RESEARCH ARTICLE

Low back pain among hospital nurses: The interplay of underlying factors

Upasana Chowdhury [1], Tamal Das [1], Sahana Mazumder [2], Somnath Gangopadhyay [3*]

ABSTRACT

Background: Low back pain (LBP) is a wide-reaching phenomenon among nurses. In a country like India, the scenario is not different although the prevalence of multiple causal factors and their consequences on nurses has yet to be convincingly demonstrated. *Objective:* This study examined the relationship between LBP and other causative variables in female registered nurses in West Bengal, India. *Methods:* With the multiphase sampling method, subjects with LBP and subjects without discomfort were chosen using the modified Nordic Questionnaire. Among the final study subjects the physical activity level (PAL) and copenhagen psychosocial questionnaire (COPSOQ) were performed. The daily nursing activities were analysed using the rapid entire body assessment (REBA) tool. The correlation analyses and χ2 tests were performed using SPSS version 23 software. *Results:* Few demand scales and role conflict scale were found to be strongly related to LBP. Among the daily tasks analyzed two activities showed high-risk scores, indicating immediate investigation and ten activities showed medium risk. *Conclusion:* This study showed the connection between various psychosocial variables and LBP as well as the risk-prone body postures that nurses adopt when performing routine jobs. Investigating the intricate interaction of variables that may impact or promote LBP in Indian nurses is crucial.

Keywords: Low back pain, Nursing personnel, Posture, Psychosocial factors, Occupational health.

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INTRODUCTION

Healthcare workers are often impacted by work-related discomforts in the musculoskeletal system. This remains the biggest cause of disability, missing work days, greater expenses, and human injuries. Nurses, who are vital to health sectors, are most susceptible to these problems and have the highest prevalence of discomforts, which can affect the neck, shoulder, arm, wrist, and mostly back region.[1,2] Low back pain (LBP) is one of the top ten manifestations of disease and disability, according to the Global Burden of Disease Study. Various demographic, behavioural, and workplace characteristics have been linked to LBP along with workplace stressors.[3] As the previous research showed, LBP related to work is common among nurses, with an incidence rate of 40 to 90% globally; hence, it is classified as an important workplace risk. LBP is regarded to have a significant impact on nurses' participation and job constraints, influencing clinical efficiency and care provided to admitted patients. Nurses who operate in settings that require severe exertion, such as the intensive care unit (ICU), tend to be more vulnerable to LBP. In a hospital setting, the absence of proper lifting assistance, particularly in developing nations like India, compels nurses to exert themselves while handling patients. In this densely populated country, with diverse healthcare set-ups and varying requirements of patients, most of the public hospitals face a shortage of ergonomically designed sophisticated tools, thereby instigating strenuous manual handling to meet the need. There are only a few research investigations in India to elucidate and recognise the risk elements that induce LBP among nurses and which could help hospital management take immediate measures and reduce harm.[4]

Another important consideration in this regard should be job demands, which include factors like physical (work overload), psycho-emotional (continuous exposure to pain and mortality), social (communicating with co-workers), and organisational (job intricacy) elements. Though no medical provider is excused from work pressure, nurses exclusively are overburdened by conflicting roles, work-home disagreements, organisational politics and adverse work environments.[5,6] As the causation of work-related musculoskeletal discomforts is multidimensional, future studies must consider both the psychosocial components of

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vocations as well as the physical exposures they generate.[7] Although there are studies[8-10] that have revealed the high prevalence of LBP among Indian nurses, the overall depiction of the interplay of work-related causal factors along with psychosocial aspects has not yet been shown properly. This study aimed to observe the relationship between the occurrence of LBP and various underlying factors among female registered nurses in West Bengal, India.

The objectives of this study are:

- Estimating the probable physical and physiological contributing factors among the nurses with LBP.
- Assessing the psychosocial stress factors and the possible interplay between those factors and the occurrence of LBP among the nurses.
- Analysing the presence of risk-prone postures adopted by nurses while working.

MATERIALS AND METHODS

Ethical Clearance of the Study

The ethical clearance of the study was obtained from the Institutional Human Ethical Committee, Department of Physiology, University of Calcutta.

