Relationship between Job Stress and Employee Health

By
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A thesis submitted to the Department of Pharmacy in partial fulfillment of the requirements for the degree of Bachelor of Pharmacy (Hons.)

Department of Pharmacy
Brac University
March 2020

Declaration

It is hereby declared that

1. The thesis submitted is my own original work while completing degree at Brac University.
2. The thesis does not contain material previously published or written by a third party, except where this is appropriately cited through full and accurate referencing.
3. The thesis does not contain material which has been accepted, or submitted, for any other degree or diploma at a university or other institution.
4. I have acknowledged all main sources of help.

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Approval

The thesis/project titled “Relationship between Job Stress and Employee Health” submitted by Smarak Islam (15146074) of Spring, 2015 has been accepted as satisfactory in partial fulfillment of the requirement for the degree of Bachelor of Pharmacy (Hons.) on March 3, 2020.

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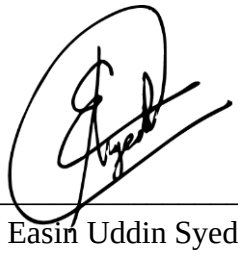

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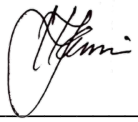

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Ethics Statement

This study does not involve any human or animal trial.

Abstract

Job stress and employee health are two closely associated topics. The following study was conducted upon reviewing publications from authentic sources. For assessment of job stress, various models such as Job Demand Control model, Effort Reward Imbalance model etc. were used in these journals. The connection of job stress with the health of employees was established by the Allostatic Load model. The authors study the literature objectively within an Allostatic Load setting, considering stress hormones, tension and anxiety as primary outcomes and blood pressure, cholesterol, body mass index as secondary outcomes, as well as endpoints of cardiovascular disease, depression, mortality as tertiary outcomes. Various review articles were supportive of the association between job stress with cardiovascular diseases, depression, blood cortisol level, heart rate, anxiety disorders, body mass index and other health conditions. Some review articles did not show strong association between job stress and employee health such as relationship of job stress with diabetes and immune system has not yet been strongly established. Recommendations regarding how future research should be done in this section with the aim for the betterment of an individual's well-being are also stated.

Keywords: Stress; Job stress; Well-being; Job Demand Control; Effort Reward Imbalance; Allostatic Load.

Dedication

Dedicated to My Parents

Acknowledgement

This research could not have been completed without the support of many people who are gratefully acknowledged here.

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List of Acronyms

AL	Allostatic Load
ACTH	Adrenocorticotropic Hormone
AUC	Area under the Curve
BP	Blood Pressure
BMI	Body Mass Index
CAR	Cortisol Awakening Response
CVD	Cardiovascular Disease
DSM-IV	Diagnostic and Statistical Manual of Mental Disorders, 4th Edition
DCS	Demand-Control-Support
ERI	Effort Reward Imbalance
ESM	Experience Sampling Methodology
GI	Gastrointestinal
HPA axis	Hypothalamic–pituitary–adrenal axis
HDL	High Density Lipoprotein
IgA	Immunoglobulin A
IgM	Immunoglobulin M
JDC	Job Demand Control
LDL	Low Density Lipoprotein
OR	Odds Ratio

SNS	Sympathetic Nervous System
WBC	White Blood Cell

Chapter 1

Introduction

A feeling involving mental, bodily or emotional tension which occurs while an individual is tensed can be defined as stress. This tensed state occurs due to stimuli that endangers the well-being of an individual (Foot, 1991). Moreover, stress is a result of unpleasant physical and emotional reactions as men and women seek to attain their anticipation in the future (Baron & Branscombe, 2012). If a person fails to attain what he or she expects, it in turn results into mental, bodily and emotional tension threatening the well-being of him or her. Stress can also be generated through a variety of responses related to physiology, emotion and behavior (Kayumba, 2017).

1.1 Development of Stress

Stress is generated by how one deals with the environment and thinks of the ways of dealing. Stress is dependent on stressor, which can be found in various environments, is any factor that can provide a challenge to an individual's capacity to adapt the environment (Lazarus &Folkman1984, Feng, 1992; Volpe, 2000). Moreover, events relating to the environment, psychology, biology and other factors concerned with social issues can result in stress. These events can have a negative or a positive effect on an individual, depending on the potency and tenacity of the stressor Kayumba (2017). A person's assessment of a stressor; cultural and social resources that are at disposal mediate the connection between an individual with the environment. (Antonovsky & Kats, 1967; Cohen 1984).

Moreover, a key assessment is when a person assumes a potential threat while facing a stressor. Primary assessment can be how a person judges an event's consequence as stressful, positive, manageable, challenging or inappropriate. Secondary assessments point out what an individual

can do about the condition. Which leads to actual effort for coping while the individual aims to regulate the problem and produce consequences of the process of coping (Cohen,1984).

1.1.1 Stages of Stress

Stress goes through 3 phases from the period it is initiated up to the time acute level is reached.

Before getting into those phases it is necessary to understand General adaptation syndrome. General adaptation syndrome (G.A.S.) is an extremely complex sequence of interrelating events which establish the human response to stressor of any type. The General adaptation syndrome comprises three principal stages.

The alarm reaction is elicited in the first stage. It generates from sudden exposure to stressors to which the body's adaptation is not done.

The second phase is the adaptation phase. In this stage utilization of energy takes place for adaptation to imbalanced homeostatic condition.

The third phase is the exhaustion phase. Here the reserves are worn-out due to the demands made for adapting (Desai, 2018).

Similarly,

The Stage of Alarm Reaction: This is a phase of initial shock. Resistance is lured in this stage and mechanisms for defense for the body are activated.

The Stage of Resistance: Until resistance rises to a level which is above normal this stage persists; resistance maximum adoption is occurred in the stage.

The Stage of Exhaustion: Here, exhaustion of energy to adapt happens. Organism collapses after showing off the signs of stage of alarm reaction and irreparable decline of level of resistance starts (Gharib, Jamil, Ahmad, & Ghouse, 2016)

1.1.2 Types of Stress

Stress can be categorized into three types.

Neustress: It can mainly be called neutral stress. Neither of the harmful nor helpful effects on the mind or body is produced by this type of stress.

Distress: It occurs when arousal is either too low or too high. It results in harm to the mental and physical condition of and body.

Eustres: It can be defined as positive stress or helpful arousal. It can promote well-being, energy, fulfillment and performance. (Walter and Mayeda, 1996)

In this review we are going to take distress caused by various job conditions into accord.

1.2 Job Stress

Job stress is a term that can be well-defined as a group of external harmful factors in the work environment and this may be related to psychology, physique or society (Greenberg & Baron, 2007; Arnold & Feldman, 2000). Job stress is bound to be experienced, when there is an increase in imbalance between work demands and the capability of an individual. Stress may be an awareness specified by ambiguity, conflict and overload rising from the environment of work and the individual characteristics (Gharib, Jamil, Ahmad, & Ghouse, 2016).

Three main components of job stress process can be noted:

(1) Stimulus: Is the starting stimulants which can result from feelings regarding stress.

(2) Response: Reactions relating to psychology, physic and or behavior that individual embodies as anxiety, tension and state of being frustrated (Sur & NG, 2014),

(3) Interaction: Explaining the relationship between stimulus and response elements. (Alamian, 2005; Alsharm, 2005)

Job stress may be of 2 types:

(1) Eustress or positive stress.

(2) Distress or bad stress (Kotteeswari and Sharief, 2014; Kazmi et al., 2008; Rizwan, Waseem, &Bukhari, 2014).

These two types of stress are the same as mentioned before (Walter and Mayeda, 1996).

1.3 Mostly Used Models to Determine Job Stress:

Various models regarding job stress are available but JDC and ERI models are used most widely to measure job stress.

1.3.1 JDC Model:

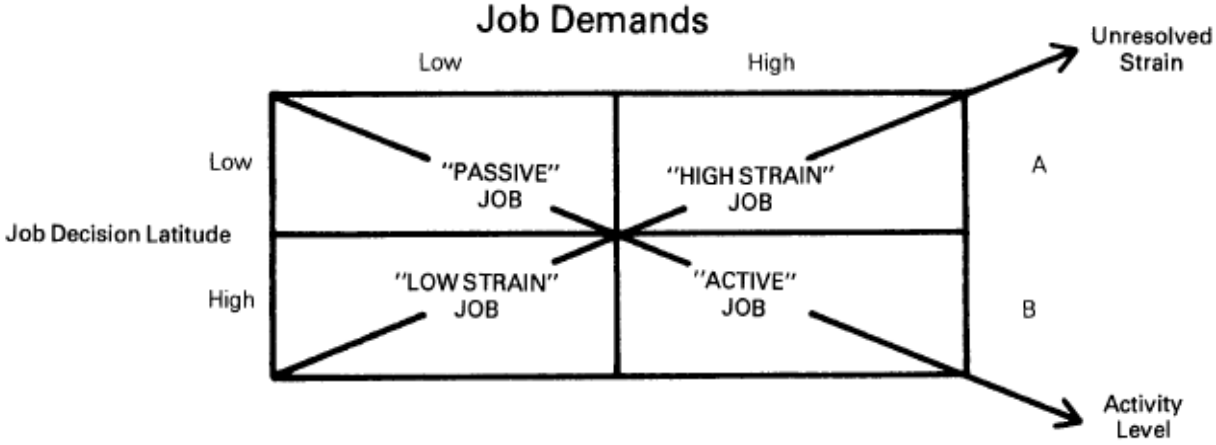

Figure 1: Job strain model (Karasek, 1979).

