

**Shift Work: Evaluation of Employee's Physical well being and its Impact on Quality of Life**

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**Abstract**

Over the last a few decades, major changes have taken place in the workplace. The growth in the use of information technology, globalization , organizational restructuring, changes in work contracts and work time scheduling have radically transformed the nature of work in many organizations.

Many industrialized countries have adopted non standard work schedules and shift work system with a view to optimize utilization of human resources and to ensure continuity of operations . While a large body of research has demonstrated the positive impact of shift work practices on the financial performance of organizations, the impact on well being of employees is less well known. But the limited evidence that is available suggests that productivity gains have come at the expense of employees and the adoption of shift work has been accompanied by deterioration in the quality of life of employees. It is becoming widely recognized that shift work has significant implications for health. Hence, a greater understanding is needed of the interaction between shift work practices and well being.

The paper focuses on shift work as a work schedule in order to investigate health issues related to shift work among employees. The main purpose of paper is to systematically review the evidence in the published scientific literature that examines the association between shift work and physical well being and its impact on quality of life of employees. The paper concludes with the possible coping strategies that can be adopted in order to minimize health hazards among shift workers and thus improve their overall quality of life .

**Key Words:** Shift work, Health, Well Being , Quality of Life.

## **Shiftwork :Evaluation of Employee Well-being and its Impact on Quality of Life**

### **Introduction**

Work is an important social determinant of health. The mental and physical health of workers depends not only on what they do at work but also on when they work and for how long they work. The nature of the work we do and how it is organized also can affect our physical and mental health.

During the 19<sup>th</sup> century not much attention was paid to the physiological and psychological needs of the people in the workplace. The needs of the worker were regarded as subordinate to the technological needs of the industrial process, based on the assumption that more hours equaled more production. The first challenge to this assumption came at the end of the 19th century with some pioneering experiments carried out at the Mather and Platt engineering works in Manchester UK (Mather 1884). The management abolished before-breakfast working and were able to demonstrate that a reduction in weekly hours actually increased production as well as reduced sickness absence. These experiments marked the beginning of a more general change in attitude towards the well-being of the industrial workforce and in many countries there was increased recognition of the importance of occupational health and safety and, as part of this, a shift in public attitudes towards working time. Organizations started recognizing the importance of rest and relaxation and as a consequence there was a gradual reduction of the number of hours worked.

During the last quarter of the twentieth century accelerating technology and accompanying social change fuelled new concerns about working hours. Advanced technology, increased competitiveness and customer demands for round the clock services necessitated the adoption of new working time arrangements, comprising numerous combinations of shift times and lengths with much greater use of flexible systems and irregular hours. However there remains a concern that the demands of work may have disruptive effect on peoples' lives. The health problems in the workplace might have serious consequences not only for the individual but also for the productivity of the enterprise.

Global trends towards a '24-hour society' suggest that the proportion of people employed in shiftwork are likely to rise; thus, the implications of shiftwork for physical and mental health is not only a matter of current concern but also one that is likely to become increasingly important in the future (Costa, 2001; Rajaratnam & Arendt, 2001). A greater understanding is needed of the interaction between shiftwork practices and well being. The paper focuses on shift work as a work schedule in order to investigate health issues related to shift work among employees. The main purpose of paper is to systematically review the evidence in the published scientific literature that examines the association between shift work and physical well being and its impact on productivity and efficiency in shiftwork environments. The paper also aims to provide insights into areas where possible further development work / would facilitate the planning and management of shiftwork environment thereby making shiftwork conducive both to the employees and the employers.

### **Objectives of the Study**

- To Study the concept of non standard working hours particularly shiftwork
- To understand the relation between working time, well being and quality of life
- To study the effects of working time on the physical well being of workers engaged in shift work
- To suggest measures aiming at making the shift work environment conducive both to the employers and employees

**Shift work- Concept and Evolution**

There is no specific definition of shift work in law, but it usually means a work activity scheduled outside standard daytime hours, where there may be a handover of duty from one individual or work group to another.

According to the International Labour Office, shift work is defined as: ‘*A method of work organization under which groups or crews of workers succeed each other at the same workstations to perform the same operations, each crew working a certain schedule or shift so that the undertaking can operate longer than the stipulated weekly hours for any worker. Often the term is used when more than one work period is scheduled in a workday or when most of the working hours fall outside the standard workday, such as evening, night or weekend shifts*’.  
( ILO 1986)

**Table 1: Definitions of Shift Work**

Knuttsen (1989)	The term usually refers to an arrangement of work hours which employs two or more teams (shifts) of workers in order to extend the hours of operation beyond that of conventional office hours
Knauth and Rutenfranz (1987)	work either permanently or frequently at unusual times or at changing times”.
Landy (1989)	The term <i>shiftwork</i> refers to the allocation of work schedules to allow job duties to “shift” between groups of workers over various times of the day
Monk & Folkard (1992)	Shiftwork does not only refer to night work. Any work that occurs outside the normal work day window of 8.00 am to 6.00 pm can be included as shiftwork
Bøggild and Knutsson (1999)	shift work is defined as “work outside the conventional day time and... covers fixed evening and night work, roster work, and ordinary 3 shift work”

Shiftwork is not a new phenomenon and has been practiced for centuries in some form or the other (Kogi, 2001). Late hour employment can be traced back to Roman times , when city deliveries of goods by horse drawn vehicles were restricted to the night hours to reduce daytime traffic congestion. ( Scherrer 1981). The advent of industrial revolution during the 19<sup>th</sup> century, accompanied with the growth of large cities, increasing complexity of the division of labor and the introduction of artificial lighting provided strong motivation to expand economic activity round the clock, where organisations such as steel companies worked 24 hours a day because of operating costs and the impracticality of shutting industrial processes down.