Selection of Study Area

Both government and private hospitals were selected for the study and 15 large- and small-scale hospitals were contacted and approached randomly. This study was accepted by 8 of them for execution on their premises. The institutional authority had been approached directly by appointments. After the initial acceptance of our proposal, the director or the superintendent of the willing health institution was requested with permission letters, documented details of the study, the institutional ethical clearance certificate, and consent letters. After the authorization, a subsequent request was presented to the nursing superintendent with the said documents for a detailed discussion about the suitable wards for this research work.

Selection of Subjects

A total number of 250 nursing personnel working in those hospitals were addressed to perform the study and, among them, 231 nurses completed the questionnaires. Maintaining the inclusion and exclusion criteria of the study 215 subjects were selected in 1st phase of multiphase sampling.

The inclusion criteria of the 1st phase were:

- Registered nurses working in different hospitals in West Bengal
- Female nurses

The exclusion criteria of the 1st phase were:

- Nursing students
- Presence of any disease related to the musculoskeletal system
- Presence of clinically identified psychological disorders
- History of major accidents or injury
- Incidents of recent injury
- Pregnancy
- History of major surgery
- Taken sick leave for 7 days or more within the last month before the study

As this study focuses on only LBP a second selection of subjects was made with more precise exclusion and inclusion criteria. Among these 215 subjects, the modified nordic Questionnaire[11,12] was performed. Subjects with discomfort in any other body part apart from the lower back and /or in various body parts were excluded from the study in the 2nd phase of subject selection (Figure 1). Subjects with only LBP and subjects without any discomfort were included in this study (N = 153).

Study of Physical Parameters

The body height (cm) and body weight (kg) of the subjects were measured by using an anthropometer (Martin's Anthropometer) and a weighing machine (Crown Victoria Dx, manufactured by Ramon Surgical Company), respectively. The body mass index (BMI) of the subjects was calculated using the following formulae: BMI in kg/ m^2 =Weight in kg. / Height in m^2.[13]

Questionnaire Study

The subjects were given the first two questionnaires in the 2nd phase of selection and finally the next two were provided to the final study subjects. They were asked to answer the questions written or tick/mark the preferred area mentioned along with a question or statement.

- A general data sheet containing the personal data of the subjects like age, working experience, presence of any chronic disease, etc. Subjects were asked to fill up the required details.

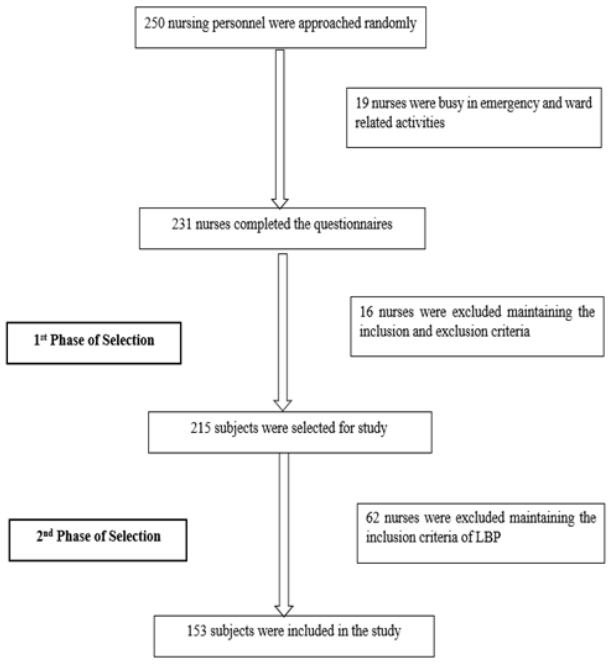


Figure 1: Schematic of multiphase sampling of the subjects

- Modified nordic questionnaire[11,12] in which, specific body parts like elbows, shoulders, wrist/hands, upper back, lower back, hip, knee, and ankle were indicated in a schematic diagram for the ease of the subjects and also there were questions related to trouble like pain, discomfort, numbness or ache in those body parts in the last 12 months' time durations, which they had to answer by filling the checkboxes.
- Physical activity level (PAL) questionnaire[14,15] comprising various daily chores and activities and time spent daily in those activities. Subjects were asked to find the daily activities specific to themselves and put the time spent in each of those activities in a 24-hour duration.
- Copenhagen psychosocial questionnaire (COPSOQ)[16] in which subjects were presented with some questions segmented in different scales regarding the psychological and social aspects of the job. As prior studies indicated that health sectors are workplaces with extensive workloads and responsibility, 8 scales from the COPSOQ, quantitative demands, cognitive demands, demands for hiding emotions, influence at workplace, degree of freedom, job satisfaction, role conflict and general health, were chosen for this study to assess their effects on nurses.[17-19] All these questions had options ranging from 0 to 100 where a score of 100 meant the highest response value or highest level of the criteria being measured and 0 being the lowest.