Job demand control models can assess the relationship between two things. These are 1) what the job demands from an individual and 2) how much freedom one has to make independent decisions. An individual is most likely to experience job strain if he or she is burdened with high job demand while having low control over the job. This figure shows the types of jobs that can result from diverse mixtures of job demands and job decision latitude(Karasek Robert A,1979).

1.3.2 ERI Model:

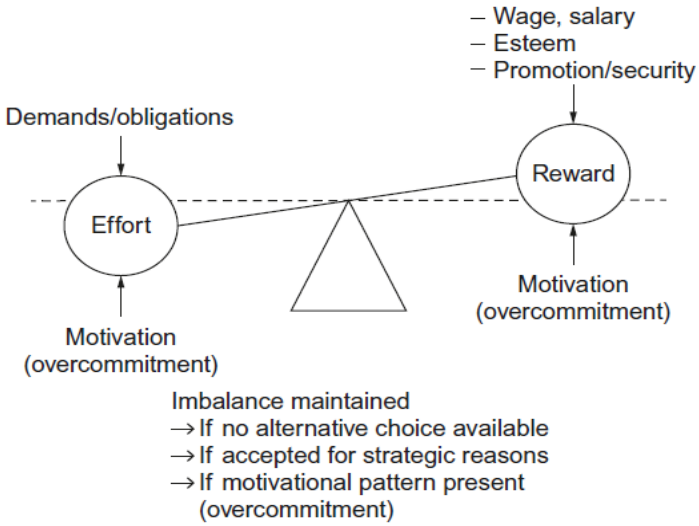

Figure 2: The model of effort-reward imbalance at work (Siegrist, 2017)

'Effort–reward imbalance' model was proposed as a stress-theoretical model of a health-adverse psychosocial work environment that is based on the notion of justice of exchange. Job stress can occur if there is an imbalance between effort and reward while various factors can have their effects (Siegrist, 2016).

1.4 The Allostatic Load Model

Allostasis means stability which was achieved through modification (Sterling and Eyer, 1988). Allostasis denotes the procedure that is important to keep a stable homeostatic state. In this model it is considered that various restrictions of control in dependent on the environment. These restrictions or factors are said as "set points. Responses of an organism to its physical state are primarily given by allostatic system. For example, sleeping, waking up, standing and exercising is regulated by the allostatic system. When people wake up in the morning their blood pressure increases and it frequently changes in response to what an individual is doing (eg, workout) while awake. This frequent change makes it possible for one to keep functioning in altering social and physical conditions. When exposed to various challenges, our body turns on an allostatic response. By this process the body starts a cascade of reactions for coping and

adaptation, and a negative feedback is initiated after the challenge is dealt with (McEwen, 2017).

The body gives two initial allostatic responses. Which are the SNS and HPA axis. When these systems are activated, they release various mediators such as catecholamines which are secreted from the sympathetic nerves, specially the adrenal medulla. Moreover, adrenocorticotropic hormone (ACTH) is released from anterior pituitary gland. ACTH is responsible for release of cortisol. After the challenge has been confronted the catecholamines and other mediators return to a basal level due to shutting down of the response. Fortification via adaptation dominates over adverse consequences given that the allostatic response is restricted to the duration of challenge. However, unfavorable pathophysiological consequences can occur if an individual is exposed to increased stress hormone level over longer periods (i.e. weeks, months, or even years). A result of allostatic load and overload can be initiated from this (McEwen, 2017).

The following figure was taken from Cortisol Level, Hydrocortisone (am and Pm) https://www.labpedia.net/cortisol-level-hydrocortisone-am-and-pm/

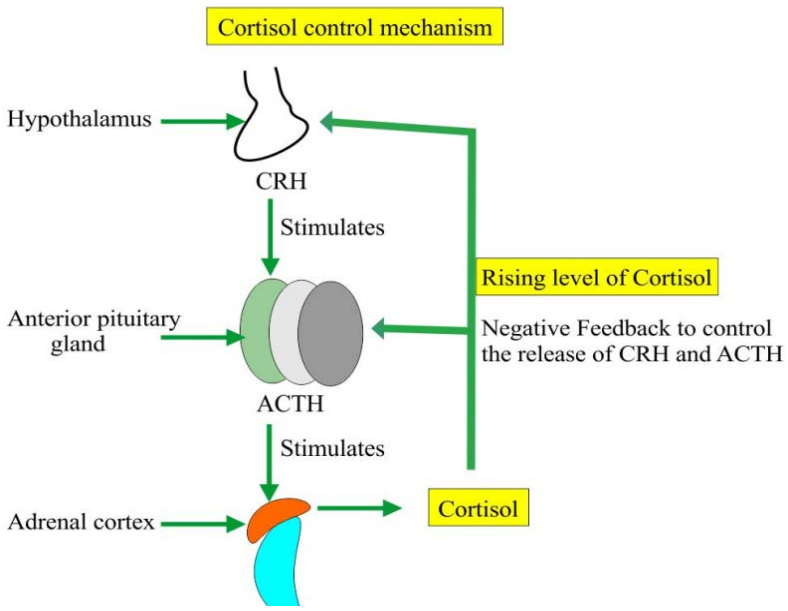

Figure 3: Cortisol control mechanism

1.4.1 Allostatic Load and Overload

Allostatic load and allostatic overload refer to the total addition of result of an allostatic state.

A core feature of AL model is that different adaptation mechanisms communicate in dynamic and nonlinear ways with each other, and there are temporal sequences to these procedures. First segment involves primary mediator stimulation. These mediators are primarily stress hormones like adrenaline, nor-adrenaline and cortisol. Immune system mechanism like cytokines, interleukin-6 and other inflammatory cytokines are also responsible. When these responses which are initial gets triggered in the brain, they serve as a role for adapting by making the organism ready to meet demands that threaten to disrupt homeostatic systems. Nevertheless, effects of these mediators on cellular activities may give a negative effect in various physiological processes. Especially, for regular and chronic activation of these mediators. Secondary mediators get activated by long-lasting activation of these primary mediators. A lot of biological systems are dependent on secondary mediators.(Ganster & Rosen, 2013).

An important push in AL study has been to inspect primary and secondary AL mediator composite indexes because they have the capacity to predict the endpoints disease. Also, to predict, the physical functioning and functions related to cognition and mortality. Among first such attempts were MacArthur Successful Aging Studies. In this study an index was created based on ten primary (e.g., cortisol, adrenaline, noradrenaline) and secondary (e.g, blood pressure, cholesterol, ratio of waist-to-hip) (Ganster & Rosen, 2013). Thus, AL mediators was created. Early studies concerning validation showed that the AL composite was correlated successfully at baseline with both and physical functioning and cognitive functioning measures (Berkman et al., 1993). Its projected decreases in physical and cognitive activity and cardiovascular disease (CVD) events after three and seven years (Seeman et al., 1997). It also projected all-cause mortality irrespective of demographic and health status baseline (Seeman, McEwen, Rowe, & Singer, 2001).

1.4.2 Cortisol and the HPA Axis

One of the primary AL systems is the HPA axis. It is one of the first factors to respond to social stressors (Juster et al., 2010). After the assessment of the cognitive stressor, the HPA axis initiates cortisol release throughout the body. Cortisol affects most major organ systems and helps provide energy resources to prepare an individual for a stressor. Cortisol has been linked as one of the primary AL mediators to a variety of clinical and subclinical conditions including metabolic syndrome (Brunner et al., 2002), depression (McEwen, 2007), and risk of cardiovascular diseases (Smith, Ben-Shlomo, Beswick, Yarnell, Lightman, & Elwood, 2005).

Diurnal Rhythms: Studies that integrated cortisol into formulations of AL measured cortisol production over twelve to twenty-four hours (Seeman et al., 1997). It is to be noted that, elimination of cortisol abides by a diurnal rhythm that displays increased levels when waking up and is increased till thirty to forty minutes, followed by a gradual decline through the rest of the day (Kirschbaum & Hellhammer, 1989). Instead of evaluating cumulative production of cortisol for each day, researchers have been emphasizing on the diurnal cycle instead. The focus of these studies suggests deviations from this pattern reflect systemic dysregulation (Stone et al., 2001).

Many aspects of the diurnal cycle have undergone research investigations, along with waking of cortisol. Which include Cortisol Awakening Response (CAR), which is the production of cortisol in the first hour after awakening; Diurnal Cortisol Slope, such as the slope derived from the rate of decrease of cortisol from awakening until night; Area Under the Curve (AUC), an estimation of total output of cortisol in a day; levels at specific points during the day and at bedtime levels. For analyzing secondary AL composites and the tertiary outcomes, there is no specified consensus of which indicator is the most applicable. However, majority of the researchers focus on CAR and the slope indicators for studies (Chida & Steptoe, 2009).

