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A Review

Ergonomic evaluation of nurse's life style: Some insights on current research trends

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■ **ABSTRACT :** Nursing profession within the health care sector focused on the care of individuals, families and communities to attain and maintain optimal health and quality of life. Nurses spend more time with patients than do any other health care providers and patient outcomes are affected directly by nursing care quality. Nurses suffering from high stress level due to their emotional and heavy physical work as they are often required to lift heavy load, work for long hours and also exposed to frequent social encounters in their jobs. The present study explores the condition of work life imbalance and psychological constrains faced by the nurses.

■ **KEY WORDS:** Nurses, Occupational health hazards, Work life imbalance, Night shifts

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Health service is one of the industries that provide continuous facilities around the clock for the benefit of all citizens in any country. Hospital personnel are responsible for provision of health care though application of medical science knowledge and skill expertise in meeting the health needs of all people within each country. It is expected that a healthy and psychologically balanced workforce provides health care industry workers. Nurses play the major role in health care industry and are the first ones who are thought about when we talk about health care. The demand for nurses is also increasing not only because of the job security and attractive salary but also because of the care they provide thus making a difference in other lives which is generally not found in many other careers. Stress in the nursing profession is an ongoing worldwide problem. Of all health care professionals, nurses have been found to have especially high levels of stress. Nurses shortage can be a symptom of low job satisfaction, poor management and organizational support. Shortage is resulting in heavy workload which is a precursor of job stress and burnout which have also been linked to low job satisfaction. The most important factor related to workload is rapid body movement combined with poor posture, especially when nurses perform their duties under time pressure.

The purpose of combining ergonomics with hospital employees is to provide an appropriate working environment which enhances the work capacity and job satisfaction level of the nurses. Since ages, the health industries are working in shift pattern but focus was not given to this area in Uttarakhand. The shift work pattern

in multinational companies in India has revealed that hospitals are also at risk particularly with regard to nurses who are the worst sufferers of the shift pattern and thus need to be investigated in depth. Hence, the working pattern of nurses need serious attention. There is an important issue to provide safe working environment to the nurses. The literature pertinent to the present study has been reviewed under the following headings.

Overview of nursing profession:

Nurses are the primary hospital caregivers and they are crucial part of healthcare delivery worldwide (Agrawal *et al.,* 2012). Increasing the efficiency and effectiveness of nursing care is essential for the better functioning of hospitals and the delivery of safe patient care (Hendrich, 2008). Nurses often need to work long hours under stressful conditions, which can result in fatigue injury, and job dissatisfaction. According to American Nurses Association, nurses suffering in these stressful environment are more prone to making mistakes and medical errors due to which patients care quality can suffer. For these reasons improving the workplace safety for nurses around the nation is important.

The biggest nursing shortage is observed in the developing countries. India alone has a shortage of 2.4 million nurses. The primary causes of the nursing shortage in the developing world are the migration of nurses to wealthier countries and an insufficient number of qualified nursing instructors (Agrawal *et al.,* 2012).

An insufficient supply of nurses is a critical stressor for hospitals. Many hospitals are struggling with the nurse shortage that began in 1998. The shortage resulted from a combination of factors including rising demand, little growth in wages, demographic changes in the workforce that decreased the supply of working nurses, and a stressful hospital workplace environment (Peter *et al.*, 2007).

There is a shortage of nurses so the nursing workforce is overloaded in terms of the number of patients that nurses oversee, the number of hour that nurses work, and the number of tasks that nurses perform. For example, many nurses work 12 hours or more per day (Houle, 2001) and often work without breaks or meals (Rogers *et al.,* 2004). There is a growing consensus that hospital nurses should not be assigned more than four to six patients or one to two high-acuity patients (acuity refers to severity of illness) (Curtin, 2003).

In 2004 estimates of the turnover rate for Registered nurses (Rns) was nearly 14 per cent and the vacancy rate for Rns was about 16 per cent (Bernard Hodes Group, 2004). Based on a review of more than 600 studies, it was concludes that the increasing shortage of nurses is a risk to patient safety (Ulrich *et al.,* 2004). Some evidence indicated that medication error rates and patients falls vary inversely with the proportion of experienced nurses in a unit (Blegen *et al.,* 2001).