In the modern industrial society, reasons for shiftwork are found to be similar in different countries (Kogi,2001). At the macro level there are three inter related factors that increase the demand to work late or in shifts. These are: the changing economy, changing demography and changing technology.

Globally, since World War II, there has been a shift in the predominance of industry, from manufacturing to services. ( Castell, 1998). This occupational shift or growth of the service sector has implications for work arrangements also. The service sector has different requirements from those of the manufacturing sector especially in a 24- hour work scenario.

The earlier reasons for extending the hours beyond the day time shift were based on a need for continuous service. For example hospital services, police, security. Strong competitive pressures forced employers to identify ways to operate their enterprises for longer periods or better adjustments to seasonal or other fluctuations. . Many industrialized countries introduced and adopted non standard work schedules as shift work system with a view to optimize utilization of human resources and to ensure continuity in operation of industries and various other production houses (Knuttsen, 1989). Industrial and commercial activities that operate outside normal work hours have become widespread in recent years; services such as banking, communications, transport, catering, and retailing are routinely available during evening hours, and often round-the clock. Shift work has also become common in industries where the technical processes cannot be interrupted without deterioration or destruction of the product, and in industries where expensive equipment can only be used profitably when in constant operation. Consequently, the work patterns of a substantial proportion of the population now extend beyond regular day-work hours; variable schedules (often including evening or night work) and rotating shifts are both widespread.

The technological changes have moved the world towards a twenty four hour economy. Cairncross ( 1997) mentions about the death of distance due to such changes and this death of distance is further strengthened by the adoption of global low cost technologies. With the rise of multinational corporations and the use of latest tools of communication technology increase the demand for offices in various parts of the world to operate at the same time as the corporate office. In simple words technology has facilitated the global distribution of work as services are carried from offshore locations. Globalization of support services, or back end work, means that both the customers and the vendors have to adjust to working in each others time zones. This requires round the clock workers twenty four hours a day , seven days a week.

Demographic changes have also contributed to a growing demand for late-shift and weekend employment. The rise in real family income resulting from the growth of two earner couples has increased the demand for recreation and entertainment during evenings, night and weekends. Further the ageing of the population has increased the demand for medical services over twenty four hour day, seven days a week. Over the last several decades, there has been a rapid increase in the number of shift workers worldwide (Sudo and Ohtsuka 2001). The percentage of individuals working shifts is often seen as a symptom of industrialised societies but is reported to be increasing in developing countries where legislation is less restrictive (Kogi, 1985).

#### **Work-time influence, health and Quality of Life**

The workplace is one of the key factors affecting mental health and well being. The number and pattern of hours which people are required to work, has a pervasive influence not only on their working lives but also on their health, safety, psychological and social well-being. The study of work hours and work intensity has both theoretical and practical interest considering the importance of work in people's lives and its implication in individual and organizational well being ( Hyman et al, 2003) .

The concept of well-being is closely related to the concept of the quality of life. Both concern the satisfaction of material, biological, psychological, social, and cultural needs and demands of an individual, which are necessary for his satisfaction with life ( Fig. 1).

Under the term of well-being rather the immediately experienced state may be understood whereas the quality of life concerns the more complex condition enabling satisfaction with life, which is of longer time duration and of a certain positive perspective respectively. From these points of view, health may be considered as the vital factor as concerns the capability of an individual to meet his aspirations and satisfy his needs and demands, and to manage the requirements of the biological and social environment as well (Zikmund 2003)

***The physiology of our body systems and risk of disease, especially cancer, heart disease and diabetes***

***Our mental health, emotions behaviours and beliefs***

***Our interactions with people, co workers family and friends***

***Our disposable income and financial health***

***The environment where we live, where we work***



**Fig. 1 The Well Being Model**

( Source: <http://www.hwbuk.com> )

Lack of data available on the number of workers employed in shift work arrangements makes it difficult to assess the implications of shift work on well being particularly health. Increasingly in recent years health has come to mean not only the absence of disease, but the presence of an overall sense of well-being, requiring attention to the psychological and social as well as the physical aspects of an individual’s life.

Furthermore, distinction between physical and psychological health is gradually being replaced by a term “biopsychosocial” approach which recognizes the essential interaction between the two. Most of the countries are adopting this biophysical perspective that well being involves not only involves addressing the problems of dust, fumes, noise and unguarded machinery but also the causes and potential effects of stress and fatigue.

The study of working time therefore represents a particular example of an area where a number of physical, psychological and social factors may all come into play to determine the general well-being of the worker.

**Physical Well Being and Organizational Productivity**

There is a two-way relationship between employees’ health and workplaces, employee health affects the workplace and the workplace affects the health of employees (Abbot et al, 2007) as mentioned in Table 2.