The subjects were asked to answer the question in a one-to-one process, others were not allowed to enter the area of questioning. To avoid the answering bias the participants were asked not to share or discuss the study questions among others.

Analysis of Working Postures

To examine the everyday tasks of subjects, video recordings were made at various wards in several hospitals while maintaining the privacy of the patients and their family members. The video recordings from the wards had been split into frames, which were then retrieved for examination.

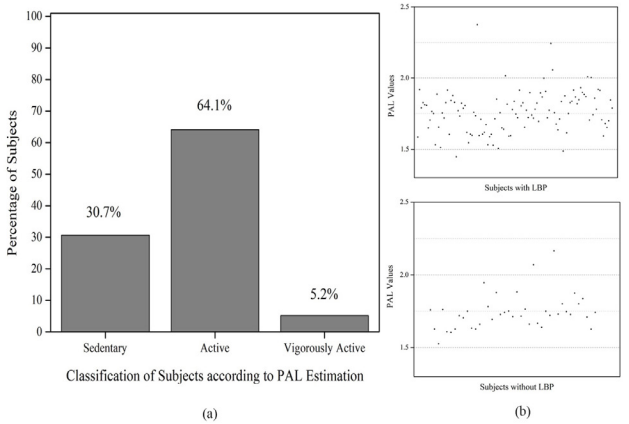


Figure 2: (a) Percentage of subjects in each physical activity group according to PAL estimation (b) Distribution of the subjects' (with and without LBP) PAL values

Table 1: Demography of subjects

Parameters	*Minimum*	*Maximum*	*Mean (±SD)*
Age (Years)	20	57	30.93 (±9.37)
Height (m)	130	173	155.34 (±7.86)
Weight (kg)	31	82	57.74 (±10.17)
BMI (kg/m^2)	15.06	40.17	23.92 (±3.92)

Table 2: Chi-square analysis of LBP with PAL and COPSOQ subscales

Factors	χ^2	*df*	*p*	*φ*
PAL	.026	1	0.873	.013
Quantitative demand	37.492	1	<0.001	.495
Cognitive demand	37.356	1	<0.001	.494
Demand for hiding emotions	16.950	1	<0.001	.333
Influence at workplace	3.748	1	0.053	-.157
Degree of freedom	5.401	1	0.020	-.188
Job satisfaction	3.090	1	0.079	-.142
General health	4.938	1	0.026	-.180
Role conflict	7.288	1	0.007	.218

The tasks were selected from the recording based on the highest frequency detected and the respondents' ratings of discomfort. Thewsessment (REBA)[20] tool was used to evaluate the respondents' working postures.

Statistical Analysis

SPSS Version 23 was used for statistical analysis. Descriptive statistics were used to designate and estimate several factors. Spearman's correlation and χ^2 tests were used to analyze the presence of any significant relationship between different causal factors with LBP.

RESULTS

In this present study, the mean age of the subjects was 30.93 (± 9.37) years with a minimum of 20 years and a maximum of 57 years, and the mean BMI was 23.92 (± 3.92) kg/m^2 (Table 1). No significant correlations were found between LBP and age, height, weight and BMI of the subjects of this study. Most of the study subjects (64.1%) were found to be in active lifestyles and 5.2% of subjects were in vigorously active lifestyles. Subjects with 30.7% were sedentary according to the PAL estimation (Figure 2).

After categorizing the subjects (N = 153) according to their responses on COPSOQ scales, the most concerning aspect was found in the cognitive demand scale (Figure 3).

Subjects with a percentage of 82.4%, reported the requirements of high cognitive demand in their workplace. In the case of demand for hiding emotions and quantitative Demand, the percentages of subjects in high-value groups were 71.2 and 57.5%, respectively. Here the job satisfaction scale showed satisfactory reports with 94.8% of subjects in the high-value group of that scale (Figure 3).

For various scales of COPSOQ and the occurrence of LBP, the chi-square tests were statistically significant (Table 2).