To manage health care, nurses perform numerous and diverse tasks that are not limited to direct contact with the patient. Nursing tasks have been classified into three categories: direct patient care indirect patients care and no nursing tasks or tasks unrelated to nursing (Hobgood *et al.,* 2005).

Direct patient care involves task performed at the bedside, such as establishing intravenous assess and administering medication (Hobgood *et al.,* 2005). Studies indicated that nurses spent 26 per cent to 31 per cent of their time on direct patients care (Hendrickson *et al.,* 1990; Hobgood *et al.,* 2005 and Hollingsworth *et al.,*1998). An analysis of nursing activates in a large urban hospital was conducted with 44 hours of direct observations of 7 Registered nurses (Rns) by interview, task analysis, and link analysis (Wolf *et al.,* 2006). Result indicated that nurses spent 25 per cent of their time on patient contact. During a 4 hours observation period, nurses spent a mean of 31 minute in a given patients room and 46.5 minute per patients conducting nursing care processes (assessing diagnosing, planning intervening evaluating), the reported ranges were 19 to 49 minute and 28 to 67 minute, respectively.

The above studies showed that nurses are the primary care givers and play an important role in patient's health care. The nursing shortage and inefficiencies in the nursing work system result in task overload for nurses, nurses work long shifts, often without breaks. Their time is not used efficiently. Tasks included excessive documentation, waiting and searching. Completion of such tasks results in less time spent on patient monitoring, which is needed to maintain situation awareness.

Work stress and sleep problems associated with shift pattern in nursing job:

Work stress and sleep problem associated with shift pattern is common in the healthcare services particularly in the nursing profession. Needleman (2002) focused on

the impact of stress in the nursing profession and linked it to poor patient outcomes and medical complication. Nurses working in rotating shifts experience stress at work which tends to lead to a high level of absenteeism (Colligan *et al.,* 1979 as cited by nursing informatics, 2008). Several articles related to 12 hour shift highlighting the negative aspects of these shift (Yokoyama and Unhiyema, 2005). Some studies linked shift work to sleep disturbances (Adami and Lavie, 2007; Drake *et al.*, 2004 and Chan, 2008) While further studies support that workload and management style all contributed stress (McVicar, 2003). Lastly, nursing shortage was directly linked to increase work and stress among nurses (Buchan and Calman, 2006 and Buerhaus *et al.*, 2005).

Studies have highlighted shift work and sleep disturbances (Adami and Lavie, 2007; Drake *et al.*, 2004; Chan, 2008). Adami and Lavie (2007) identified that shift work had a direct impact on performance. Similarly, Drake *et al.* (2004) identified morbidity associated with sleep disturbances among shift workers and that there were a greater sleep related accidents, stress and depression. Hanna *et al.* (2008) agrees concluding in a study that working rotating shifts reported higher levels of occupational accidents. Dorrian *et al*. (2006) conducted a study on nurses working night duty which reported higher levels of stress and physical and mental exhaustion.

Mc vicar (2003) conducted a literature rereview on workplace stress in nursing which looked at workload, management styles, and conflict as contributing factor in stress. nurses work in an environment with constant stressors often caught between doctors, management, patients, and families. One of those stressors identified was the nurse doctor relationship. Conflict identified by Rosenstein (2002) in his research on the doctor-nurses relationship as a major conflict for nurses. In a study of 90 per cent of the nurses witnessed verbal abuse by doctor to other colleagues and other staff personnel. Which contribute to conflict and stress in the workplace. in contrast, Timmons and Tanner (2005) highlight that nurses do try to keep doctors "happy'' and try not to make "upset" even in when poor surgical practices are witnessed by nurses.

Stress has been defined by many researchers but there is a general consensus that stress is intrinsic to nursing (Chan, 2005). The nursing profession is one the most stressful professions (Malone *et al.*, 2004). Mann and Cowburn (2005) identified that the nursing profession was an emotionally demanding job. Shift work was identified as a source of stress for nurses, regardless of shift for length (Jennings, 2005). Sleep performance was directly associated to shift work (Adami and Lavie, 2007). There was considerable attention paid to shift work pattern, shift length, night duty and its impact on stress.