**Table 2:- Potential Benefits of Physical Well Being to Employees and Employers**

Benefits to Employers	Benefits to Employees
<p><b>A healthy, happy and present workforce</b></p> <ul style="list-style-type: none"> <li>• Reduced absenteeism and presenteeism ( Makrides, 2004; Shaw et al, 2007; Hemp, 2004; Goetzel and Ozminkowski, 2008; )</li> <li>• Improved employee engagement, recruitment and retention (Pricewaterhouse Coopers, 2008)</li> <li>• A happier, more resilient workforce (Thøgersen-Ntoumani et al, 2005)</li> <li>• A positive workplace culture (Equal Employment Opportunities Trust, 2007)</li> </ul> <p><b>Increased employee performance and productivity</b> (Addley et al, 2001; World Economic Forum, 2007; Shaw et al, 2007; Brand et al, 2006; Makrides, 2004).</p> <p><b>Financial benefits including</b></p> <ul style="list-style-type: none"> <li>• Reduced health care costs (Partnership for Prevention, 2005; World Economic Forum, 2008)</li> <li>• Reduced costs relating to absenteeism and</li> </ul>	<p><b>Increased mental well-being, energy and resilience, reduced stress and depression, and increased quality of life</b> (Thøgersen-Ntoumani et al, 2005; Brand et al, 2006; Broadhead, 2008; Harvey, 2008a; Renaud et al, 2008)</p> <p><b>Financial benefits</b> (e.g. including reduced expenditure on medical costs and receipt of incentives) (Partnership for Prevention, 2005 )</p>

<p>presenteeism (World Economic Forum, 2007; Harvey, 2008a)</p> <ul style="list-style-type: none"> <li>• Return on investment (from improved productivity [i.e. increased innovation or efficiency] or cost savings [i.e. reduced workplace accidents, fewer staff absences, greater staff retention meaning recruitment and training costs are minimised) (Chapman, 2006, Goetzel and Ozminkowski,2008)</li> </ul>	<p><b>Improved job satisfaction</b> (Partnership for Prevention, 2005 )</p>
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(Source:- [www.nzwellatwork.co.nz/pdf/wrkplc-wellness-lit-rev-feb09.pdf](http://www.nzwellatwork.co.nz/pdf/wrkplc-wellness-lit-rev-feb09.pdf))

While a proof exist of the positive impact of shift work hours practices on the financial performance of organizations, the impact on well being of employees is less well known. Research suggests that productivity gains have come at the expense of employees and the adoption of atypical work hours has been accompanied by deterioration in the health and hence quality of life of employees.(Kumar, P. 2000). If they are to be stable and enduring, organizations need to strike a balance between organizational imperatives for improved productivity and employee needs for a healthy, challenging and satisfying quality of life

### **Shiftwork and Impact on Physical well being**

The general impetus towards reducing/ revamping working hours has been based on the assumption that long hours, non standard hours and shift work are all potentially injurious to health. Conventionally therefore research in this field has taken place within a framework which focuses on the risks of working excessively long hours, thus viewing working time as a potential workplace hazard ( Spurgeon, 2003).

In the last decade the topic of shift work has received a great deal of research attention. This is partly due to the rapid rise in the number of people working on a shift system, and also a raised awareness of the difficulties shift workers experience. Probably the main reason for the large volume of research in recent years is the concern regarding changes in an individual’s well-being and performance due to the number and arrangement of the hours they work.

One of the earliest studies concerning the effect of shiftwork on workers was carried out by researchers at the University of Michigan (Mott et al, 1965). Their main findings indicated that shiftwork resulted in sleep related difficulties that in turn led to a disruption in physical and social patterns. These findings first highlighted shiftwork as a potential work related stressor.

Physical well being is more than the absence of disease; it is a resource that allows people to realize their aspirations, satisfy their needs and to cope with the environment in order to live a long, productive, and improve the quality of life (Breslow 2006) In this sense, it enables social, economic and personal development fundamental to overall well-being. In order to fully appreciate the importance of promoting wellness it is useful to look at the impacts of poor physical well being

In terms of shiftworking in general most researches appear to regard four potential health outcomes as being particularly important. These are disturbance of sleep, cardiovascular disease,

gastrointestinal disorders and reproductive effects. These factors have been considered to be important in determining the coping ability of a worker to shift work.

### **Circadian Rhythms**

Under normal circumstances human physiological processes are programmed for daytime activity and night-time sleep. The human body functions such as heart rate and blood pressure, respiration, temperature, and digestive functions vary predictably over a twenty-four hour period. The production/ suppression of certain hormones encourage the body towards either wakefulness or sleep at different times during this period. These cyclical fluctuations are known as “circadian” rhythms (from the Latin “circa dies” meaning “about a day” ( Wever 1979, Pheasant 1991 ). The basic principle underlying the rhythm variations is catabolism (the breaking down and release of energy) and readiness for action during the day, and anabolism (regeneration) and rest during the night.( Akersttdt, 1996).

Circadian rhythms are partly driven by the internal “body clocks” and partly synchronized to the external environmental cues such as daylight, noise and the social habits of the individual known as zeitgebers (German: *Ziet*, time; *Geber*, giver). Normally the body uses cues from the body clock and from the environment such as clock time, social activities, the light/dark cycle, and meal times to keep the various rhythms on track.

