living conditions, current smoking, and age were not associated with an increased estimated relative risk (table 3). Of the psychosocial factors, insufficient social support was associated with the highest relative risks (table 3). In the univariate analyses, combined exposure to forward-bent work positions and low intellectual discretion gave an increased risk estimate of 9.0 (95% CI 2.5–33). Nursing personnel with insufficient social support in combination with forward-bent work positions had a

risk estimate of 6.2 (95% CI 1.7–22). However, no multiplicative interaction effects of the included variables were observed in the multivariate analysis.

Discussion

In this study, nursing work, especially work as a registered nurse, seemed to decrease the relative risk of consultation for low-back pain. An increased prevalence of low-back pain has been reported for nursing personnel in a comparison with the general population (20). Official Swedish statistics for 1995–1996 show an increased prevalence of low-back pain for assistant nurses and home-care workers when compared with that of the general working population, whereas no difference appears between registered nurses and the general working population (21). Presumably, the relatively low-risk level for registered nurses can partly be explained by a low physical work load. According to previous studies, assistant nurses have a higher physical work load and also a greater risk of low-back pain when compared with registered nurses (22, 23).

Work in forward-bent positions and with a high energetic load, but without lifting, was associated with an increased relative risk in our study. Several studies on nursing personnel have shown an association between the amount of patient-handling and the risk of low-back pain (24). Patient-handling involves work in forward-bent positions, lifting, and also manual handling such as pushing and pulling. In the present analyses pushing and pulling were not considered, and it could be that energetic load and the time spent in bent positions were better estimates than lifting for the time in patient-handling.

If the observed association between work in bent positions and consultation for low-back pain is causal, an attributable fraction can be calculated $[(RR-1)/RR \times \text{proportion of cases exposed}]$ (19). The attributable fraction can be explained as the proportion of cases whose disorder was caused by the examined exposure. If work in forward-bent positions is not considered part of the work load, 73% of the cases of consultation for low-back pain could have been prevented in our study.

A high RPE was associated with an increased relative risk in our study. In previous studies, ratings on the RPE scale have been useful for listing the patient-handling tasks perceived as most stressful for the low back (25). In our study the RPE scale was used as an item in a questionnaire, and the instructions to the subjects were to report the perceived physical exertion in their daily work. In accordance with previous studies, the variation in the RPE not only seemed to mirror the physical activity, but maybe also the worker's physical capacity and the psychological load (26, 27). If the RPE scale is used

Table 3. Number of exposed subjects among the referents and cases. The estimated odds ratios (OR) with 95% confidence intervals (95% CI), adjusted for age by the Mantel-Haenszel method, and the estimated OR in a multiple invariate logistic regression analysis. In the logistic regression, besides age and smoking, factors with a crude risk estimate of ≥ 1.5 were included. (Intercept -4.5, log likelihood = 280.998, Hosmer & Lemeshow goodness-of-fit test P-value=0.13). Age was examined as a potential confounder.

Exposure factors	Exposed referents	Exposed cases	Age-adjusted OR ^a	95% CI ^b	OR in multivariate logistic regression	95% CI ^c	Missing
Working in forward-bent positions	154	77	4.3	1.6—12	.		1
≥ 60 minutes per day	15	17	.		8.7	2.1—46	.
1—59 minutes per day	139	60	.		2.2	0.7—10	.
Manual lifting							
≥ 30 kg at least once a week (compared with <10 kg)	37	16	1.1	0.5—2.2	.		2 ^d
≥ 10 kg at least 5 minutes per day	22	11	1.2	0.6—2.6	.		3
High energetic work load	23	18	2.1	1.1—4.2	2.3	1.0—5.3	1
High perceived physical exertion	51	40	2.7	1.6—4.7	2.3	1.2—4.5	15
High psychological demands	46	12	0.5	0.3—1.0	.		12
Low intellectual discretion	61	40	2.0	1.2—3.4	1.2	0.6—2.2	11
Low authority over decisions	69	30	1.1	0.6—1.9	.		8
Job strain	12	6	1.2	0.4—3.3	.		20
Insufficient social support	11	16	1.7	0.8—3.8	2.4	0.9—6.4	18
Mainly routine work	5	1	0.4	0.1—3.2	.		2
Temporary employment	37	21	1.9	0.9—4.2	1.6	0.7—3.4	3
Part-time work	53	35	2.0	1.1—3.4	1.6	0.8—3.5	.
Night shifts	22	15	1.7	0.8—3.4	1.5	0.5—4.4	4
Children							
0—6 years at home	40	11	0.6	0.3—1.4	.		-
0—8 years at home	67	18	0.5	0.3—1.0	.		-
Single parent	15	4	0.6	0.2—1.9	.		1
Responsible for daily domestic work	134	59	1.1	0.6—2.0	.		3
Domestic work ≥ 5 hours per day	34	17	1.1	0.6—2.1	.		-
Current smoking	50	24	1.2	0.6—2.0	1.0	0.5—1.9	-