Lehovillier *et al*. (2012) conducted a study to identify individual, situational and lifestyle variables related to shift work tolerance among nurses who have worked night shifts for less than 1 year and nurse who have worked night shift for more than 6 years, all engaged in rotation shift work. Working shift is related to negative health consequence.

Work hours can affect nurse's performance and patient's safety. Nurses who work at night or who rotate shift make more errors from fatigue than nurses on other shift (Page, 2004) and the risk for error can increases by two to three times when nurses work 12.5 hours or more in succession (Rogers *et al.*, 2004 and Scott *et al.*, 2006). Nevertheless, hospitals use overtime to cover staff vacancies. The institute of Medicine recommended that nurses not provide direct patient care for more than 12 hours in any 24 hours period or more than 60 hours in any 7 day period. However nurses do work longer than 12 hours (Houle, 2001). They work longer than their assigned shift by an average of 49 minute (Scott *et al.*, 2006). Further in a study of 393 Rns no break or meal was reported on 10 per cent of shifts and nurses who worked longer shifts did not report having more break than those working shorter shift (Rogers *et al.*, 2004). Logistic regression analysis indicated that extending break durations by 10 minute decreased risk of error by 10 per cent of course, work hours are influenced by staffing.

Work hours can affect nurses performance and patient safety. Nurses who work at night or work with rotating shifts make more errors from fatigue. High prevalence of sleep disorders was found among the nurse who worked on shifts.

Occupational hazard/Accident/Risk injuries in nursing occupation:

Nursing is physically demanding, and nurses have higher rates of musculoskeletal disorders (MSDs) than most other occupational groups. The physical demands of nursing may lead some nurses to leave the profession, contributing to the shortage of registered nurses in many

workplace that is a major concern today. Low back pain (LBP) remains a common and costly problem among the nursing profession. Several studies have indicated that LBP is attribute to mentally staining or demanding work fatigue or exhaustion or general work satisfaction.

Work related low back pain (LBP) is known to be multi factorial and studies from across the globe have documented their higher prevalence in nurses. Overall studies showed that nursing activities conferred increased risk for back pain and were associated with back disorders regardless of nursing technique, personal characteristic, and non-working related factor. Patient handling appear to confer the highest risk, but other nursing duties are also associated with elevated risk of back disorder (Annalee and Karen, 2013).

Whereas, Lee *et al.* (2011) conducted a study to determine work stress, and stress coping, and to analyze their relationship in order to improve health promoting lifestyle of nurses in Taiwan.The findings indicated work stress and the health promoting lifestyle of nurses are at a higher level, with stress-coping strategies being at a medium level.

Work related musculoskeletal disorders (MSDs) are the leading work related health problem experienced by nurses (DeCastro, 2006) although occupational MSDs are common, precise definitions are lacking (Tayyari and Smith, 1997). Nurses are exposed to many physical factors associated with musculoskeletal symptoms the most frequent being forceful exertions awkward postures and repetitive motions (Marshall and Worthington, 1993). Other factors includes moving and lifting heavy loads in stooping, bending, twisting, standing for long periods, and maintaining static posture (Choobineh *et al.,* 2006; and Hou and Shiao, 2006). Injuries occur more commonly during direct patients care than during indirect care (Retsas and Pinikahana, 2000). Vieira (2007) reported that 70 per cent of work related back disorders were related to patients transfers.

Long work hours and shifts work in nursing profession adversely impact workers health by increasing exposure to occupational hazards and reducing time for recovery. Nursing activities increases the risk for back pain which is associated with back disorders. Number of health problems were also observed in night shift nurses including cardiovascular diseases, digestive disorders, headache, muscle pain etc. Musculoskeletal disorders (MSDs) are the leading work related health problems experienced by nurses.

Epidemiology and aetiology of back injury among nursing staff:

Exposure to physical postural stresses as a precursor to low back injury is supported in the literature, a method for quantifying exposures to back stressing tasks, particularly patient handling, is less apparent. Difficulties in assessing the exposure represented by patient handling arise because patients handling tasks do not fit the criteria that normally applied to assessing lifting. Patient handling tasks present combinations of movement that are difficult to extrapolate and tasks may differ from patient to patient and throughout a shift.