Shift work, and particularly night work, makes people behave in opposition to their natural biological timing system. This disorientation can lead to “Jet lag”. The American Academy of sleep medicine recognizes jet lag as a sleep disorder typified by excessive daytime sleepiness and associated physiological impairments ( Sack 2009 ). Working night shifts involve work during the nights and to rest during the day.

To work against the body clock is a stress factor which demands additional effort (Vespa *et al.*, 1998; Costa, 2003). Shift work can result in insomnia or non restorative sleep during the period of adjustment to a new schedule. It can lead to changes in hormonal levels which can impair cell growth and division. Moreover, workers rarely become habituated to unusual shifts (Haus and Smolensky, 2006).

Due to the body clock and the activation level during the day respectively the employees’ **motivation** and **capability to work** during the night are restricted fundamentally. ( Folkard and Tucker 2003). Due to the increased activity level, noise, social and family requirements, sleep during the day is easily disturbed and is of poor quality. Caused by the experienced tiredness the employees develop **inadequate coping** strategies. Shift workers reported an increased consumption of stimulants as cigarette, coffee and tea consumption, and more frequent use of laxatives, sleeping pills, pain killers, and cough medicine than did day workers. The use of stimulants activates the cardiovascular system only for a short time, whereas in the long run they are an additional health risk ( Wallace et al 2002, Knutsson, 2003).

Individual differences can act as moderators that help some people respond to a stressful environment positively, while others respond negatively (Tjong, 2000).The **capabilities to adapt** to shiftwork depend on the individual body clock. According to the chronotypes people can be classified as *Homo larkensis* and *Homo owlensis* ( Minor et al 1981). **Homo Larkiens (Lark people) or the morning types** are characterised by a rather shorter rhythm, while **Homo Owlensis ( Owl People) or the evening types** have a longer rhythm.

According to the time of going to bed and awakening time, the owl people go to bed almost past midnight, while the lark types go to sleep around 22.00 h or even earlier than this. The lark people show signs of fatigue first. Alert and sharp in the morning, they begin to slow down and

ease up as sunset approaches. The owl persons on the other hand have longer rhythm than 24 hours usually are more capable to adapt to a changed **sleep-wake cycle**. Individual differences, for example being morning active or evening active type, can explain some of the variations in adaptability to shift work ( Folkard and Hunt , 2000) .

### Sleep

The most obvious and direct effects of shiftworking therefore relate to sleep deprivation, fatigue and a general sense of dissatisfaction. Shiftwork leads to disruption in circadian rhythms thus affecting the quality and quantity of sleep and leading to sleep disturbances, sleepiness and sleep disorder. The fundamental problem is the mismatch between the need for wakefulness and work activity during night hours when circadian rhythms are conducive to sleep, and for sleep during daylight hours, normally the time of wakefulness and activity ( Akerstedt, 2003; Harma *et al.*, 2002; Ohayon *et al.*, 2002).

Sleep deficit occurs on two parameters, first a reduction in the actual number of hours slept, and secondly fragmentation of those hours. Normal sleep consist of different phases which occur at intervals throughout the night. The most important type of sleep for brain restitution, slow wave sleep, occurs during the first five hours of the sleep cycle. In shift workers sleep is displaced to daytime when hormonal activity is geared to promote wakefulness. Continuous sleep is therefore difficult to maintain and is becomes fragmented at a point when slow wave sleep normally occurs. (Lavie *et al.*, 1989). In addition to this problem shiftworkers are then required to work at a time which is sub-optimal in terms of their normal body clock.

This reversal of the usual diurnal pattern underlies many of the sleep problems experienced by shift workers; environmental conditions (e.g. domestic and traffic noise, presence of children, normal social activities) may also contribute to disturb shift workers' daytime sleep. Shift workers do have problems with sleep management, specially because they attempt to have sleep at unsuitable time of the day . Sleepiness is not only experienced during the night shift, a considerable increase in sleepiness has also been observed in workers while they return to day work soon after the night shift (Åkerstedt,1995). An early start of morning shift at around 06.00 h has particularly deleterious effects upon alertness and thus more sleepiness is experienced during the day (Tucker et al 1998)

Shift workers reported shorter sleep duration than day workers. (Mark et al 2010, Ursin et al 2005). The problem has been reported by rotating shiftworkers in a range of occupations such as textile workers in Bangladesh (Khaleque, 1991), and nurses in Spain (Escriba *et al.*, 1992) .The nature and magnitude of shiftwork effects depend on the type of schedule, particularly the direction and speed of rotation (Akerstedt, 2003). These factors combine to influence sleep, fatigue and performance differently during morning, afternoon, and night shifts, but productivity tends to be most adversely affected during night work (Folkard & Tucker, 2003). *Sleep disorder* causes a decrease in performance leading to decreased productivity. Major performance lapses have been found to occur at high levels of sleepiness (Gillberg et al, 1994).

The association between shift work and sleep disruption results in adverse medical and psychological consequences. Changes in mood state, increased feelings of fatigue, sleepiness and irritability, inability to concentrate and periods of misperception also occur on account of reductions in sleep length in night-shift workers (Williamson and Sanderson 1986 ). Short sleep lengths are associated with decreased life expectancy ( Kripke et al, 1979). The sleep disturbances reported by shift workers are both qualitative and quantitative and may lead to

increased use of alcohol and hypnotics. The experienced fatigue of employees is a result of the number of hours worked, the timing of work within the 24 hours, the number of subsequent shifts and the amount of free time between the shifts (Rosa 2001; Folkard, 2003). Impairment of psychological health often leads shift workers to change to day-work jobs.