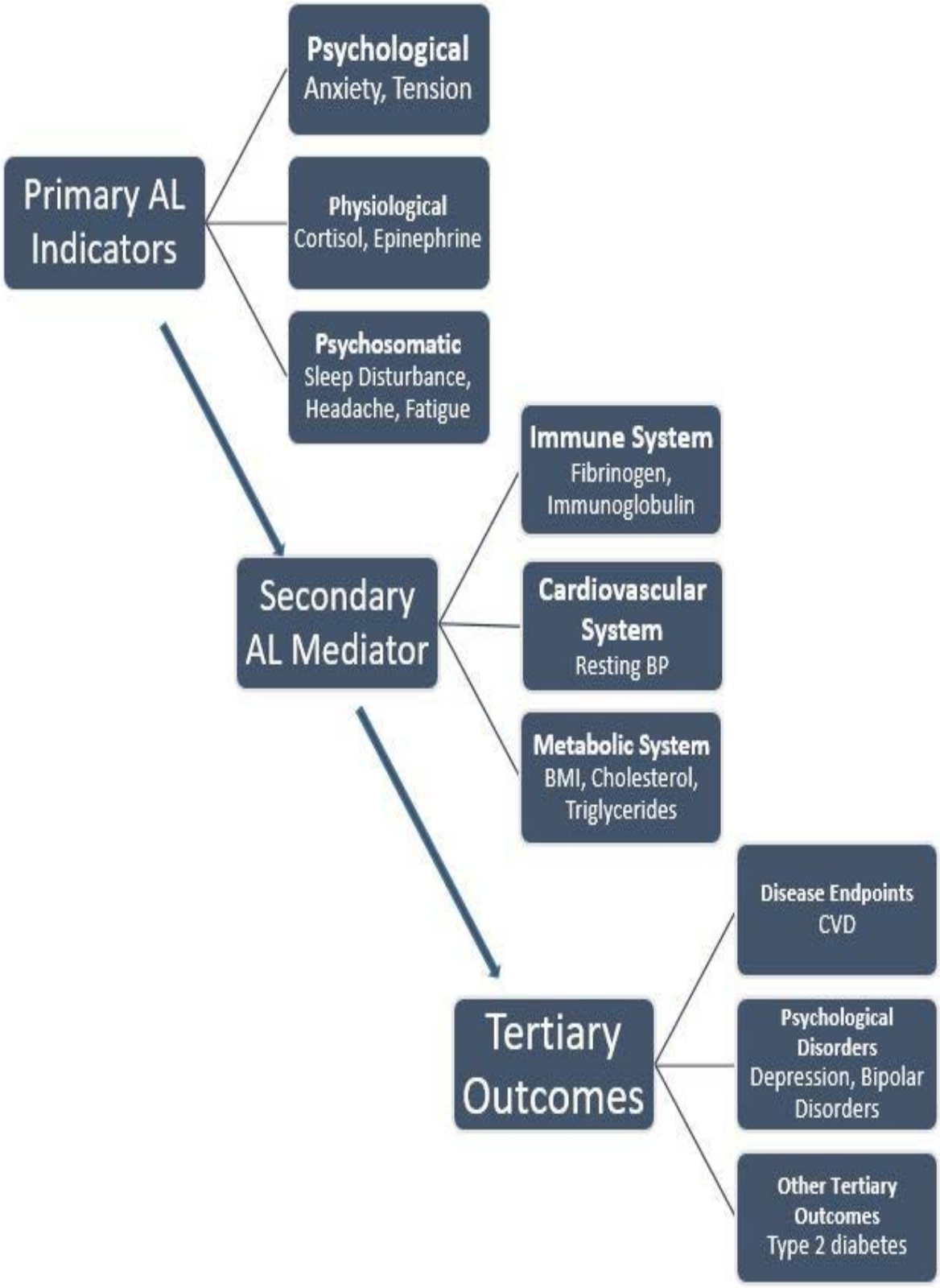

Figure 4: Allostatic Load Model of the Stress Response (Ganster & Rosen, 2013).

1.5 Job Stress and Employee health

Here we studied work stress through the Allostatic Load model. This model appeared as the foremost theoretic perspective in physiology of stress (McEwen, Juster, & Lupien, 2010; Lupien et al., 2006; Stellar & McEwen, 1993). A review of the work stress literature is offered by this article. This is based on groupings of outcomes including primary, secondary, and tertiary outcomes. It was itemized by the Allostatic Load model.

1.5.1 Primary Mediators:

1.5.1.1 Psychological and psychometric indicators:

First of all, we considered the frequently researched outcomes of work stress. This includes affective outcomes such as anxiety, distress and exhaustion in terms of emotion and also includes health complaints which are acute stress related such as headache, GI troubles, fatigue etc. Most of these studies we took into account included self-reported data. So, the outcomes can be said to be self-reported and they are also subclinical estimation of well-being. Relatively immediate reactions to stress exposure, proximal responses are reflected by these outcomes. During the acute phase these outcomes are thus most likely to operate (Ganster& Rosen, 2013).

1.5.1.2 Affective outcomes and health complaints:

Three trends developed from meta-analysis of the literature on work stress. First, modest to strong correlations of work stressors with well-being are shown in some reliable confirmation. This outcome pattern is illustrated best by two meta-analyses. Both summarized how different psychosocial stressors co-relate to subjective well-being reports (Lee and Ashforth 1996; Nixon, Mazzola, Bauer, Krueger, and Spector's 2011). Research suggested that work stressors (e.g., role clarification, role conflict, role stress, stressful events, and workload and work pressure) display relatively strong associations with emotional exhaustion, a job burnout factor

which is a widely used psychological well-being predictor (Lee and Ashforth 1996; Maslach, 1982).

Additionally, focus has be given on the relationships between self-reported physical symptoms and various stressors at work. These physical symptoms may include headache, sleep disturbance, backache, eye strain, nausea, dizziness, loss of appetite, and problems associated with gastrointestinal system. The meta-analysis of all seven job stressors included in showed significantly statistical but modest associations with a composite measurement of physical indications. Seven job stressors were working hours, role conflict, position uncertainty, lack of control, interpersonal conflict, organizational constraints and workload (Nixon et al., 2011).

The second trend that emerged during our study is that affective outcomes (e.g., exhaustions of emotion) are most strongly associated with job stressors related to physical symptoms. Two meta-analysis that considering the impact of being insecure at job corroborate this trend. Both of them suggest that feeling of insecurity at job shows a stronger correlation with well-being of the psychology than with physical health (Cheng & Chan, 2008; Hellgren Sverke, &Naswell, 2002). Likewise, another meta-analysis suggested outsider violence, boss and coworker are typically in closer relationship to psychological (e.g., exhausted mental state) factors rather to physical well-being (Herschcovis and Barling, 2010).

Another observed pattern suggest that employees can be prevented from achieving job goals by stressors. This condition is more related to wellbeing stressors rather than stressors promoting personal growth. For instance, when a study was conducted with differential effects of daily challenges stressors, obstacles stressors and burnout measures. In this case job pressure, workload and urgency of time was considered as daily challenges and constraint, hassle, inadequate resources etc. were considered as obstacles. For these study anxiety disorders, frustration, depression was considered as stressors. These meta-analysis co-efficient

were corrected and after the correction it indicated that both type of stressors are significantly associated with stress and burnout. However, corrected correlation coefficients from these meta-analyses indicate that both obstacle stressors are more strongly related to stress and burnout rather than how challenge stressors are related. (Crawford, LePine, & Rich, 2010; LePine, LePine, & Jackson, 2004; Podsakoff, LePine, &LePine, 2007).

1.5.1.3 Event and time sampling:

This type of techniques, for instance, Experience sampling methodology (ESM) and diaries are particularly relevant to the analysis of primary outcomes associated with exposure to work stress because these methods allow researchers to aggregate encounters with multiple situations over time to assess cumulative effects on temporary, impaired outcomes such as emotions and anxiety within individuals. This particular group of research provided additional evidence for the stress effect, showing that there is a fluctuation of psychological well-being with stress(Ganster & Rosen, 2013).

A study was conducted in which accountants were asked for four weeks of completing a survey three times a day. Portfolio workers were asked to record for 26 weeks each week their perceptions of work demand, job control, social support and psychological strain (e.g., anxiety and depression). Results indicated that participants had a greater psychological burden during weeks involving high demand for work and low control (Teuchmann, Totterdell, and Parker,1999). A day-to-day analysis was conducted to understand the relationship between poor job characteristics, need for rehabilitation and well-being over a five-day period. The results showed that high demands for jobs, low job control, and unfavorable off-job activities (e.g., domestic demands) predicted recovery needs. In addition, the need for rest in bedtime was negatively linked to health (Sonnentag and Zijlstra, 2006). ESM (experience sampling method) was used to assess the negative emotional effects of interpersonal conflict. Results

indicated that interpersonal conflict in the workplace was more closely associated with negative impact for agreeable employees and those reporting lower workplace social support.Studies using event and time sampling techniques indicate that affective responses fluctuate over time with stressful working conditions, so that individuals exhibit fairly immediate reactions to acute demands at work (Judge and Keeney, 2011).