Three demand scales, degrees of freedom, role conflict and general health scales of COPSOQ were found to have statistically significant relations with LBP (Table 2). The distribution of responses of subjects with LBP (Figure 4) and without LBP (Figure 5) on the COPSOQ scales that are significantly associated with LBP were depicted in Figures 4 and 5, respectively.

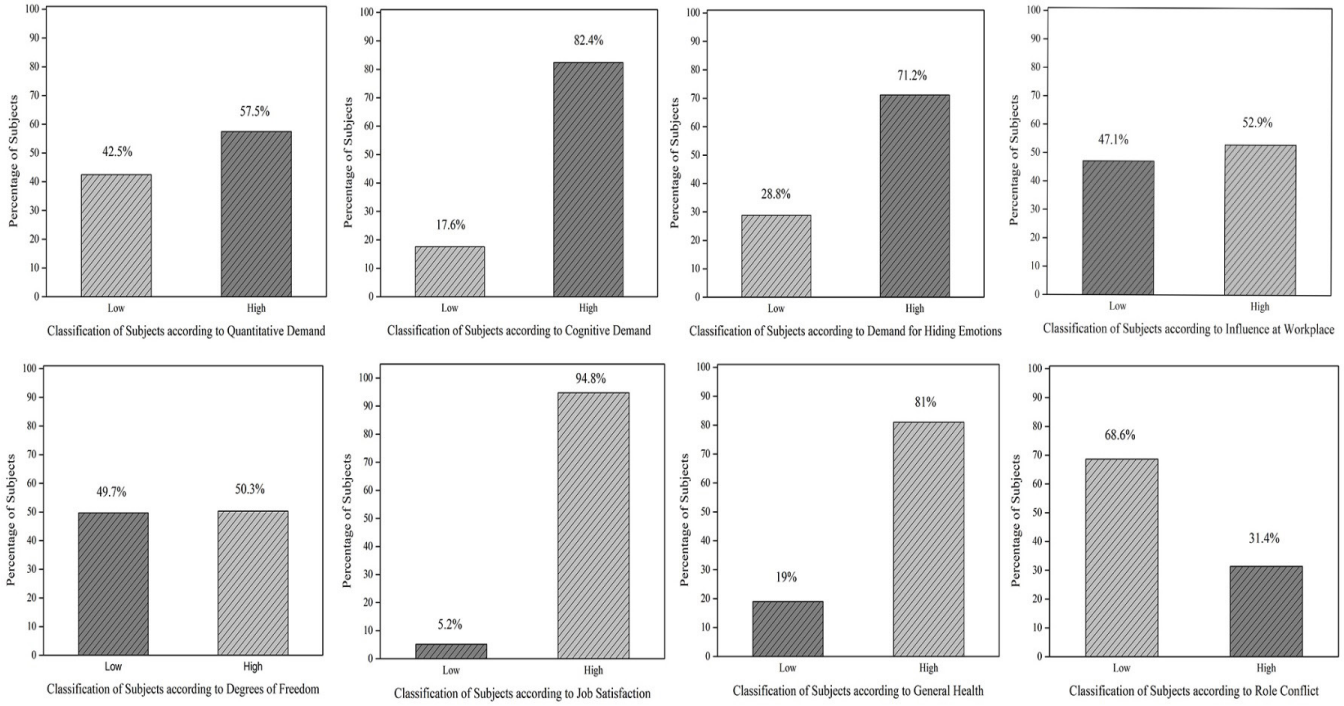


Figure 3: Percentages of subjects in high and low-value categories in different COPSOQ scales

