RESEARCH ARTICLE

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The Association Between Occupational Stress and Psychological Distress Using Quantile Regression in Isfahan's Steel Employees

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Background & Aims of the Study: Occupational stress is one of the most common problems that can occur in any occupational population and can cause problems for the individual mental health. Therefore, the present study aims to investigate the relation between occupational stress and psychological distress in Isfahan's steel employees.

Materials & Methods: This cross-sectional study was conducted in 2014 among 3063 of Isfahan's Steel employees.
GHQ-12 questionnaire was used to assess psychological distress and ERI-23 questionnaire was used to determine occupational stress. Data analysis was performed using quantile regression method in R software (quantreg package).

Results: The results of the study showed that 2803 (91.5%) of the participants were men and the rest were women. Due to the use of quantile regressions in this study, it is not possible to report results in all deciles, however, Effort, reward and overcommitment in all deciles had a significant relationship with psychological distress($p<0.05$). High scores of rewards and effort, and low scores of overcommitment were associated with high scores of psychological distress.

Conclusions: The results showed that if high effort is accompanied by high overcommitment in the workplace, in case of low reward, it can be considered as a risk factor for psychological distress.

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Background

Occupational stress is physical and psychological strain which happens when there is an imbalance between the objective or cognitive demands for the job and the individual's compatibility (1). Sharit and Salvendy categorized occupational stress in physiological, psychological, and social kinds [18]. According to them, both the responsibilities that demand higher than the person's ability and those that demand lower than the person's ability can cause stress (2,3).
In recent years, environment and lifestyles have drastically changed worldwide. These changes have caused social and economic chaos, especially in industrialized countries (4). Consequently, stress factors have increased in communities and people experience stress constantly (5). According to the literature, 30% of workers suffer from work-related stress in the

developed countries and the rate of workers with stress in the underdeveloped countries is worse than that in the developed societies (6,7). Studies in Iran have shown that the prevalence of high job stress in Iran was 14.4 percent (8-11). Mental health in the workplace has recently attracted attention, and an appreciable proportion of workers have been reported as having psychological distress (12). Psychological distress in the general population and workforce are a major concern because of their increasing prevalence and high-cost implications for individuals, employers, and society. In the workplace, however, one important risk factor for psychological distress may be an occupational stress. Previous studies indicate that occupational stress increases the risk of psychological distress (13,14).

Majority of previous studies on the association of occupational stress and psychological distress focused on general population (15,16) and some specific populations such as workers (17-19), doctors (20), and teachers (21). Few studies available on industrial employees, in one hand and on the other hand they were simple and preliminary statistical methods, therefore the current study was conducted on a large sample of Iranian industrial employee using quantile regression. In this method, we can carry out a more comprehensive examination of the relationship between occupational stress and psychological distress in different quantiles of psychological distress, so that the psychological distress variable is divided into several quantiles, and in each of these quantiles, the relationship between occupational stress and psychological distress is examined.

Aims of the study:

Investigate the relationship between effort, reward, and overcommitment with psychological distress, and investigate whether high levels of effort, high levels of overcommitment, and low levels of rewards are associated with high levels of psychological distress.

Materials & Methods

Study design and sample

We did a cross-sectional study among 16,000 formal and contractual employees of ISC (Isfahan's steel company). All employees with at least one year of work experience and enthusiasm in participation included in the current study. Participants who had not answered to a large fraction of questions (more than 10% of the questionnaires' pages) were excluded from analysis. Multistage cluster along with stratified random sampling method was used to select participants based on the number of managerial departments and the number of employees who worked on each section. Because of the random nature of sampling as well as a limited number of female employees, 260 volunteer females intentionally included in the study to have a sufficient sample size of females. Therefore, finally, a total number of 3063 participants were included in the statistical analysis. The study protocol was approved by medical research ethics committee of the Cardiovascular Research Institute and signed informed consent was obtained from all participants.

Study Instruments

Job stress Questionnaire

The Effort-Reward Imbalance (ERI) questionnaire, developed by Siegrist, measures effort, reward, and over-commitment, to determine whether ERI and over-commitment are present. The questionnaire consists of 23 questions, indicating an effort and reward imbalance, and has three scales of effort (6 questions), reward (11 questions), and over commitment (6 questions) (22). ER<1 indicating an imbalance in favor of rewards and ER>1 indicating an imbalance in favor of the effort (23). The reliability of this questionnaire was studied by Yadegarfar et al. And Cronbach's alpha for attempts, rewards, and commitments

was reported to be 0.61, 0.85 and 0.67 respectively (24).