1.5.1.4 Physiological indicators:

More objective indicators and clinical markers of health have been considered by very few studies. Such studies have largely focused on non-experimental methods and much of the emphasis has been on reported stressor effects, with cortisol being one of the physiological outcomes most frequently observed. Cortisol shows pronounced diurnal patterns, as described above.

While researchers in the field of work stress have been measuring cortisol for quite some time, measures that require diurnal patterns exploration have rarely taken into account (Rose, Jenkins, Hurst, Herds, & Hall, 1982).

Samples of saliva was taken at waking, at the working day midpoint, and again at two to three hours after work on two different working days with a sample of nurses for measuring cortisol level in blood. Although this sampling program would have allowed certain diurnal trend analyses, these measurements have not yet been done routinely. So, concentration on cortisol at work and after-work was given (Dwyer, Fox, and Ganster, 1993). Measurements of cortisol at awakening time and at intervals of fifteen minutes until forty-five minutes after awakening for over two hundred employed women was done. It was found that people who worked more than overtime of ten hours during those morning periods displayed elevated cortisol (Lundberg and Hellstrom, 2002).In a study that directly analyzed the CAR, it was found that a relationship between the rise in cortisol after awakening and high workload during the first 30 minutes

exists(Hellhammer, Schlotz, Schulz, and Stone, 2004). That high level of cortisol in morning was predicted in line with the JDC model by a mixture of high job demands and low status (Kunz-Ebrecht, Kirschbaum, Marmot, and Steptoe, 2004).

Measurement of CAR at forty-five minutes after the awakening was done and it was found that not women but man, had inferior mean job demands in the high CAR quartile than those in the lower 3 quartiles (combined).In the high CAR quartile, however, both men and women stated lower heights of control and proficiency of work, and higher levels of subjective health concerns (Eek, Garde, Karlson, Hansen, and Orbaek, 2011). A study measured cortisol at awakening, midwork shift, and at night was done, butdiurnal pitch was not calculated. However, it was found that cortisol at night was predicted by a low-control relationship and high demands on jobs.High cortisol levels in the evening would usually be in association with a flatter diurnal curve, though this was not explicitly established in this study (Ganster, Fox, and Dwyer, 2001). Level of cortisol in blood was calculated in morning and evening in a research, but calculation of a diurnal slope was ignored. Fascinatingly, it was indicated by the research that long-lasting isostrain (i.e., a cumulative measure of social support work, demands, and control) was associated with cortisol levels in the evening but not in the morning (Devereux, Rystedt, Cropley, and Michalianou, 2008). Researchers also found that morning cortisol showed a sharpened sudden drop starting working days until weekends. This indicates that cortisol levels in blood in the morning can be more prone to real day-to-day job pressure shifts (i.e., stressors producing acute effects), while cortisol levels in blood in the evening may be extra vulnerable to long-lasting vulnerability (Rystedt et al., 2008). Earlier studies of literature concerning relationship between work stress and level of cortisol in blood have found no reliable proof of work stress being correlated with serum and urine cortisol (Rugulies, Hansen, Garde, Larsen, & Knudsen, 2009). However, a study settled that stress at work

responded with positive results to Cortisol CAR which was for the most part saliva-assayed (Chida and Steptoe, 2009).

Recent researches have shown proof of correlation between mental and physical measures of primary AL outcomes, indicating that stress at work can have almost synchronized impacts on these primary indicators of well-being. It was indicated that interpreted work load interconnected with control in order to predict various primary outcomes, including blood pressure at workplace, job satisfaction, and workplace levels of blood cortisol. These discoveries are confirmation of the potential for primary mental and physical outcomes instantaneously (Fox et al., 1993)**.**

One cross-sectional research found that work stressors which were self-reported overlap in terms of predicting psychological, somatic, and physiological pressure parameters. Workers of the oil company were surveyed on their observations of position conflict, psychological anxiety, political capacity and somatic complaints. Physical measures included blood pressure and heart rate. Both may imitate secondary AL mediators here in the study. The cause of this is that the job at professional biofeedback clinic these gave these measures. The results showed that the relationship between role conflict and somatic complaints, mental anxiety, and blood pressure was punier for superiorly politically qualified employees (Perrewé, Zellars, Ferris, Rossi, Kacmar, and Ralston, 2004).

Investigation to access the impact of perceived workload on affective (e.g., affective distress) and physiological (e.g., blood pressure) responses over a two-week span within individuals was conducted. Workload showed significant associations between individuals with affective distress and burnout which were self-reported interventions, but not with blood pressure. In-individual associations, however, suggested that workload was correlated with affective

distress and blood pressure ether during or at the end of the working day (Dimotakis, Ilies, and de Pater, 2010).

Over and above the key impacts which were showed by job control and organizational support included moderating impact on the relationships between workload and both blood pressure and affective distress. It was showed that workload was more closely linked to primary AL response indicators (i.e. affective distress at workplace and blood pressure) for workers who reported less control and support (Ganster & Rosen, 2013).

1.5.2 Secondary Mediators

Following repeated long-lasting activation, primary mediators that unfavorably affect the proper operational condition of allostatic pathways can result in a series of secondary outcomes. Here in this case other biological systems adjust to response to primary mediator over- and underproduction. Immune system, cardiovascular and metabolic performance indicators are included in these secondary mediators. Many responses may be marked as primary when reactions are momentary, but when evaluated at resting rates are seen as secondary. Our analysis of these different approaches for evaluating secondary AL measures is structured around these(Ganster & Rosen, 2013).

1.5.2.1 System-focused measures:

Research analyzing markers of the body's immunity have yielded more mixed outcomes. For instance, a study looked at the effects of job control, job demands, traditionality (i.e., devotion to conventional cultural values), and apportionable justice on the immunity of workers in manufacturing field. Immunoglobulin M (IgM) and Immunoglobulin A (IgA) from blood samples and self-reported illness (i.e. respiratory tract infections) were included in their functioning indicators of immune system. Scholars involved blood pressure and psychological wellbeing as dependent variables (i.e., emotional exhaustion). However, the results indicated

that both long-lasting upper respiratory tract infections and IgA too were predicted by a three-way collaboration between traditionality, workload, and job control (Schaubroeck, Lam,Xie, and 2008).

The consequence of workload and job management on immune system indicators were considered in a study that indicate about inflammation that is induced by stress in the body (i.e., WBC counts, C-reactive protein, and fibrinogen). Results in the end provided support for only just a small proportion of Job Demand Control model-based relationships. For instance, the key and interactive end-result of perceived control and workload were generally not predictable. Findings were interpreted suggesting that inflammatory processes in the body probably do not include the physical mechanisms linking the DCS model to morbidity due to cardiovascular issues (Berliner, Shirom, Shapira, and Toker, 2008).

Most reliable data came from a research which looked at factors of risk for CVDs. For example, assessment by accumulating ambulatory readings of average regular blood pressure was done. This measured BP was often associated with work strain (or its components), ERI, threatening cautionand long hours of work. (Baker, Schnall, Landsbergis, Belkic, Schwartz, & Pickering, 2011; Turner,Light, & Hinderliter, 1992; Schwartz, Schnall, Warren, Landsbergis, & Pickering, 1992, 1998). Evidence is also present about that demands for work and control over work interrelates to monitor blood pressure both off and, on the job, (Perrewé et al., 2004; Fox et al., 1993; Schaubroeck & Merritt, 1997). The impact of biopsychosocial strain (e.g., emotional health, sleep, strength, attention, stress that is perceived) on a larger scale measure of risk of CVD including BP, composition of body, cholesterol at state of fasting, and fasting level of glucose was considered. Results specified that the impact of job demands on CVD risk factors were mediated by work tolerance and biopsychosocial stress. This result could have been construed as assisting a relation between primary (e.g., perceived stress level, vigor) and secondary AL mediators (Sinclair, Ferris, and Kline, 2005).

A couple of studies also gave evidence of a stress effect on metabolic function. One of these studies found considerable levels of associations between occupational strain groups which was based upon values of demand and control and 11 parameters including total cholesterol; triglyceride; MI; WHR; glycosylated hemoglobin HDL; LDL; glycol-lipid allostatic load index after controlling age factors, marital status, smoking, and differences in education (Dong, Zhang, Li, Ke, Sun, and Wang, 2007).

The association between long-lasting stress at work and metabolic syndrome was investigated by utilizing a study of British civil servants from the Whitehall II cohort. A bunch of risk issues (e.g., cholesterol, elevated BP, insulin resistance, abdominal obesity) that amplifies heart disease risk and the risk concerning type 2 diabetes. Results designated that people who reported increased vulnerability to work stressors (i.e., higher demands and lower control) during the study's 14-year period at a very higher risk of suffering from metabolic syndrome (Chandola, Brunner and Marmot, 2006).