### **Cardiovascular Diseases**

Before 1980 shift work was not generally considered to be a risk factor for heart diseases. The data, reviewed by researchers, gave no particular grounds for concern and hence they concluded that there was “limited evidence of a causal association between shift work and ischemic heart disease.” (Frost, Kolstad and Bonde 2009).

After reviewing the data published between 1949 and 1993 it was found that there a 40% increased risk of cardiovascular disease in shift workers particularly night workers (Knutsson 1999).

(Bøggild *et al* 1999) found that social class was an important confounder of the relationship between shift work and heart disease. Shift workers coming from lower social classes reported high incidence of cardiovascular disorders. This was attributed to increased cholesterol levels due to frequent consumption of high fat and high carbohydrate snacks and irregular timing of meals. Also shift workers reported lower dietary intake during night shifts than during morning and afternoon shifts. According to them, the redistribution of food intake from diurnal eating to nocturnal eating is related to serum total cholesterol, LDL cholesterol and HDL cholesterol, which might increase the risk for CVD. The cholesterol level has been witnessed to be higher in shift workers compared to day workers ( Lennernas *et al*, 1994).

An association is found between shift work and number of days spent in shiftwork. There is an increased risk of ischemic heart disease (IHD), at least during the first two decades of shift working. In case of female shift workers, exposure to 6 or more years of shift work may increase the risk of CHD (Knutsson *et al*. 1986).

Smoking habit seems to be more common among shift workers than among day workers. This can be attributed to abnormal working hours where smoking may serve as a stimulant or as a way to spend time during the night shift. Smoking behaviour makes a shift worker more prone to cardiac complications. Smoking habits may be related to the type of work and industry. A boring task (e.g. mail sorting, watching a computer monitor with ‘nothing’ to do) may favour smoking, while in high-risk industries (e.g. oil refinery) smoking is strictly forbidden (Knutsson *et al* 1992).

**Improper diet, increase in smoking and alcohol consumption, lack of sleep and exercise have been cited as major reasons for increase in CVD.** People exposed to night shift working are at greater risks of heart diseases because of the following factors:-

- the sleep contradicting the circadian rhythm,
- problems in social and private life as well as
- unfavourable health behaviour of shiftworkers (smoking, unhealthy diet, lack of exercise, alcohol).
- Unfavourable working conditions as noise , heat, monotonous tasks etc.

(Knutsson *et al*., 2003 ; Boggild & Knutsson, 1999 ,Liu and Tanaka (2002), Williams 2008).

An understanding of the causal link between shift work and heart disease will ultimately be of value in reducing the risk.

### **Gastrointestinal Disorders**

One of the detrimental effect of shiftwork on health is the increase in gastrointestinal symptoms and diseases. The nature of these gastrointestinal disorders includes loss of appetite, heartburn, constipation, stomach pain, flatulence and ulcers ( Knuttson 2003). Digestive and gastrointestinal complaints are between two and five times more common in shiftworkers than in day workers ( Caruso *et al.*, 2004). The length of time a person has been working in a shift work environment is important in the development of these disorders. Peptic ulcers tend to be diagnosed after 5-6 years of shiftwork compared to 12-14 years in day workers (Costa et al, 1987). Difficulties such as sleep related disorders tend to be transient and disappear after ceasing shiftwork but gastrointestinal complaints have been found to continue after shiftwork is ceased (Thierry & Meijman, 1994).

Gastrointestinal complaints is linked to the presence of a number of risk factors including the timing and composition of meals, smoking and drinking. These factors lead to short term digestive disorders such as indigestion, heartburn and flatulence and may ultimately lead to ulcers (Barton et al, 1995). Qualitative and quantitative food intake also affect health of workers. Balanced intake, the time of the day for consumption and the frequency of intake affect the functioning of the stomach and its enzymes. The time of the day for consumption of food may affect uptake, digestion and metabolism. Normal rhythm in gastric functioning does not adapt to night work and consequently eating during the night exacerbates gastric problems ( Mejean et al 1992) . Thus frequent night eating may be related to undesirable metabolic effects, for example, increased levels of serum lipids or an increased body mass index in shift workers.

Such problems are due to impoverished catering facilities and that poor food service or bad eating habits such as : the lack of hot food at night and so the reliance upon sandwiches, etc.; the tendency to nibble rather than take full meals; the higher intake of carbohydrate, caffeine and alcohol; and the higher consumption of tobacco are a major cause of gastrointestinal disturbances. Night workers had more sick days, non-prescription medication use (antacids and acetaminophen or paracetamol), gastrointestinal complaints (Harrington 1978).

### **Cancer**

Evidence linking night work and cancer is largely specific to breast cancer; little is known about other types of cancer. Studies demonstrate associations between night work and elevated risk of breast cancer and the risk increased with age and length of exposure to night work (Hansen, 2001; Schernhammer *et al.*, 2001).