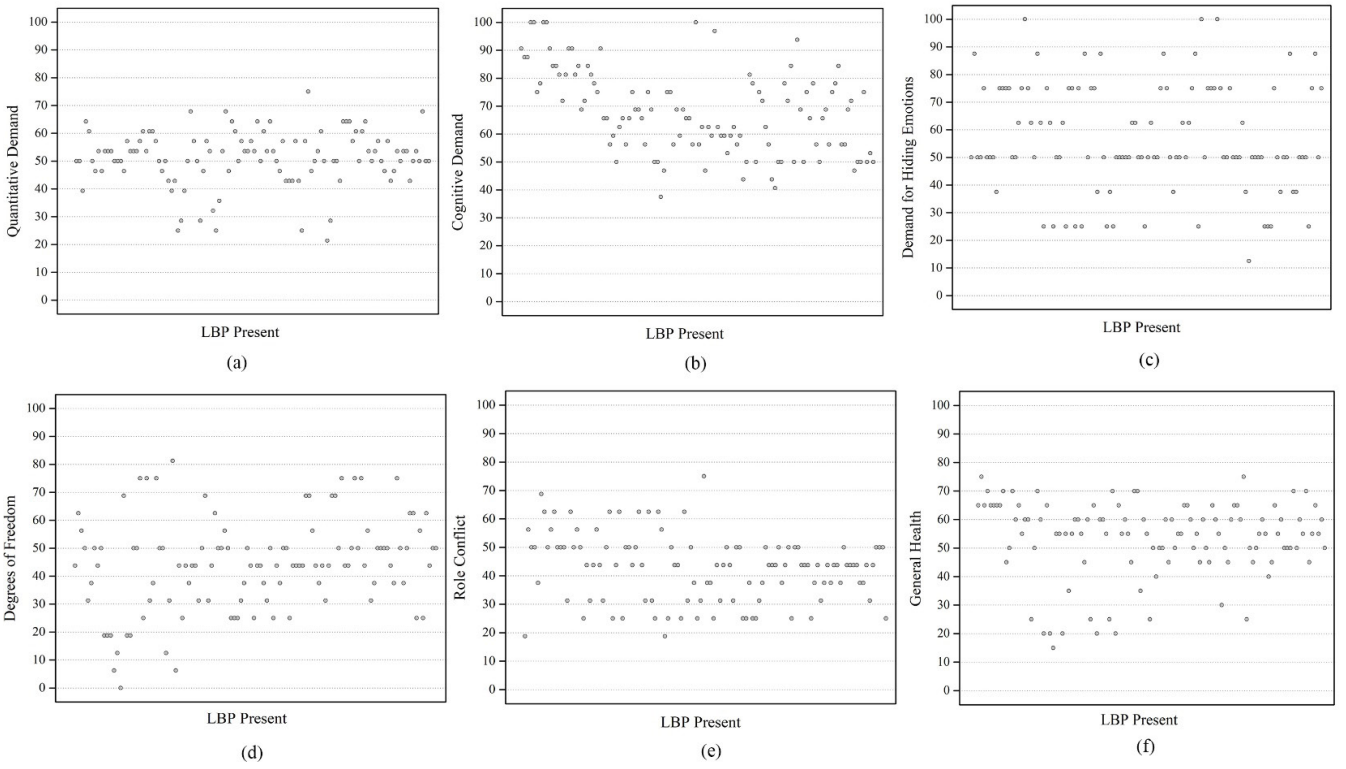
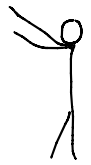
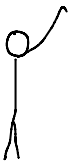


Figure 4: Distribution of the responses in the COPSOQ scales (g-l) of the subjects with LBP

Table 3: Analysis of working postures of the subjects using the REBA tool

S. No.	*Figure*	*Frequency*	*Task description*	*REBA score*	*Risk level*
1		12	Collecting trey and instruments from a rack	7	Medium
2		4	The procedure of childbirth: holding the newborn's head	8	High
3		4	The procedure of childbirth: dragging the newborn by gripping the head	4	Medium
4		4	The procedure just after childbirth: holding and moving the newborn towards the mother's abdomen	9	High
5		4	Weighing the newborn	3	Low
6		12	Arranging the injections and cotton	5	Medium
7		8	Discarding excess materials in the dustbin	3	Low
8		4	The procedure of clearing the placenta from the mother's body	6	Medium
9		80	Arranging the injection for outdoor patients	5	Medium
10		50	The procedure of creating a saline channel on the patient's hand in an outdoor setting	3	Low
11		28	Writing to keep records of medicines administered	5	Medium
12		28	Pulling the patient's bed by rotating the lever handle	7	Medium
13		28	Arranging and preparing medicines	2	Low
14		28	The procedure of the Ryles tube feeding	4	Medium
15		28	Administering injection through a saline channel	4	Medium
16		28	Administering injection through a saline channel	2	Low
17		28	Administering injection via saline	4	Medium
18		12	Administering injection via saline	3	Low
19		8	Performing the Doppler Test on pregnant patients	3	Low
20		28	Helping patients with drinking	2	Low

After collecting all the information about the daily activities, the following types of activities are selected for posture analysis.