1.5.2.2 Broad AL indices

Researchers collected questionnaire evaluations of psychosocial workplace characteristics from hospital employees (e.g., decision latitude, work demands, and social support).These staffs also undertook a medical examination, during which thirteen physical measures (e.g., BMI, cholesterol, WHR, cortisol, epinephrine etc.) were collected and was merged for creation of an AL index which explained about bodily activity across regulatory systems in a summary. Test subjects were classified based on freedom of decision making and scale of demand of the job. The score given upon whether one experiences high or low strain or not. Cross-sectional analyzes showed that, before and after adjustment for various risk factors (e.g., exercise and smoking status) in the high strain group AL was meaningfully greater than it was in the lower group. Examination of individual measures suggested that the most prone to stress exposure is

systolic blood pressure, BMI, ratio of total cholesterol to high-density lipoprotein, triglycerides and cortisol, a result that further indicates that more than one biological systems (e.g., metabolic and cardiovascular) are involved in the stress control cycle(Wang, Li, Zhang, and Sun,2007).

AL index of the 10 indicators and an extended index of metabolic, immunological, and blood coagulation markers were used for another study. Results indicated that both AL composite formulations were related to ERI and exhaustion but individual constituent was ignored. These findings led to the conclusion of that multisystem summary that indicates physiological risk associate chronic work stress and exhaustion (Bellingrath, Weigl, and Kudielka, 2009).

1.5.3 Tertiary outcomes:

When secondary dysregulations continue for a long time, it leads to tertiary phase of allostatic overload. These are known the disease endpoints.

1.5.3.1 Cardiovascular disease:

An extensive review of research was conducted investigating specific markers of CVDs. The analysis however, was limited in a way that they were solely established on the work strain model (Karasek & Theorell, 1990). Moreover, we investigated different symptoms of CVD, including death (Belkic et al., 2004). For each sample, 15 quality rating parameters were produced. These parameters were ensured to be multidimensional so that they are not biased towards selection. Moreover, behavioural and medical confounders of the sample were also corrected. A total of 38 studies were analysed by them. However, these studies were surveys that were based on population. A result was interpreted from their studies that there remains a significant relationship between CVDs and job pressure in men. The results found were consistent through their sample. However, the interpretation was not significant when the same parameters were tested in women. Meta-analysis research was also conducted by some

researchers which investigated correlation between job stress and CVDs. For this instance, they paid particular attention to prospective cohort studies which assessed Effort reward imbalance, Job demand control model and organizational justice-based models. Measurements of mean impact sizes were done in terms of CVD risk levels. The results indicated that risk or mortality from CVDs were increased. It is worth mentioning that the cohort study was based on samples collected from population which were free from CVDs at the time of sample collection. The forward-looking spans range from 4 to 26 years (kivimaki et al., 2006). When the experiment was conducted using the JDC stress model, the mean risk ratio of having high pressure tendencies was 1.42 ($p<0.05$). The test in this case was adjusted according to age and gender. Moreover, the risk estimates were almost always measured on the basis of a single exposure factor (JDC, ERI or injustice). However, a retrospective analysis was not included in their study.

Another assessment of work performance which was conducted twice 3.7 years apart from each other was used to forecast an incident CVD step at after another interval of 4 years. The subjects that had consistently high control measures showed the lowest risk of CVDs. Inversely, a much higher risk level was seen in subjects who had a fall in their control levels or who had constantly low control levels. This study suggests that exposure is subjected to change in years. It also indicates that the duration of exposure will also affect the development of CVDs (Bosma et al., 1997; Belik et al., 2004).

Latest prospective cohort research analysis has investigated the correlation between stress in the job sector and CVDs. They have identified a statistical quality measure. It was based on Scottish Collegiate Guidelines (Harbour & Miller, 2001). The results were then linked with the statistical quality measures (Backe et al., 2012).

When the Whitehall II cohort was conducted it showed correlation between demands and CVD risk. The research accounted for a large list of confounders which held the highest quality score. The confounders included obesity, cholesterol, diet, alcohol consumption, asthma and BMI (Kruper et al., 2002).

Another study British Civil Servants' Whitehall II research and recorded both fatal and non-fatal cases of coronary heart diseases and myocardial infractions. The study was carried out in a cohort with the sample size of 5533 adults who were CVD free at that time. Another recent study suggests that job strrain is a factor for risk of CVDs in an employee. They have also enlisted other factors of CVDs. In this case measurement of various components of job strain was done over three periods. It tracked new cases of CVDs for 10 years. Subjects were classified into high strain quadrant when their median control scores were low. Above-median demand and support scores were the lowest third among the sample distribution. The assessment was done in all of the three periods. Then they used the number of times the subject was highly stressed to generate a datasheet and calculate cumulative sensitivity. They accounted for framingham risk ranking using total cholesterol, blood pressure, diabetes and smoking habit. When they accounted for these factors, they found that, a cumulative sensitivity of three of four phase is significantly more linked with CVD cases than sensitivity of none or one phase (Kivimaki et al., 2011).

1.5.3.2 Mental health outcomes:

Various studies have given attention to the relationship between mental health and job stress. Focus on depression is well-originated in a data on the population of U.S. shows that about seven per cent of full-time workers aged eighteen to sixty-four have experienced a serious depressive episode in the year before the study was conducted. Furthermore, rates of occurrence of depression in case of women are about twice the rate for men in virtually all

occupations. Depression is also a major cause of illnessand absence from sickness (Burr, Christensen, Rugulies, Bultman, Lund, Labriola, & 2006).

The JDC model has been the leading theoretical model evaluated in epidemiological depression studies (Bugel, Goldberg, Neidhammer, David, & Leclerc, 1998; Fuhrer, Stansfeld, Head, & Ferrie, 1997; Shipley, Marmot, Stansfeld, & Fuhrer, 1999). A particularly huge-sample test of this modellooked at statistical data from the health survey of Canadian Community. This survey information covered multi-item demand scales, social support, control (latitude for decision), insecurity at job and exhausted physical state. A variant of the Revised International Diagnostic Interview (based on the DSM-IV) was used to assess depression and test responders were identified as experiencing (or not experiencing) a major disorder associated with depressive behavior or depression over the past twelve months (six percent for females and 3.4 percent for male). Their outcomes generally did an imitation of those from previous studies, excluding that they found more significant gender differences than previously reported; work strain, job demands and job insecurity were associated with a meaningfully higher risk of male but not female depression. Nevertheless, control has been an important indicator for women but not for men (Blackmore et al., 2007).In longitudinal epidemiological studies, the JDC model was also tested in which consistency and shifts in job control and demands could be measured as depression predictors (Taris, deLange, Houtman, Kompier, & Bongers, 2002; Stansfeld et al., 1999; Schmitz, Wang, Stansfeld, & Dewa, 2009).

Canadian Community Health Survey were used on a number of waves to access depression. Depression chances were greater than the low strain no-change group for the continuously existing high strain group (OR = 1.52) and the group changing from low strain to high strain, at the time those changing from high strain to low strain stayed the same from the stubborn low strain group. The constantly existing high strain category had a large odds ratio (OR = 1.77) only if they stated they had a good or excellent health at baseline but not if they described

average or poor healthiness at baseline, signifying that those in good health are more vulnerable to working conditions which is stressful (Wang et al., 2009).

1.5.3.3 Other tertiary outcomes:

A variety of studies have looked at type 2 diabetes. Though obtained results appear to be mixed from cross-sectional studies, there is comparatively strong potential evidence that job strain can predict the onset of diabetes after a follow-up period of 15 years and after control for a range of confounding factors (Witte, Brunner,Heraclides, & Chandola, 2009).There is also evidence that work-stress exposure is associated with health care costs for employees, which could reflect a variety of underlying physical conditions. It wasfound that demands for employment interrelated with controls to predict claims for insurance of health. The results were collected over a period of five years, so this indicator is likely to tap into more long-lasting health problems that may represent endpoints related to the disease. Fascinatingly, results also indicated that cortisol levels in blood after work settled the effects of the demands-control collaboration on costs for health care, which persistently remained existing with an AL model framework (Ganster et al., 2001).

1.6 Purpose of this study:

The purpose of this study was to present evidence of how job stress can affect employee health.

Chapter 2

Methodology

All of the information, data and statistics regarding this topic were acquired from articles, renowned journals, and published research papers. To construct a review, research databases like PubMed, Scopus, Science Direct, Academic Search, ResearchGate etc. and review of random papers and magazines were avoided for searching information related to this paper. Finally, title and modified work were screened to check the accuracy and similarities of the paper.