^a OR adjusted for age (<45 , ≥ 45 years) by the Mantel-Haenszel method.

^b For the age-adjusted OR.

^c For the OR in the multivariate logistic regression.

^d 92 subjects lifted 10—20 kg at least once a week.

as an item in a questionnaire to identify those with a high physical load, the extent of independent misclassification may be substantial.

In a previous study among nursing aides in geriatric care, the cross-sectional analysis and the 6-month follow-up demonstrated a weak tendency towards a higher prevalence of low-back pain among the persons who reported a high level of physical exertion at work (27). In another study, including 4 annual cross-sectional surveys in a hospital setting, a higher prevalence of symptoms from the neck, shoulders, and back was observed among the persons who reported high physical exertion. In the 1-, 2-, and 3-year follow-up analyses the crude point estimate of the risk ratio for having current symptoms was between 1.3 and 1.6 for the high-exertion group (1). Perceived high physical exertion in nursing work may partly be an effect of current low-back pain, but our study and previous studies indicate that high perceived physical exertion is a risk indicator of a condition preceding low-back pain.

Insufficient social support is strenuous in itself and may probably also increase the negative effect of other strenuous work conditions (28). Studies concerning the

influence of social support on low-back pain are not consistent. One showed that nursing personnel who reported low-back pain were more satisfied in their relationship with workmates (29). In a Swedish study among nursing personnel low support from superiors was related to low-back pain (22), while, in another study (30), low support was related to neck and shoulder symptoms but not with symptoms from the low back. In a study concerning home-care workers, social support had no main effect on low-back symptoms, but it modified the effect of physical and psychological work load (31). Our study indicated evidence for a direct association between insufficient social support and low-back pain. However, the frequency of insufficient social support was low and the association was not significant.

Job strain was less frequent among the registered nurses than among the women in the nursing occupations with a relatively increased risk of low-back pain. On the other hand, in the analyses on the individual level, when nursing personnel who reported job strain were compared with nursing personnel not reporting job strain, no increased relative risk was shown. In 1 study, including 4 annual cross-sectional surveys in a hospital setting, the

risk ratio for current symptoms from the neck, shoulders, or back was between 1.1 and 1.5 for the job strain group when compared with that of the other members of the nursing staff (1). In 2 cross-sectional studies among nursing personnel, a significant relationship between job strain and low-back pain was observed (5, 30). In our study the outcome definition was incident cases of care sought for low-back pain, whereas in the studies with a positive relationship, the outcome was the prevalence of self-reported symptoms. The prevalence of self-reported low-back pain is dependent both on the incidence and the duration of the symptoms, and job strain may be more relevant for the duration of symptoms than for the onset of low-back pain.

Working part-time seemed to imply an increased risk for low-back pain. In a previous cross-sectional study on female hospital staff, full-time and part-time workers did not differ in the prevalence of low-back pain. However, a multiple analysis indicated that psychosocial job factors were associated with the intensity of low-back pain for full-time workers but not for part-time personnel (32). In order to test the same hypothesis, we stratified the univariate analyses for workhours, but no differences in risk were observed.