The aetiology of back pain in nursing staff is complex and multi- factorial. An association with patient handling has been made in several studies (Stubbs *et al.,* 1980, Arad and Ryan, 1986; Venning *et al.*, 1987 and Smedley *et al.*, 1997). Clinically, back pain are frequently attributed to a specific patient handling incident. Jensen (1987) reported that 75 per cent of nurses submitting a compensation claim for back injury cite a specific patient handling incident as the cause. Other studies (Arad and Ryan, 1986; Venning *et al.,* 1987; Kumar, 1990 and Garrett *et al.*, 1992) however, suggested that lifting exposure (both within a shift and over the total duration of an individual's nursing experience) is a better predictor of back pain. Larese and Fiorito (1994), commenting on the presence of significant difference between the rated of musculoskeletal disorders amongst nurses at two hospitals, attributed the observed differences to discrepancies in the frequency of provision of patient care assistance. Cumulative lifting exposure has been suggested as the link between employment in medical and back injury.

Nursing activities conferred increased risk for back pain and are associated with back disorders. Extended work schedule and stressful patient handling are found to be the main cause of musculoskeletal disorders.

Psychological problems related with nursing:

Shift system can influence the extent of well-being and health problems experienced by the workers involved. Extended working days have been found to aggravate some problem associated with shift work, especially when the work is mentally and emotionally demanding.

Stress is defined as when one is faced with events

or encounters that they perceive as endangerment to their physical wellbeing (McGowan, 2001). In relation to the nursing profession many researchers have attempted to define stress. Chang (2005) proposed that stresses is intrinsic to nursing and a highly demanding job with poor support, and rapidly changing circumstances. Whereas, Mann and Cowburn (2005) identified nursing as emotionally demanding and this interactive stress contribute to daily stress as a nurses.

Nurses life style showed that certain unsatisfactory features of work such as poor opportunities to exert influence and insufficient social support networks increase the risk of care worker's physical condition and functioning capability deteriorating (Brown *et al.*, 2006). According to the domestic estimates (Rauhala *et al.*, 2007), an increase of 30 per cent to the optimum level of strain in nursing work increases the number of sick leaves 1.5 times. At the yearly level, this means about 12 extra days for sick leaves.

The study of Abdalkader and Hayajneh (2008) describes the effect of night shift among nurses working in critical care units. The finding showed that female nurses had a significant difference on sufficient sleep and interpersonal conflicts. In addition, the result indicated that nurses experience health problem and their work performance affected by the night shift. The study findings indicated that night shift affect critical care nurses well-being.

Many errors in nursing have been attributed to factors that implicate cognitive and perceptual overload (examples Memory, distractions and interruptions). The nurses who worked for longer hours experiences more chronic fatigue, anxiety, sleep disturbances and emotional exhaustion.

Job satisfaction level in nursing:

The need of professional skilled nurses increases as the population ages while the shortage of nurses is the reality already, nurses are stressed further by inconvenient working conditions like extensive working hours, weekend work, evening and night time work, insufficient breaks during working shift, and even having to take on two job in order to make reasonable pay. Stress experienced in the field of nursing is increases. The growing conflict between the demand and the resources available creates an increasing amount of overload (Wickstrom, 2001).

Gelsema *et al*. (2005) examined the influence of organizational and environmental work conditions on the job characteristic of nurses and on their health and wellbeing. The direct influence of work conditions on outcomes was examined. Mediation of job characteristics in the relationships between work condition and outcomes was tested by means of regression analysis. The results indicated that by managing organizational work job characteristics can be altered, and these in turn influence nurse's job satisfaction and distress.

Nielsen *et al*. (2008) reported that intention to leave the workplace due to increased present working hours was highest among employees, who against their preference had non day working hours or weekend work. It is thus important to take employees preference in to account when planning and evaluating the work schedule. According to Korompeli *et al*. (2009) greater job satisfaction levels were found in the morning shift workers.

There is shortage of nurses, so they are overloaded with work. Nursing work hours and staffing levels are associated with patient safety and with job burnout and dissatisfaction. These factors in turn contribute to the nursing work shortage. To improve job satisfaction in nurses, attention should be paid on improving working conditions and taking their preference into account while planning the work schedule.