Chapter 3

Discussion

This review contains information from various work stress literature. In most of these literatures we can see a clear relationship between the stress that a job can produce and the well-being of a person. Here we took the Allostatic load model of work stress into account. There are various indicators in the AL model. Some deal with acute responses to job stress. However, Job stress is often assessed by the 'Job demand control' model and the 'Effort reward imbalance' model. Evidence has been found that shows how job stress effects the psychological health of employees and how it can produce the feeling of fear, tension and anxiety in workers of various occupations (Wang, Lesage, Schmitz, & Drapeau, 2008). Various anxiety disorders appear in those who are in constant exposure to job stress (Segura Marcenes & Sheiham, 1992). Chronic state of job stress can cause various types of dysregulation of the normal homeostatic mechanism of the body (Ganster & Rosen, 2013). Job stress can affect a person physiologically by various types of stressors. For instance, cortisol level in blood plays a vital role when an individual experiences stress. When someone has to deal with job stress, he or she is most likely to have higher cortisol level in blood. While exposed to stress the body is in an urgent need of plenty of energy to deal with it and the source of this required energy is cortisol. Cortisol stimulates the process of gluconeogenesis which refers to the synthesis of new molecules of glucose. Cortisol also plays an important role in proteolysis which simply breaks down the protein molecules and modifies the rate of breaking down of fat which is lipolysis. Cortisol helps to maintain the blood pressure by increased narrowing of the lumen of blood vessels. It also reduces production and release of inflammatory mediators such as prostaglandin and interleukins as well as inhibiting proliferation of T-Lymphocyte (Al-marzooq & Awar, 2020). Then again, an individual is most likely to experience disturbance in sleep pattern due

to stress produced by his or her job. Many workers have reported that they can't have a sound sleep as they were feeling stressed (Kim et al., 2011). Chronic headaches can be produced in employees of any occupation and can persist for years. This type of headache can be caused by job stress (Van Der Doef, Maes, &Diekstra, 2000). There is also an association between fatigue and restlessness in case of people experiencing job stress (Godin, Kittel, Coppieters, & Siegrist, 2005). The immune system of a person can be seriously compromised due to exposure of job stress. In a study it was found that job stress can actually increase the development of HIV in a person (Schneiderman, Ironson, & Siegel, 2005). Job stress plays a role in the elevation of blood pressure and heart rate. Increased heart rate can result in irregularities in heart rate. Severe strain on the heart and abnormalities in the systemic circulation most likely will occur (Chandola et al., 2008). The cardiovascular system can be negatively affected by job stress. Risk of stroke, angina etc. are also associated with job stress. There are various other conditions which can be the result of abnormalities in the cardiovascular system (Kivimäki&Kawachi, 2015). Additionally, job stress can affect the weight of a person. Many people tend to change their healthy diet and go for unhealthy diet to deal with job stress. Women tend to eat more than they usually do and they may do it at an extreme amount which results in obesity (Overgaard, Gyntelberg, &Heitman, 2004). An individual can also experience lack of appetite and and rely on smoking and alcohol intake to tackle job induced stress. Job stress can initiate a series of recalling of past trauma or bad memory. Blood insulin level can fluctuate vastly when someone experiences stress. Blood glucose level is not stable and within normal range in a person who is dealing with chronic stress (Vrijkotte, Van Doornen, & De Geus, 1999). This demonstrates that the metabolic system of the body can be affected in various ways by the presence of job stress. Compromised immune, cardiovascular and metabolic systems can be stated as secondary indicators but can also be considered as tertiary indicators if the abnormalities in these systems persist (Ganster& Rosen, 2013). Job stress can cause various

diseases in a person. Different types of cardiovascular disease can be the result of job stress. Age plays a role in the prevalence of job stress in cardiovascular diseases (Backé, Seidler, Latza, Rossnagel, & Schumann, 2012). Little evidence showed how job stress can have influence in development of diabetes in a person (Ganster& Rosen, 2013). These disease endpoints are under consideration of tertiary AL indicator. Various psychological disorders can be specified in a person with job stress. Depression can occur if further dysregulation of secondary Al mediator such as anxiety disorder happens (Wang et al., 2008). Various studies considering how job stress can cause an increase in employee mortality rate have also been done but the results were not reliable.

Chapter 4

Conclusion

This study seeks to look at the negative effects that job stress can have on an individual's health and it shows various evidences concerning the effects of job stress on employee health. Job stress can have negative effects on a person's mental or physical or on both mental and physical health. However, for some studies that we reviewed, the way various findings were achieved was not very significant and had some shortcomings. There are scopes of various future studies in this section. Association of job stress with many diseases and health conditions is not clearly stated and does not have a strong base. More studies should be conducted on how the workplace environment and its structure should be redesigned so that the employee does not feel excessive job demand while the productivity remains unhampered. More studies should be done regarding ways of reduction in work stress. The betterment of supervisor's support, increase in healthy relationships with co-workers, proper counseling should be encouraged in various job sectors. This type of study should also be conducted with individuals other than employees. For instance, studies on students should be done to assess their stress. Overall focus on this matter has to be increased for ensuring the betterment of individual's health, improvement in employee's control over work and increase reward.

Chapter 5

Future Directions

Evaluation of job stress could be done in Pharmaceutical Industries and in various other job sectors of Bangladesh. Moreover, survey could be done to verify the relationship between increased mortality rate and job stress.

References

Al-Emian, M. S. (2005). Organizational behavior in business organizations. Jordan, Amman: Dar Wael for Publishing and Distribution.

Annals of Socials Sciences. (2018). Annals of Social Sciences Management studies Work Related Stress : A Literature Review. Annals of Social Science and Management Studies, 2(3), 1–7.

Antonovsky, A., & Kats, R. (1967). The life crisis history as a tool in epidemiologic research. Journal of Health and Social Behavior, 8(2), 15-20.

Backé, E. M., Seidler, A., Latza, U., Rossnagel, K., & Schumann, B. (2012). The role of psychosocial stress at work for the development of cardiovascular diseases: a systematic review. International archives of occupational and environmental health, 85(1), 67-79.

Backé, E. M., Seidler, A., Latza, U., Rossnagel, K., & Schumann, B. (2012). The role of psychosocial stress at work for the development of cardiovascular diseases: A systematic review. International Archives of Occupational and Environmental Health, 85(1), 67–79. https://doi.org/10.1007/s00420-011-0643-6

Baron, R. A., & Branscombe, N. R. (2012). Social psychology (13th ed.). Michgan: Library of Congress Cataloging-in-Publication Data.

BEEHR, T. A., & NEWMAN, J. E. (1978). Job Stress, Employee Health, and Organizational Effectiveness: a Facet Analysis, Model, and Literature Review. Personnel Psychology, 31(4), 665–699. https://doi.org/10.1111/j.1744-6570.1978.tb02118.x

Belkic, K. L., Landsbergis, P. A., Schnall, P. L., & Baker, D. (2004). Is job strain a major source of cardiovascular disease risk? Scandinavian journal of work, environment & health, 85-128.

Bellingrath, S., Weigl, T., & Kudielka, B. M. (2009). Chronic work stress and exhaustion is associated with higher allostastic load in female school teachers: original Research Report. Stress, 12(1), 37-48.

Berkman, L. F., Seeman, T. E., Albert, M., Blazer, D., Kahn, R., Mohs, R., ... & Nesselroade, J. (1993). High, usual and impaired functioning in community-dwelling older men and women: findings from the MacArthur Foundation Research Network on Successful Aging. Journal of clinical epidemiology, 46(10), 1129-1140.

Blackmore, E. R., Stansfeld, S. A., Weller, I., Munce, S., Zagorski, B. M., & Stewart, D. E. (2007). Major depressive episodes and work stress: results from a national population survey. American Journal of Public Health, 97(11), 2088-2093.

Blackmore, E. R., Stansfeld, S. A., Weller, I., Munce, S., Zagorski, B. M., & Stewart, D. E. (2007). Major depressive episodes and work stress: Results from a national population survey. American Journal of Public Health, 97(11), 2088–2093. https://doi.org/10.2105/AJPH.2006.104406

Bosma, H., Marmot, M. G., Hemingway, H., Nicholson, A. C., Brunner, E., & Stansfeld, S. A. (1997). Low job control and risk of coronary heart disease in Whitehall II (prospective cohort) study. Bmj, 314(7080), 558.

BR, B. E. H. H. W. (2002). Page M Clarke P Juneja M Shipley MJ Kumari M Andrew R Seckl JR Papadopoulos A Checkley S Rumley A Lowe GD Stansfeld SA & Marmot MG. Adrenocortical autonomic and inflammatory causes of the metabolic syndrome: nested case-control study. Circulation, 106, 2659-2665.

Bültmann, U., Rugulies, R., Lund, T., Christensen, K. B., Labriola, M., & Burr, H. (2006). Depressive symptoms and the risk of long-term sickness absence. Social psychiatry and psychiatric epidemiology, 41(11), 875-880.

Cheng, G. H. L., & Chan, D. K. S. (2008). Who suffers more from job insecurity? A meta-analytic review. Applied Psychology, 57(2), 272-303.

Chida, Y., & Steptoe, A. (2009). Cortisol awakening response and psychosocial factors: a systematic review and meta-analysis. Biological psychology, 80(3), 265-278.

Chida, Y., & Steptoe, A. (2010). Greater cardiovascular responses to laboratory mental stress are associated with poor subsequent cardiovascular risk status: a meta-analysis of prospective evidence. Hypertension, 55(4), 1026-1032.