Working at night disrupts the normal production of melatonin which in turn leads to an increase in reproductive hormones (particularly oestrogen), acting to increase hormone-sensitive cells in the breast and thus affecting tumour growth. (Schernhammer & Schulmeister, 2004). Melatonin secretion is normally at its peak at night, but production of this hormone is reduced as a result of light exposure during night hours . There exists a positive relation between different measures of light exposure at night and breast cancer risk. (Bovbjerg 2003 ). Night exposure to light of short wavelength suppressed melatonin secretion. Wearing goggles filters out light of short wavelength and thus can help preserving melatonin levels without impairing performance or alertness (Kayumov et al. 2005).

There also exists a link between duration of exposure to rotating night shifts and breast cancer. Relative to those who had no history of night shift work, women who worked 1-29 years on rotating night shifts had a risk of developing breast cancer that was eight per cent higher

(Schernhammer et al. 2006). Incidence of prostate cancer have been reported among working men in Japan (Kubo et al. 2006) .They found that those working rotating shifts had a significantly higher risk of prostate cancer than day workers as rotating shift workers experience greater disruption in circadian rhythms.

On the basis of “limited evidence in humans for the carcinogenicity of shift work that involves night work” and “sufficient evidence in experimental animals for the carcinogenicity of light during the daily dark period (biological night),” an expert Working Group convened in 2007 by the International Agency for Research on Cancer (IARC) concluded that “shift work that involves circadian disruption is probably carcinogenic to humans” (Straif et al., 2007).

### **Pregnancy and Reproductive Disorders**

Research suggests that shift working, particularly night working, may present special risks for women of childbearing age and may cause disorders as spontaneous abortion, sub-fertility ( measured as time to pregnancy), pre-term birth and to a lesser extent menstrual irregularity so it is recommended that women should avoid shift work during pregnancy. (Scott 2000, Knutsson 2003, Bonzini, Coggon, and Palmer ,2007). Disruption of circadian rhythms and the resulting desynchronisation of cyclic physiological functions cause psychological stress and hormonal disturbance and is thought to be the most likely cause of menstrual problems among shift workers (Smith *et al.*, 2003)

### **Interference with Social and Family Life**

Apart from the physiological de-synchronization, the social de-synchronization as well causes additional demands on the shift worker. Less attention has been given to the multiple forms by which the work might intrude into domestic life of employees. The intangible expressions of work into household life include exhaustion, feelings of stress and disturbed sleep patterns, and tendencies to continue worrying about work following completion of contractual working hours. These home demands are represented by family commitments ( having dependent or care responsibilities, household responsibilities) which affect women particularly who might be described as coming home to a ‘second shift’. These pressures obviously lead to work life conflict further worsening their quality of life.(Hyman et al , 2003)

Working in shifts creates difficulties in family life and tends to restrict worker’s social and leisure activities (Khaleque 1998). Participation in clubs, sports and other organized activities is very difficult since they are usually geared to the normal day schedule. The lack of regular social contact can lead to feelings of loneliness and isolation ( Pocock, 2003). The amount of leisure time of shiftworkers is equal to that of employees on day duty (Grzech-Sukalo *et al.*, 1989), but differ in the position of the free time within the 24 hours of a day (Costa, 2003): Shiftworkers have to work at times when friends and family are having leisure time. Not only are shiftworkers affected by working in shifts, but their spouses reported significant disruption of social and domestic lives, as well( Smith and Folkard 1993.) Particularly, working at night, either on permanent or rotating shifts, often produces discordance with the spouse’s working hours and free time.(Escriba 1992).

Interference of shift work with participation in family life, because of both scheduling and fatigue may increase the risk of depression (Haines et al, 2008). A negative impact on school success and the development in school was found for children of shiftworkers. The

characteristics of the particular shift system have to be considered when analysing the impact of shiftwork on family life. Different **shift patterns** may result in different psycho-social impairments (Grzech-Sukalo *et al.*, 1989; Colligan & Rosa, 1990). Shift working possess serious adverse outcomes which include increased risk of employees experiencing a range of physical and mental health disorders, difficulty in balancing work and family life and poor relationships with family members with possible negative effects on children's emotional and intellectual development (**Pocock 2001**).

Organizations need to promote programmes that aim at balancing the professional commitments of employees with the commitments at home

### **Accidents and Injuries**

A more important area of impact is safety. Severe sleepiness ceases the interaction with the environment ceases, and, if this interaction coincides with a critical need for action, an accident ensues. (Tosvall *et al* 1987).

Night, rotating and irregular shifts all were associated with an increased risk of occupational injury or illness compared with regular day shifts (Dembe *et al.* 2006). Sleep loss and fatigue associated with circadian disruption impairs cognitive performance, particularly in tasks requiring vigilance, concentration, and decision-making . This impairment potentially increases the risk of accident and injury incidents (Meijman *et al.*, 1993);.

It has been found that the rate of serious accidents is higher at night than during the day ( Folkhard 1997) Various kinds of industrial injuries have also been shown to be two to three times higher during the night shift compared to the evening shift (Leigh 1986, Kreiger 1987). Accidents can be partly attributed to fatigue inducing work schedules.

The accidents resulting in injury are more frequent in machine-paced workers at night. The disasters of Three Mile Island, Chernobyl, and the Challenger space shuttle all occurred during the night (Smith *et al.* 2003) .

### **Performance**

In industries and factories, performance variables are of immense importance, because they are related both to productivity and safety. Global performance decrement is one of the harmful effects of shift work. Studies demonstrated that performance deteriorates during the night time ( Folkhard 1990, Monk *et al* 1985).