Mental Health Questionnaire (GHQ-12)

The GHQ-12 was used to assess the mental health of study participants consists of 12 questions: focusing, being useful, enjoying life, confronting problems, depression, life satisfaction, worrying, decision making, constant pressure, overcoming problems, self-confidence and worthlessness. Every one of its 12 items regarding recent symptoms, feelings or behaviors is answered on a four-category Likert scale (Too usual, in the usual range, less than usual and much less than usual). Categories 1 and 2 are given the value 0, and categories 3 and 4 are given the value 1. Values from 12 items are added together to get an overall score. The score of the questionnaire varies from zero (favorable condition) to 12 (unfavorable condition). In this questionnaire, the score of 4 is considered as the cut-off point. Scores above 4 are considered to be people with psychological distress. And scores below 4 are considered as people without psychological problems. (25,26). Montazeri et al. Reported the Cronbach's alpha coefficient of the questionnaire 0.87 (27).

Sociodemographic and job-related variables

In this research, the other determinants of mental health include age (year), gender (male/female), marital status (married/single), number of family members (number), education (0-5 years/6 -12 years/over 12 years), sleep duration (hours), Mental Health (normal / abnormal), occupational stress (imbalance between effort-reward), type of job (daily / rotational) and second job (yes/no).

Data analysis

Quantitative variables have been reported as mean (standard deviation) and qualitative variables as numbers (percentages). To investigate the relationship between occupational stress and psychological distress, quantile regression method has been used. Quantile regression, which was introduced by Koenker, models the relation between a set of predictor variables and specific percentiles (or quantiles) of the response variable (It specifies changes in the quantiles of the response) (28). Quantile regression is particularly useful when the rate of change in the conditional quantile, expressed by the regression coefficients, depends on the quantile. The quantile regression parameter estimates the change in a specified quantile of the response variable produced by a one unit change in the predictor variable. This allows comparing how some percentiles of the psychological distress may be more affected by occupational stress than other percentiles. This is reflected in the change in the size of the regression coefficient. All variables except for the confounding variables were standardized before entering the model. Also, for categorical variables, a category considered as reference category (sex (male), second job (yes), education (>12years), marital status (single), Type of Job (daily)). All analyses were conducted using R 3.4.1 for Windows using the quantreg package. Statistical significance was defined as $p<0.05$ (two-tailed).

Results

Table1 shows the demographic and occupational characteristics of participants within the demographic categories. Respondents included 2803 men (91.5%) and 268 women (8.5%), whose ages ranged from 21 to 64 years (mean 36.74 years, SD=7.3). Occupational stress (ERI>1) was observed in 6.2% of employees. 6.21%(190) of employees have mental health problems(GHQ≥4).

The relationships between occupational stress and psychological distress using quantile regression with adjusting all confounding variables have been reported in table 2.

Table1) Demographic and occupational characteristics of participants

Variables		Mean ± Sd/Number(Percent)
Age (year)		36.74±7.3
Sleep duration (hours)		7.12±1.17
Number of Family Members(number)		3.61±1.1
sex		
	male	2803(91.5%)
	female	260(8.5%)
Type of Job		
	rotational	1680(54.9%)
	daily	1380(45.1%)
education		
	0-5 years	255(8.3%)
	6-12 years	1908(62.3%)
	Over 12 years	900(29.4%)
Second job		
	yes	285(9.3%)
	no	2775(90.7%)
Marital status		
	single	305(10%)
	married	2775(90%)
ERI		
	ERI>1	191(6.2%)
	ERI	2872(93.8%)
Mental Health		
	Abnormal	190(6.21%)
	Normal	2871(93.79%)

Table2) Estimated coefficients(SD) of the relationship between occupational stress and psychological distress with adjusting all confounding variables