Cohen, L. (2002). Research methods in education. London: Routledge.

Crawford, E. R., LePine, J. A., & Rich, B. L. (2010). Linking job demands and resources to employee engagement and burnout: a theoretical extension and meta-analytic test. Journal of applied psychology, 95(5), 834.

De Lange, A. H., Taris, T. W., Kompie, M. A., Houtman, I. L., & Bongers, P. M. (2002). Effects of stable and changing demand-control histories on worker health. Scandinavian journal of work, environment & health, 94-108.

Desai, T. P. (2018). Stress and Mental Workload : A Study in an Industrial Organisation Author (s): Tripti P . Desai Source : Indian Journal of Industrial Relations , Vol . 28 , No . 3 (Jan ., 1993), pp . 258-273 Published by : Shri Ram Centre for Industrial Relations and. 28(3), 258–273.

Feng, G. F. (1992). Management of stress and loss. Taipei: Psychological Publishing Co.Ltd.

Ferris, P. A., Sinclair, C., & Kline, T. J. (2005). It takes two to tango: personal and organizational resilience as predictors of strain and cardiovascular disease risk in a work sample. Journal of occupational health psychology, 10(3), 225.

Foot, T. (1991). Stress management. Work Study, 40(3), 9-11

Ganster, D. C., & Rosen, C. C. (2013). Work Stress and Employee Health: A Multidisciplinary Review. In Journal of Management (Vol. 39). https://doi.org/10.1177/0149206313475815

Ganster, D. C., Fox, M. L., & Dwyer, D. J. (2001). Explaining employees' health care costs: a prospective examination of stressful job demands, personal control, and physiological reactivity. Journal of applied psychology, 86(5), 954.

Ganster, D. C., Mayes, B. T., Sime, W. E., & Tharp, G. D. (1982). Managing organizational stress: A field experiment. Journal of Applied Psychology, 67(5), 533.

Gharib, M. N., Jamil, S. A., Ahmad, M., & Ghouse, S. (2016). The impact of job stress on job performance: A case study on academic staff at dhofar university. International Journal of Economic Research, 13(1), 21–33.

Gilbert-Ouimet, M., Trudel, X., Brisson, C., Milot, A., & Vézina, M. (2014). Adverse effects of psychosocial work factors on blood pressure: Systematic review of studies on demand-control-support and effort-reward imbalance models. Scandinavian Journal of Work, Environment and Health, 40(2), 109–132. https://doi.org/10.5271/sjweh.3390

Godin, I., Kittel, F., Coppieters, Y., & Siegrist, J. (2005). A prospective study of cumulative job stress in relation to mental health. BMC Public Health, 5, 1–10. https://doi.org/10.1186/1471-2458-5-67

Greenberg, J., Baron, R. A., & Grover, R. A. (1993). Behavior in organizations: Understanding and managing the human side of work.

Hansen, Å. M., Larsen, A. D., Rugulies, R., Garde, A. H., & Knudsen, L. E. (2009). A review of the effect of the psychosocial working environment on physiological changes in blood and urine. Basic & clinical pharmacology & toxicology, 105(2), 73-83.

Harbour, R., & Miller, J. (2001). A new system for grading recommendations in evidence-

based guidelines. Bmj, 323(7308), 334-336.

Hellhammer, J., Fries, E., Schweisthal, O. W., Schlotz, W., Stone, A. A., & Hagemann, D. (2007). Several daily measurements are necessary to reliably assess the cortisol rise after awakening: state-and trait components. Psychoneuroendocrinology, 32(1), 80-86.

Heraclides, A., Chandola, T., Witte, D. R., & Brunner, E. J. (2009). Psychosocial stress at work doubles the risk of type 2 diabetes in middle-aged women: evidence from the Whitehall II study. Diabetes care, 32(12), 2230-2235.

Heraclides, A., Chandola, T., Witte, D. R., & Brunner, E. J. (2009). Psychosocial stress at work doubles the risk of type 2 diabetes in middle-aged women: evidence from the Whitehall II study. Diabetes care, 32(12), 2230-2235.

Hershcovis, M. S., & Barling, J. (2010). Towards a multi-foci approach to workplace aggression: A meta-analytic review of outcomes from different perpetrators. Journal of Organizational Behavior, 31(1), 24-44.

Ilies, R., Dimotakis, N., & De Pater, I. E. (2010). Psychological and physiological reactions to high workloads: implications for well-being. Personnel Psychology, 63(2), 407-436.

Ilies, R., Johnson, M. D., Judge, T. A., & Keeney, J. (2011). A within-individual study of interpersonal conflict as a work stressor: Dispositional and situational moderators. Journal of Organizational Behavior, 32(1), 44-64.

Juster, R. P., McEwen, B. S., & Lupien, S. J. (2010). Allostatic load biomarkers of chronic stress and impact on health and cognition. Neuroscience & Biobehavioral Reviews, 35(1), 2-16.

Juster, R. P., McEwen, B. S., & Lupien, S. J. (2010). Allostatic load biomarkers of chronic stress and impact on health and cognition. Neuroscience & Biobehavioral Reviews, 35(1),

2-16.

Karasek Jr, R. A. (1979). Job demands, job decision latitude, and mental strain: Implications for job redesign. Administrative science quarterly, 285-308.

Karasek Robert A., J. (1979). Job Demands, Job Decision Latitude, and Mental Strain: Implications for Job Redesign. Administrative Science Quarterly, 24(2), 285–308. Retrieved from http://www.jstor.org/stable/2392498

Karasek, R. (1990). Healthy work. Stress, productivity, and the reconstruction of working life.

Karlson, B., Eek, F., Hansen, Å. M., Garde, A. H., & Ørbæk, P. (2011). Cortisol variability and self-reports in the measurement of work-related stress. Stress and Health, 27(2), e11-e24.

Kayumba, T. D. (2017). AN ASSESSMENT OF STRESS FACTORS AFFECTING STUDENT-TEACHERS IN TANZANIA A Case of Marangu Teachers ' College AN ASSESSMENT OF STRESS FACTORS AFFECTING STUDENT-TEACHERS IN TANZANIA A Case of Marangu Teachers ' College.

Kirschbaum, C., Pirke, K. M., & Hellhammer, D. H. (1993). The 'Trier Social Stress Test'–a tool for investigating psychobiological stress responses in a laboratory setting. Neuropsychobiology, 28(1-2), 76-81.

Kivimäki, M., Nyberg, S. T., Batty, G. D., Shipley, M. J., Ferrie, J. E., Virtanen, M., ... & Hamer, M. (2011). Does adding information on job strain improve risk prediction for coronary heart disease beyond the standard Framingham risk score? The Whitehall II study. International journal of epidemiology, 40(6), 1577-1584.

Kivimäki, M., Virtanen, M., Elovainio, M., Kouvonen, A., Väänänen, A., & Vahtera, J. (2006). Work stress in the etiology of coronary heart disease—a meta-analysis. Scandinavian journal of work, environment & health, 431-442.

Kunz-Ebrecht, S. R., Kirschbaum, C., Marmot, M., & Steptoe, A. (2004). Differences in cortisol awakening response on work days and weekends in women and men from the Whitehall II cohort. Psychoneuroendocrinology, 29(4), 516-528.

Kuper, H., & Marmot, M. (2003). Job strain, job demands, decision latitude, and risk of coronary heart disease within the Whitehall II study. Journal of Epidemiology & Community Health, 57(2), 147-153.

Lazarus, R. S., & Folkman, S. (1984). Stress, appraisal and coping. New York: Springer-Verlag.

Lee, R. T., & Ashforth, B. E. (1996). A meta-analytic examination of the correlates of the three dimensions of job burnout. Journal of applied Psychology, 81(2), 123.

LePine, J. A., LePine, M. A., & Jackson, C. L. (2004). Challenge and hindrance stress: relationships with exhaustion, motivation to learn, and learning performance. Journal of applied psychology, 89(5), 883.

Li, W., Zhang, J. Q., Sun, J., Ke, J. H., Dong, Z. Y., & Wang, S. (2007). Job stress related to glyco-lipid allostatic load, adiponectin and visfatin. Stress and Health: Journal of the International Society for the Investigation of Stress, 23(4), 257-266.

Light, K. C., Turner, J. R., & Hinderliter, A. L. (1992). Job strain and ambulatory work blood pressure in healthy young men and women. Hypertension, 20(2), 214-218.

Lundberg, U., & Hellström, B. (2002). Workload and morning salivary cortisol in women. Work & Stress, 16(4), 356-363.

Maslach, C. (2003). Burnout: The cost of caring. Ishk.

McEwen, B. S. (2017). Stress: Homeostasis, Rheostasis, Reactive Scope, Allostasis and Allostatic Load☆. In Reference Module in Neuroscience and Biobehavioral Psychology.

https://doi.org/10.1016/b978-0-12-809324-5.02867-4

McEwen, B. S. (2017). Stress: Homeostasis, Rheostasis, Reactive Scope, Allostasis and Allostatic Load☆. In Reference Module in Neuroscience and Biobehavioral Psychology. https://doi.org/10.1016/b978-0-12-809324-5.02867-4

McEwen, B. S., & Stellar, E. (1993). Stress and the individual: mechanisms leading to disease. Archives of internal medicine, 153(18), 2093-2101.