Conceptual/ Theoretical frameworks:

The conceptual frame work of the study represents the relationship of variables with respect to objective of the study. The following conceptual frame work:

Figure depicts that nurse's profile which is affected by personal factor (Age, Sex, BMi etc.) work risk factor (Awkward posture, force, repletion etc.) and environmental factor (insufficient light, noise, humidity etc.). It has been conceptualized that in hospital industry the nurses adopt different postures.

Those natural or unnatural postures affect the workers working capacity and leads to occupational health risks. The active variables in the working environment like noise, temperature, light, humidity affect the workers ability and also create physical and psychological problems and reduce the working capacity of the nurses, which is ultimately responsible for occupation health hazards. It is proposed that if ergonomically suitable work schedule, work environment

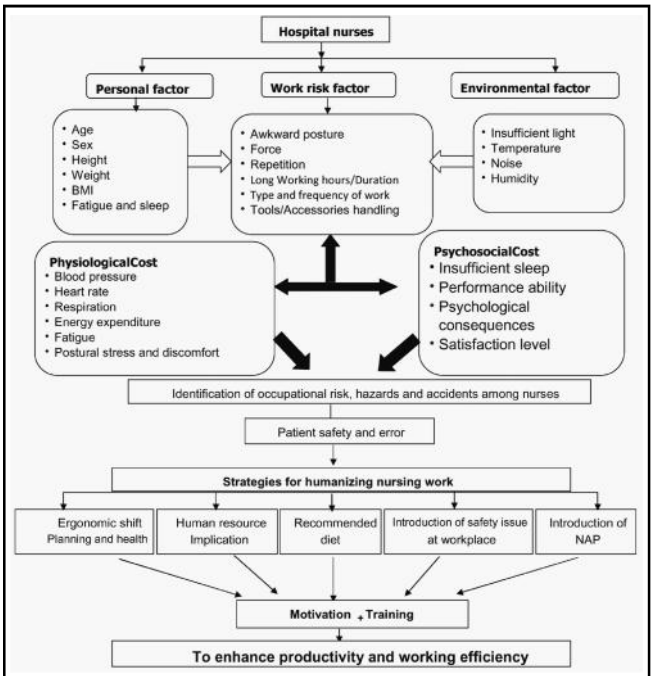

Fig. 1 : Conceptual Frame work of the study

and training is introduced in the health care industries, it will reduce the occupational health hazards of nurse and increase the productivity, working capacity and job satisfaction of the worker (Fig. 1).

Conclusion and recommendation:

Worldwide, the healthcare workforce represents 12 per cent of the working population. Health care workers are those people, who are engaged in action, whose primary intent is to enhance health. Nurses as crucial component of the health care system, are indulged in their work with focus on the maintenance of individuals, families, and communities to attain the optimal health and quality of life.

As the work place for medical treatment and health improvement, hospitals have standards for safety and hygiene, however, nurses are confronted by numerous occupational hazards, risks and high physical work load. The risk and hazard in nursing profession are related to technical factors *i.e.* poor ergonomic design of work place, adverse working environment, and insufficient space for working activities, and organization factors *i.e.* tasks that is too strenuous, unsuitable personal protective equipment, manual handling of patient, awkward posture or movements, repetitive activities/handling, prolonged standing such as in the operating theatre at the operating table. For convenience, occupational hazards among nurses may be categorized into three categories, namely, physical hazards, psychological hazards and social hazards. These occupational hazards in the work place along with many other problems such as stress and sleep deprivation have been identified as a major contributor to nurses leaving the profession, contributing to the growing nursing shortage.

In nursing, the stress is attributed by shift work which affects them in three ways *i.e.* disruption of circadian rhythms, disruption of sleep and disruption of life style, behaviour and social life. This occupational stress in nursing can have profound consequences not only on the nurses themselves, but also on patients. Thus, the quality of patient care depends directly on the work of skilful and caring nurses. In order to provide safe working environment to this dedicated group, *i.e.* nurses, needs some interventions including greater access to the use of safe devices and safe working environment that can improve the situation to protect the form any ill effect.

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