- Arrangement of instruments and medicines
- Procedures during and after normal delivery
- Stitching
- Providing injections and making saline channels
- Providing medicines
- Arranging beds
- Keeping records
- Feeding the patients

Among those types of activities, which were reported to be the most frequent and troublesome, i.e. causing uneasiness to the back region of the nurses, were selected and analyzed using the REBA tool.

Twenty tasks were selected for analysis and among those, two tasks were found to be high risk with REBA scores 9 and 8 respectively, and ten tasks were found with medium risk scores (Table 3)

DISCUSSION

Nursing professionals are busy with clinical work in a time-constrained environment with significant work demands, and various discomforts in the musculoskeletal system have become widespread among them.[21,22] In this present study, the mean age of the subjects was 30.93 (±9.37) years and the mean BMI was 23.92 (±3.92) kg/m^2. According to the PAL estimation, 30.7% of study subjects were sedentary and 69.3% of subjects were in an active lifestyle. In previous investigations being overweight and obesity were found to increase the incidence of chronic musculoskeletal discomfort[23] and it was also discovered that attaining the recommended amount of physical activity was substantially related to musculoskeletal pain. Being more active reduces the likelihood of musculoskeletal disorders (MSDs).[24] But here in this study, a large percentage of subjects were already found to be active in their daily life and no statistically significant relationships were found between LBP and age, height, weight, BMI and PAL of the subjects, from which the roleplay of some other influential factors became prominent. In a study by Yip (2001), where 40.6% of the total nurses interviewed reported experiencing LBP in the previous 12 months, and after limiting other potential confounders, LBP risk increased when nurses reported rarely or never enjoying their job and had to manually handle the patients.[25] Excessive physical and mental tasks may deplete individuals and result in persistent physical and psychological stress.[26] Analogously in this present study, 57.5% of subjects were in the high quantitative demand category while 82.4% were in high cognitive demand. 71.2% reported that they had faced the demand to hide their emotions vastly at their workplaces. As rising job demand could also become detrimental to nurses' overall health, statistically significant relations were found between LBP and quantitative demand, where $\chi 2$ (1, N = 153) = 37.50, $p < .001$ with Phi (φ) coefficient .495 showing a strong positive relationship. Also for LBP and cognitive demand, χ^2 (1, N = 153) = 37.57, $p < .001$ with Phi (φ) coefficient .494, showing again a strong positive relationship, and for LBP and