Mikko Härmä. (2006). Norwegian National Institute of Occupational Health in relation and health to work Workhours stress , recovery. Scandinavian Journal of Work, Environment & Health, 32(6), 502–514.

Niedhammer, I., Goldberg, M., Leclerc, A., Bugel, I., & David, S. (1998). Psychosocial factors at work and subsequent depressive symptoms in the Gazel cohort. Scandinavian journal of work, environment & health, 197-205.

Nixon, A. E., Mazzola, J. J., Bauer, J., Krueger, J. R., & Spector, P. E. (2011). Can work make you sick? A meta-analysis of the relationships between job stressors and physical symptoms. Work & Stress, 25(1), 1-22.

Ogińska-Bulik, N. (2005). Emotional intelligence in the workplace: Exploring its effects on occupational stress and health outcomes in human service workers. International Journal of Occupational Medicine and Environmental Health, 18(2), 167–175.

Perrewé, P. L., Zellars, K. L., Ferris, G. R., Rossi, A. M., Kacmar, C. J., & Ralston, D. A. (2004). Neutralizing job stressors: Political skill as an antidote to the dysfunctional consequences of role conflict. Academy of Management Journal, 47(1), 141-152.

Rizwan, M., Waseem, A., & Bukhari, S. A. (2014). Antecedents of job stress and its impact on job performance and job satisfaction. International Journal of Learning & Development,

4(2), 187-203.

Rose, R. M., Jenkins, C. D., Hurst, M., Herd, J. A., & Hall, R. P. (1982). Endocrine activity in air traffic controllers at work. II. Biological, psychological and work correlates. Psychoneuroendocrinology, 7(2-3), 113-123.

Rystedt, L. W., Cropley, M., Devereux, J. J., & Michalianou, G. (2008). The relationship between long-term job strain and morning and evening saliva cortisol secretion among white-collar workers. Journal of Occupational Health Psychology, 13(2), 105.

Sanne, B., Mykletun, A., Dahl, A. A., Moen, B. E., & Tell, G. S. (2005). Testing the Job Demand-Control-Support model with anxiety and depression as outcomes: The Hordaland Health Study. Occupational Medicine, 55(6), 463–473. https://doi.org/10.1093/occmed/kqi071

Schaubroeck, J., & Merritt, D. E. (1997). Divergent effects of job control on coping with work stressors: The key role of self-efficacy. Academy of Management Journal, 40(3), 738-754.

Schnall, P. L., Landsbergis, P. A., & Baker, D. (1994). Job strain and cardiovascular disease. Annual review of public health, 15(1), 381-411.

Schnall, P. L., Schwartz, J. E., Landsbergis, P. A., Warren, K., & Pickering, T. G. (1992). Relation between job strain, alcohol, and ambulatory blood pressure. Hypertension, 19(5), 488-494.

Seeman, T. E., McEwen, B. S., Rowe, J. W., & Singer, B. H. (2001). Allostatic load as a marker of cumulative biological risk: MacArthur studies of successful aging. Proceedings of the National Academy of Sciences, 98(8), 4770-4775.

Seeman, T. E., McEwen, B. S., Rowe, J. W., & Singer, B. H. (2001). Allostatic load as a marker of cumulative biological risk: MacArthur studies of successful aging. Proceedings of the

National Academy of Sciences, 98(8), 4770-4775.

Sheldon, C., Denise, J.-D., & Gregory, E. M. (2007). Psychological Stress and Disease. Journal of the American Medical Association, 298(14), 1685–1687.

Shirom, A., Toker, S., Berliner, S., & Shapira, I. (2008). The Job Demand-Control-Support Model and stress-related low-grade inflammatory responses among healthy employees: A longitudinal study. Work & Stress, 22(2), 138-152.

Siegrist, J. (2007). Work Stress and Health. The Blackwell Companion to Medical Sociology, 114–125. https://doi.org/10.1002/9780470996447.ch6

Siegrist, J. (2016). Effort-Reward Imbalance Model. In Stress: Concepts, Cognition, Emotion, and Behavior: Handbook of Stress. https://doi.org/10.1016/B978-0-12-800951-2.00009-1

Siegrist, J. (2016). Effort-Reward Imbalance Model. In Stress: Concepts, Cognition, Emotion, and Behavior: Handbook of Stress. https://doi.org/10.1016/B978-0-12-800951-2.00009-1

Smith, G. D., Ben-Shlomo, Y., Beswick, A., Yarnell, J., Lightman, S., & Elwood, P. (2005). Cortisol, testosterone, and coronary heart disease: prospective evidence from the Caerphilly study. Circulation, 112(3), 332-340.

Smithi, M. J., Cohen, B. G. F., & Stammerjohn, L. W. (1982). An investigation of health complaints and job stress in video display operations. Applied Ergonomics, 13(4), 306. https://doi.org/10.1016/0003-6870(82)90089-8

Sonnentag, S., & Zijlstra, F. R. (2006). Job characteristics and off-job activities as predictors of need for recovery, well-being, and fatigue. Journal of applied psychology, 91(2), 330.

Stansfeld, S. A., Fuhrer, R., Head, J., Ferrie, J., & Shipley, M. (1997). Work and psychiatric

disorder in the Whitehall II Study. Journal of psychosomatic research, 43(1), 73-81.

Stansfeld, S. A., Fuhrer, R., Shipley, M. J., & Marmot, M. G. (1999). Work characteristics predict psychiatric disorder: prospective results from the Whitehall II Study. Occupational and environmental medicine, 56(5), 302-307.

Sterling, P. (1988). Allostasis: a new paradigm to explain arousal pathology. Handbook of life stress, cognition and health.

Sur, S., & Ng, E. S. (2014). Extending theory on job stress: The interaction between the "other 3" and "big 5" personality traits on job stress. Human Resource Development Review, 13(1), 79-101.

Sverke, M., Hellgren, J., & Näswall, K. (2002). No security: a meta-analysis and review of job insecurity and its consequences. Journal of occupational health psychology, 7(3), 242.

Teuchmann, K., Totterdell, P., & Parker, S. K. (1999). Rushed, unhappy, and drained: an experience sampling study of relations between time pressure, perceived control, mood, and emotional exhaustion in a group of accountants. Journal of occupational health psychology, 4(1), 37.

Totterdell, P., Wood, S., & Wall, T. (2006). An intra-individual test of the demands-control model: A weekly diary study of psychological strain in portfolio workers. Journal of Occupational and Organizational Psychology, 79(1), 63-84.

Van Der Doef, M., & Maes, S. (1999). The Job Demand-Control(-Support) model and psychological well-being: A review of 20 years of empirical research. Work and Stress, 13(2), 87–114. https://doi.org/10.1080/026783799296084

Van Doef, M. Der, & Maes, S. (1998). The job demand-control(-support) model and physical health outcomes: A review of the strain and buffer hypotheses. Psychology and Health,

13(5), 909–936. https://doi.org/10.1080/08870449808407440

van Hooff, M. (2017). Book reviewWork Stress and Health in a Globalized Economy: The Model of Effort–Reward Imbalance. In Scandinavian Journal of Work, Environment & Health (Vol. 43). https://doi.org/10.5271/sjweh.3661

Verhoeven, C., Maes, S., Kraaij, V., & Joekes, K. (2003). The job demand-control-social support model and wellness/health outcomes: A European study. Psychology and Health, 18(4), 421–440. https://doi.org/10.1080/0887044031000147175

Vrijkotte, T. G. M., Van Doornen, L. J. P., & De Geus, E. J. C. (2000). Effects of work stress on ambulatory blood pressure, heart rate, and heart rate variability. Hypertension, 35(4), 880–886. https://doi.org/10.1161/01.HYP.35.4.880

Walter W., & Mayeda, K. (1996). Moment, energy, stress drop, and source spectra of western United States earthquakes from regional coda envelopes. Journal of Geographical Research, 10(6), 102-136.

Wang, J. L., Lesage, A., Schmitz, N., & Drapeau, A. (2008). The relationship between work stress and mental disorders in men and women: Findings from a population-based study. Journal of Epidemiology and Community Health, 62(1), 42–47. https://doi.org/10.1136/jech.2006.050591

Wang, J., Schmitz, N., Dewa, C., & Stansfeld, S. (2009). Changes in perceived job strain and the risk of major depression: results from a population-based longitudinal study. American journal of epidemiology, 169(9), 1085-1091.

Xie, J. L., Schaubroeck, J., & Lam, S. S. (2008). Theories of job stress and the role of traditional values: a longitudinal study in China. Journal of Applied Psychology, 93(4), 831.

Yang, E. V., & Glaser, R. (2002). Stress-induced immunomodulation and the implications for

health. International Immunopharmacology, 2(2–3), 315–324. https://doi.org/10.1016/S1567-5769(01)00182-5