Poor sleep quantity (sleep deprivation) and quality as a result of desynchronization of circadian rhythms have been considered as the key factors in modulating the performance of shift workers during the night shift (Costa *et al* 1999). However, the interference of circadian rhythm in performance depend upon the nature of the task being performed. Night shift work is associated with reduced reaction time and poor mental arithmetic on the night shift. A higher error rate in performing addition problems and fewer signal detections during the night shifts ( Folkhard & Totterell 1992).

Performance is particularly affected in psychomotor types of tasks. Available data suggest that the output from a production process will not be affected by night work as long the major determinant of the production flow is machines rather than people. In summary, the level of work performance efficiency on a night shift depends primarily upon several factors, namely the demands of the task; the type of shift system and hence potential for both short- and long-term adjustment; individual differences between shift workers in the degree to which their rhythms adjust to night work; and sleep deprivation. ( Gupta and Pati 1994)

### **The Interventions**

With such a significantly large and growing type of work environment, appropriate steps need to be taken by employers to address the well being issues of their employees so as to ensure the development of healthy and productive team of employees thereby aiming to improve their overall quality of life.

Assessment of advantages and drawbacks of shift system should be done based on an objective criteria. Adjustment of bodily functions to night work, level of well being, health problems, disturbances in personal life, accident rates and performance efficiency all should be taken into consideration in shift-work design. (Pheasant 1991). The recommendations of ILO Convention need to be implemented by all those countries where shift work is now a permanent feature . Their findings indicate that permanent and rotating night workers are generally a population at risk and need be given special attention as they are exposed to work load and extended working hours. Recommendations focus on appropriate health services for night and shift-workers, First aid facilities, Option to transfer to day work for health reasons, measures for women on night shifts, in particular special maternity protection (transfer to day work, social security benefits, or an extension of maternity leave), the right of consultation on details of work schedule (ILO, 1990). Interventions to cope with shift work can include:-

### **Identifying Personality Type**

Individual differences or personality variables/traits are often described as the moderators that help some people respond to a stressor positively, while others respond negatively (Tjong, 2000). Some of these include chronotypes, emotional stability and hardiness . These personality characteristics, have the ability to moderate or diminish the negative effects of shift work environment (Miller and Fisher, 2005). People who experience high degree of stress without illness have a personality structure ( hardiness) characterising them differently from people who become sick. The hardiness personality characteristic protects such hardy individuals in two ways: it alters perceptions of stress and mobilises effective coping strategies and this thus affect their overall quality of life (Judkins and Furlow, 2006). Organizations need to include these personality characteristics in their recruitment programmes and must provide appropriate support to workers who possess desirable personality traits and must also monitor how these traits are being affected as a result of job stressors . For e.g conscientiousness is linked to higher performance, those with high levels of this trait actually perform lower than average when they are burnt out. The employees need to identify these positive attributes and correlate with well being and future performance. Thus, the personality job fit model need to form the basis of attraction and recruitment programs.

### **Designing Shift Schedules**

Research indicates that shiftwork impacts the physical well being of employees thereby affecting safety performance and other well being issues , thus impacting their overall quality of life. A situational analysis will assist managers to identify the existing occupational health hazards affecting the employees, and they will be able to forecast on possible strategies that can help reduce hazards . Thus, the employers can help prevent the emergence of such problems among

workers by providing them with access to employee assistance, health risk appraisals, and health coaching.

Introducing Flexibility in shift schedules by allowing workers to trade shifts is one of the strategies that will go a long way in promoting employee well being and productivity. Planning of shift schedules should be based on the inputs of employers, supervisors and the employees. It cannot be possible to meet all the needs of different employees when planning schedules. On the contrary, it is possible to make adaptations that can reduce the strain of the long hours worked on night shift. Some of these strategies can be:-

- Plans shifts in advance
- Not scheduling more than 5 to 7 shifts in a row
- Slight change in the timings of shifts For example:- Starting the shift at 7:00 am may be less disruptive than starting the shift at 6:00 am
- Providing at least 48 hours between shift changes to allow the body to adjust
- Generally Scheduling time off over Weekends
- Schedule shorter, more frequent breaks throughout the shift

Some employees have to work shifts regardless of whether night shift suits them or not. Managers have a responsibility to formulate strategies to assist those who find it difficult to work at night. One of the strategies would be scheduling shifts according to the chronotypes i.e the morning types and the evening types. Scheduling of shifts according to the two types respectively would help in reducing the physical and psychological strain.

### **Rest Periods**

Introduction of certain adjustments such as stipulating official rest periods even for the night types will help in reducing some of the ill effects of night shifts. Management must be encouraged to provide a psychologically supportive environment to their employees. Rest rooms should provide tranquility and be conducive to relieve psychological stressors. Music, reading material, games provide relaxation to many in the workplace. The comfort of the environment and the furniture used for resting is essential and conducive to complete rest. Those who feel tired can benefit from a separate resting area . Ergonomically designed workplace environment with proper ventilation and lighting is likely to have apposite impact on the physical well being of employees.

### **Nutritious Food**

Providing a 24-hour cafeteria where night workers can obtain a hot, nutritious meal by cutting high salty foods, high fat foods and reducing intake of caffeine. Instead employees should focus on regular meals that have high fibre content . The employees might be allowed to take the nutritious meal packs after finishing their shifts if needed, to avoid skipping of meals or excessive reliance on ready to eat canned foods.