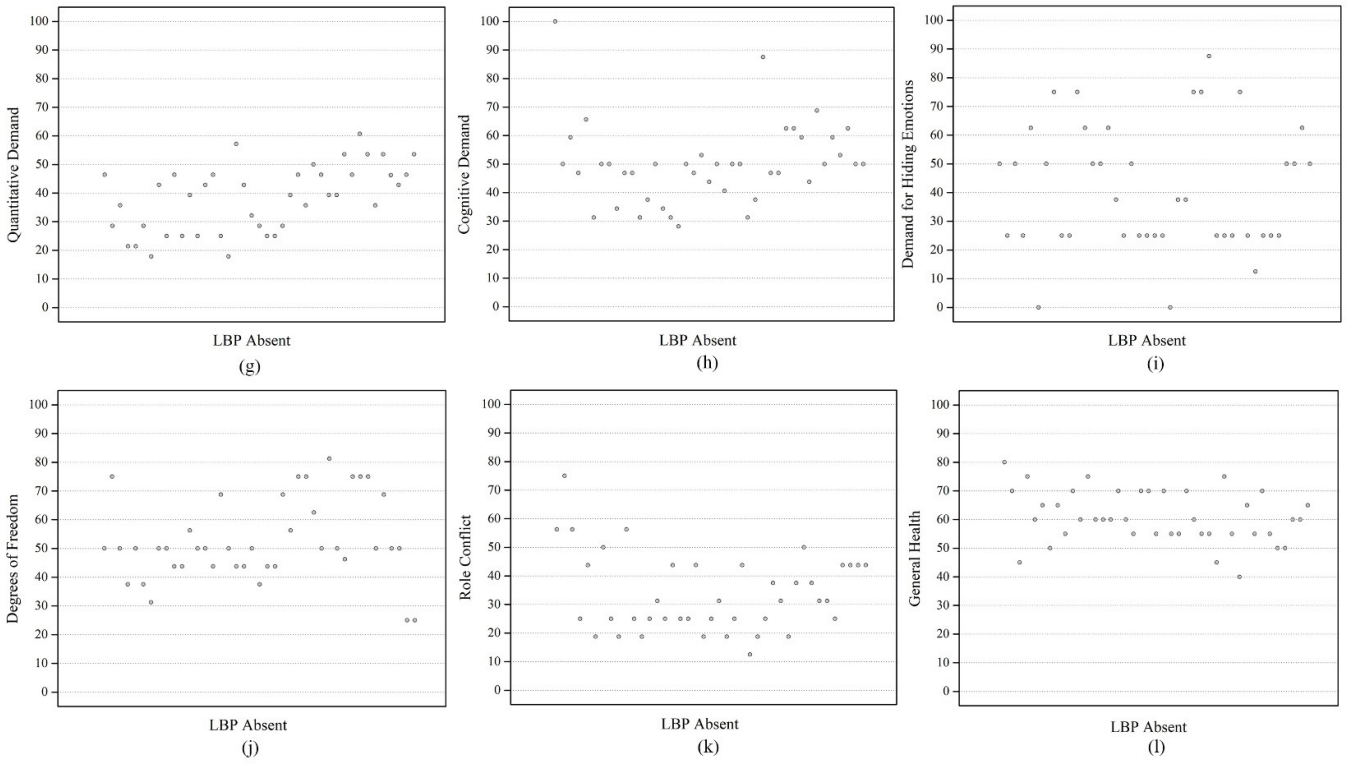


Figure 5: Distribution of the responses in the COPSOQ scales (g-l) of the subjects without LBP

Demands for hiding emotions, χ^2 (1, N = 153) = 16.95, $p < .001$ with Phi (φ) coefficient .333 moderate positive relationship. In this aspect it is critical to remember that stress is a state, not an illness, that can be suffered as a result of being exposed to an extensive variety of work demands and, as a result, can lead to an equally broad spectrum of outcomes. According to the survey by Sharma *et al*. (2014), as many as 80% of nurses reported having little time for relaxation, and 45% reported that their job was tiresome. In a similar way too much work to complete and insufficient people to handle the jobs were the major stressors for nurses.[27,28] In this present study, 52.9% of subjects reported having a high level of influence at their workplaces whereas 47.1% reported a low level (Figure 3). In the case of degree of freedom, an almost equal percentage of subjects were present in both the high and low-level groups. Here, the job satisfaction scale showed promising estimation with 94.8% of subjects in the high satisfaction category. However 19% reported low levels of general health and also 31.4% reported high levels of role conflicts in the workplace (Figure 3), which were points of concern. These factors again showed significant relations with LBP. In the case of Degrees of freedom and LBP, χ^2 (1, N = 153) = 5.40, $p = .0210$ with Phi (φ) coefficient -.188 showing a weak negative relationship. With LBP and general health, χ^2 (1, N = 153) = 4.94, $p = .026$ with Phi (φ) coefficient -.180 depicting again a weak negative relationship. With LBP and role conflict, χ^2 (1, N = 153) = 7.29, $p = .007$ with Phi (φ) coefficient .218 depicting weak to moderate positive relation. No significant relation was found between LBP with influence at work and job satisfaction. In several studies, certain patient care scenarios have been linked to increased stress in nurses. The most common triggers of stress have been found as experiencing death and dying, doubts about how to treat patients and hectic schedules. This workplace stress is increased by conflict with other healthcare employees and discrimination, hectic settings (intensive care units, emergency) with exhausting activities and little opportunity for rest and a meal, compelled to deliver care on time, a shortage of staff and lack of coworkers' assistance.[29] Furthermore, prior research has demonstrated that this kind of mental strain increases the risk of LBP in the healthcare workforce. Strategies to avoid musculoskeletal problems in this group should involve identifying and reducing work-related psychosocial stresses.[30]