Our study indicated a positive relationship between night shifts and low-back pain and supported the hypothesis of an independent association between night shifts and low-back pain. Night shifts had been shown to be connected with reduced sleeping time, and, in addition, subjective sleep quality is reduced (33). One hypothesis is that sleep disturbance leads to increased muscle tension that contributes to pain in the low back (34).

Forward-bent positions in combination with strenuous psychosocial conditions or night shifts increased the estimate for low-back pain. Different explanations have been suggested for a combined effect of psychosocial and physical risk factors. Increased muscle tension due to strenuous psychosocial conditions may lead to increased vulnerability to physical demands (34). Furthermore, low control in the planning of patient-handling tasks may lead to unsuitable and strenuous work positions (4, 34–36). However, in the risk calculations of the effects of the combination of potential risk factors compared with no exposure, the statistical power became low since few cases were exposed to a potential physical or psychosocial risk factor. It was not possible to estimate reliably whether the combination of risk factors exceeded their additive effect.

Our study focused on risk factors for health care consultations for low-back problems and did not include the actual presence of disorders, symptoms, and pain from the low back. In previous studies concerning low-back pain and work factors the definitions of disorders have not been consistent. Pain, pain leading to incapacity, sickness absence, incapacity for daily tasks, the duration of

pain, the intensity of the pain, and back problems at the workplace are examples of outcome definitions (3). In our study health-care seeking was used as a proxy for the incidence of low-back disorders. All the subjects were examined by a physiotherapist according to a standardized procedure. The cases were classified into a group with clinical signs of low-back pain or sciatica and a group without any objective clinical signs. Of the health care personnel, 47 of 81 cases had objective signs and a diagnosis. The risk estimates did not vary a great deal between the cases with and without diagnosis.

One conceivable selection bias for this study could be that health care personnel, especially registered nurses, do not seek care for their pain. However, among the female referents, 34% reported current low-back pain. Of the registered nurses 22% of the referents reported current pain, the corresponding figures being 32% for the assistant nurses and 38% for the home-care workers. The data did not support the hypothesis that health-care personnel suffer from low-back disorders without seeking care to a greater extent than do other employed women.

On the contrary, one possible selection bias could be that nursing personnel seek medical treatment for disorders more often than do other occupational groups (37). Nursing personnel possibly rely more on professional care than women employed outside the health-care sector. An inclusion criterion of this study was that the cases and the referents should not have sought care for low-back and neck or shoulder pain during the 6 months prior to the study occasion. Chronic cases currently under treatment for low-back pain were excluded. Thus a possible referral bias was that nursing personnel were currently under treatment more often than the other occupational groups.

A possible cause of the low risk for registered nurses when compared with that of the other groups could be that the health care sector in Norrtälje was better supplied with transfer equipment or that the patients' requirements for care involved less load than in other regions in Sweden. None of the official statistical data, interviews with employees, or visits to workplaces supported this explanation.

The physical and psychosocial work factors were not assessed independently of the person in that the assessments were based on interviews and questionnaires. Differential recall bias is a validity problem in case-referent studies. It is possible that low-back pain biases the self-assessment of the work load. If the cases recalled the exposure with better accuracy or exaggerated the exposure when compared with the referents, it led to an overestimation of the observed risk factors. In the analyses, the individual reporting and the exposure distribution at the occupational level were considered. Differences between the registered nurses and the other nursing occupations in the proportions exposed in the reference group, the risk

of seeking care for low-back pain in different occupational groups, and the risk factors at the individual level were presented. When the exposure pattern among the referents is considered, potential recall bias due to low-back disorders is reduced. Furthermore, when the reporting of exposure at the occupational level is examined, the importance of individual biasing factors decreases. On the other hand, exposure assessments based on occupation ignore differences in work conditions for different persons in the same occupation (38).

Perceived physical load and psychosocial factors, reported in the questionnaires, reflected the work conditions but were probably also associated with the person's psychological and physical status and factors outside work. The interview methods were developed on the basis of the statement that an interview gives more descriptive information than self-reported questionnaires (13, 39).

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