### **Well Being centre**

Establishment of a 24 hour well being centre with the appointment of trained healthcare personnel at the call centre sites is required. The service would be responsible for approved periodical examinations, for keeping of records, providing medications and plan the educational programmes based on the available statistics. These health care personnel would constantly monitor the physical well being of employees, in particular the health and sleep disorders of night shift workers. On detecting any disruption in the circadian rhythms, would require

immediate breaks either from the night shift schedule to a day time and giving few days break in extreme cases.

### **Employee Assistance Programmes**

The research indicates that apart from work stressors, the non work stressors also need to be taken into account by the managers. One of the interventions can be the effective implementation of Employees Assistance programs (EAPs) which in particular, are effective for addressing non-work stressors (e.g., family, home, leisure etc.). EAPs enable employees to take an active role in addressing problems that originate outside of the workplace. Some of these **initiatives for leisure well being** can be:-

- Organizing groups within workplace for various interests (eg.event celebrations, santa buddy,etc.)
- Sponsor employee sports teams and leagues (eg. Company cricket league, football leagues)
- Development of exercising area,
- organizing special screenings of movies for employees, picnics and parties with co workers and families

while **strategies for Social Well Being** can include:-

- Providing an on site day care facility particularly for married employees with responsibilities
- Offer activities for employee's children such as sponsoring sports teams, etc., organizing summer camps etc
- Counselling workshops on communication and work life conflict resolution

### **Training Programmes**

Providing information on shift work aspects at the time of induction training would help employees more in adjusting to the workplace environment. Workers need training about the steps they can take to reduce the negative effects of shift work. Apart from that behavioral training and job related training would definitely bring a paramount change in employees attitude towards their job, work environment and this will further impact their quality of life/ well being. Not only the employees but also the management need to be trained about the workplace issues affecting their employees. Introduction of an occupational health service could assist management in the creation of awareness about occupational health problems such as stress, injuries and diseases.

### **Employee Surveys**

Satisfaction of employees about jobs is basically about their perception towards various parameters of jobs. Jobs are engaging and healthy if workers say they are. Thus, regular employee feedback allows an organization to both identify and act on challenges, and to identify and further develop organizational strengths. Certain workplace factors as high workload, repetitiveness and little variety etc are certain factors that have been linked with job stressors that ultimately have an impact on health, well being and performance (Taylor,2004).

Employee surveys, thus can serve as the most concise, comprehensive, and scientific way of auditing job and workplace factors. Employee surveys should contain questions on job characteristics that are known drivers of engagement, health, and performance, as well as questions on these actual 'outcomes' themselves such as employee well-being, satisfaction, commitment, turnover intentions. These outcomes can be mathematically mapped onto job characteristics to identify drivers that are likely to affect the quality of life of employees. These

variables can be further tested with the demographic variables as age and gender. This feedback should be used to enact positive changes in the organization through the involvement of employee representatives. Moreover, these feedback surveys rather than being a one time activity should be used as a regular monitoring activity so that the initiatives have the desired effect.

Impact on employees quality of life/ well being and ultimately their turnover intentions can be source a loss of income to the organization. This is also an indicator for underlying problems affecting employees such as bad attitudes due to stress of work. If the employees are frustrated they will lower their performance quality and thereby impact the overall productivity of the organization. A healthy, comfortable workforce with a satisfactory QOL is the one that is productive and satisfied with their output or performance. Considering problems facing the shift work employees due to its unique work environment, a complete change is not possible. However, it is cost effective to develop the programmes within the organizational setup depending on the availability of resources.

## **Conclusion**

There is a relatively large literature on possible connections between shift work and several aspects of worker health. The research findings clearly point to an elevated risk of adverse health outcomes arising from shift work.

Disruption of circadian rhythms has been cited as the main reason for the occurrence of disturbed sleep and other health disorders. There is little dispute that people who work night shifts are likely to have shorter sleep duration and/or poorer sleep quality than regular day workers. There is also some indication of sleep disruption for those who work shifts that begin in the early morning. The risk of workplace injury and accidents appears to be higher in the second hour of a night shift.

There are several studies, in each case, that point to: a modestly elevated risk of preterm delivery for shift workers; an elevated risk of gastrointestinal disorders; evidence of a link between shift work and heart disease and shift work that involves circadian disruption is probably carcinogenic to humans.

However there exists a lot of gaps that can serve as areas for future research. There appear to have been few studies pertaining to specific industries where other possible ailments and the degree of impairment to health may be identified. Effect of age, gender, attitudinal variables, family and social life also needs to be taken into consideration as well being is composite structure of all these variables and not only health. There may be specific domains of QOL in which shiftworkers are particularly affected by their work schedule. However, there are only few investigations dealing with these aspects and much fewer particularly in India. Understanding of the various risk factors enable better planning and management or increase the ability of organizations to design their shift schedules.

With round-the-clock operations here to stay for the foreseeable future, it is to examine more carefully the impact of shiftwork on the health, behavior, and quality of life of workers and their families. We thus need more research on effective designing of interventions ( Specific to industry ) to enhance the health, well-being, and productivity of the labor force, and to reduce the effects of work-induced stress, fatigue, and constraints on social interaction.

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