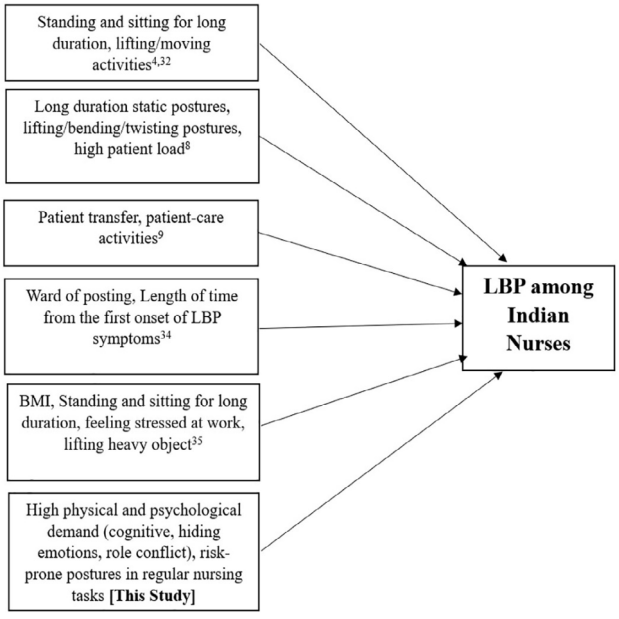


Figure 6: Contribution of this study in the investigation of LBP among Indian nurses

Along with this, previous investigations have also indicated that uncomfortable working postures might cause the emergence and exacerbation of discomfort and pain in workers. The incidence of musculoskeletal discomforts among nursing staff, along with the demands of their jobs to do tasks with suboptimal postures, their frequency, and duration, may indicate a link.[31] In this present study among the twenty daily activities of the nurses analysed with the REBA tool, two activities showed high risk scores indicating immediate requirement of changes and ten activities showed medium risk depicting the need for further investigations and timely modifications (Table 3). The postures analyzed here were from the most common and frequent tasks in hospital settings and this study revealed that the so-called simple activities could cause risk to the musculoskeletal system as there is no uniformity and user-friendliness in the workstations of the nurses. In accordance with this result, Kalyani (2019) found that 59.3% of staff nurses experienced LBP and, handling and manoeuvring patients could reveal the source of the pain. Considering hospital rooms, that are often constrained, nurses had to shift objects around to conduct their responsibilities. Most of the time, nurses are lifting objects that would not even fit in these spaces; these could be some of the contributing factors to LBP.[32] Along with the manual handling of patients, the frequency of lifting/transferring tasks, the patient's body weight, and the extent of the need for assistance/support by the patients also crucially contributed to the discomfort, mostly in the lower back area.[33] This present study unveiled the probable risk associated with the tasks that are plain sailing, regarding the exhaustive patient and/or equipment handling activities and this is an important point to consider as the focus is mainly given on the strenuous nursing tasks, where these regular small actions get un-noticed and have not been evaluated generally. The nurses continue to perform them consistently and these overlooked risk factors can be harmful to the workers if not investigated soon.

In Figure 6, the contribution of this study in the field of LBP incidents among nurses in India is depicted along with the other research in the Indian context.

Healthcare services in India, where population growth is a major issue, encounter several challenges. While health services improve and become 24x7, nurses' workloads and psychosocial pressure to perform effectively intensify rapidly.

As LBP among nurses is a serious concern in India, the role of diverse factors, and the interplay between those factors to modify or cause LBP incidents need to be addressed with utmost priority. This study depicted the presence of various psychosocial factors and their relation with LBP along with the existence of unwanted body postures that were adopted by the subjects while performing daily patient-related activity. The presence of these high and medium-risk postures portrayed the probable risk to the musculoskeletal system of the nurses working. The existence of these factors not only increases the probability of onset but also can aggravate existing symptoms. In this regard, it can be said that physical discomforts and inability can hamper the service provided to the patients and the standard of living of the affected workers. To reduce the discomfort among the nurses the following safety aspects should be considered. Regular assessment of the presence of any discomfort or intensification of existing symptoms, allotment of a proper treatment regime for the worker with symptoms, assessing the views of the nurses on the probable physical and psychosocial regulatory factors for their discomfort, the introduction of proper rest breaks and shift rotation, frequent evaluation of the working condition and work postures of the nurses, educating and providing proper training on ergonomically evaluated working methods and arrangements etc.

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PEER-REVIEWED CERTIFICATION

During the review of this manuscript, a double-blind peer-review policy has been followed. The author(s) of this manuscript received review comments from a minimum of two peer-reviewers. Author(s) submitted revised manuscript as per the comments of the assigned reviewers. On the basis of revision(s) done by the author(s) and compliance to the Reviewers' comments on the manuscript, Editor(s) has approved the revised manuscript for final publication.