Variables	category	Q-10	Q-20	Q-30	Q-40	Q-50	Q-60	Q-70	Q-80	Q-90
Effort	-	0.06(0.01) *	0.07(0.03) *	0.04(0.03) *	0.06(0.03) *	0.08(0.03) *	0.06(0.02) *	0.08(0.02) *	0.08(0.03) *	0.15(0.04) *
Reward	-	0.17(0.03) *	0.23(0.02) *	0.28(0.03) *	0.27(0.03) *	0.03(0.03) *	0.29(0.02) *	0.34(0.03) *	0.37(0.03) *	0.42(0.04) *
Overcommitment	-	-0.07(0.01) *	-0.07(0.02) *	-0.11(0.03) *	-0.07(0.02) *	-0.06(0.02) *	-0.07(0.02) *	-0.08(0.02) *	-0.11(0.02) *	-0.15(0.03) *
Age	-	-0.00(0.00)	-0.00(0.00)	0.00(0.00)	0.01(0.00)	0.00(0.00)	0.00(0.00)	0.00(0.00)	-0.00(0.00)	0.00(0.01)
Sleep duration	-	-0.05(0.01) *	-0.05(0.02) *	-0.05(0.02)	-0.06(0.02) *	-0.05(0.02) *	-0.05(0.02) *	-0.05(0.02) *	-0.07(0.02) *	-0.09(0.02) *
Number of family members	-	0.04(0.01) *	0.04(0.02)	0.05(0.03) *	0.03(0.02)	0.02(0.02)	0.02(0.02)	0.01(0.02) *	0.04(0.02)	0.07(0.04)
Marital status	Married	0.05(0.06) *	0.11(0.07)	0.15(0.08)	0.18(0.08) *	0.12(0.08)	0.12(0.06) *	0.15(0.07) *	0.24(0.11) *	0.25(0.14)
Education	0-5 years	0.07(0.04)	0.03(0.08)	0.01(0.13)	-0.24(0.09) *	-0.19(0.06) *	-0.12(0.05) *	-0.08(0.04) *	0.01(0.06)	0.09(0.11)
	6-12 years	0.09(0.05)	0.07(0.09)	0.05(0.14)	-0.02(0.11) *	-0.17(0.07) *	-0.12(0.06)	-0.02(0.05)	-0.00(0.07)	0.15(0.13)
Sex	Female	0.02(0.07)	0.06(0.08)	0.19(0.11)	0.28(0.08) *	0.23(0.07) *	0.19(0.07) *	0.23(0.07)	0.23(0.09) *	0.31(0.10) *
Second job	No	0.09(0.06)	0.15(0.06) *	0.15(0.09)	0.07(0.07)	0.11(0.07)	0.09(0.07)	0.03(0.07)	0.03(0.06)	-0.00(0.10)
Type of job	Rotational	-0.00(0.03)	0.02(0.04)	-0.01(0.05)	-0.06(0.05)	-0.09(0.04) *	-0.09(0.04) *	-0.06(0.04)	-0.1(0.04) *	-0.11(0.07)

*Significant values at 0.05 level($p<0.05$)
Results are presented as the estimate (standard deviation)

Effort, reward, and overcommitment have a significant relationship with psychological distress in all deciles. The effort and reward variables have higher scores in the higher deciles of psychological distress, also, overcommitment variable has lower scores in the upper deciles of psychological distress. There is a positive relationship between effort and overcommitment with psychological distress, also there is a negative relationship between reward with psychological distress.

Discussion

The aim of this cross-sectional population-based study was to investigate the relationship between effort, rewards, and overcommitment with psychological distress in Isfahan's Steel employees using quantile regression. The results of the study showed that effort, rewards, and overcommitment in all deciles had a significant relationship with psychological distress, also, low reward, high overcommitment, and high effort was in relation to high psychological distress.

To confirm the results of this study, in a study in order to investigate the association between effort-reward imbalance and psychological distress among workers in high voltage power lines workers in Brazil, low reward workers presented a psychological distress rate 6.2 times greater than those in the high reward group. The psychological distress prevalence rate was 3.3 greater in workers in the situation of imbalanced effort-reward than in those in effort-reward equilibrium (29). In a study in order to explore the relationship between psychosocial factors at work as defined by the effort-reward imbalance (ERI) model and self-reported health, reward, and Overcommitment was significantly associated with self-reported health for both genders, whereas effort was for men only (30). In a study in order to examine the relationships between effort-reward imbalance (ERI) and psychological distress in nurses of a Japanese general hospital, high effort, and low reward and higher overcommitment significantly correlated with psychological distress (31). In a study in order to investigate the relationship between occupational stress and the presence of mental health symptoms in special force police officers, lower levels of reward and higher levels of effort and overcommitment were associated with higher levels of mental health symptoms. Officers who had experienced a discrepancy between work effort and rewards showed a marked increase in the risk of psychological distress (OR 7.89) when compared with their counterparts who did not perceive themselves to be in a condition of distress (32).

In the present study, quantile regression analysis was used, in which the response variable was divided into deciles, and in each of these deciles, the relationship between occupational stress and psychological distress was investigated. Individuals in each of these deciles have somewhat similar psychological characteristics according to the GHQ-12 questionnaire score. These features make people in some deciles more likely to suffer or be less affected by some stressors. For example, conditions such as lack of job opportunities, high individual commitment to work tasks, and financial problems make one endure these stressful situations, like high ERI (33).

There is a positive relationship between effort and overcommitment with psychological distress, also there is a negative relationship between reward and psychological distress. In confirmation of the findings of this study, in a 3-wave panel study among Japanese male blue-collar workers in one construction machinery company that examined reciprocal relations between ERI and adverse health (i.e., psychological distress and physical complaints) Concluded that there was a positive correlation between effort and ERI with psychological

distress and a negative relationship between reward and psychological distress (34). In a study that was conducted with the aims of exploring the association between occupational stress and psychological distress in a group of university teachers, there was a positive correlation between ERI and psychological distress and a negative relationship between overcommitment and psychological distress (35).

Conclusion

In summary, our study's findings, in the context of an observational study, suggested that occupational stress, is one of the most important risk factors for psychological problems, especially If high effort at work and low rewards are associated with high overcommitment, so, industry managers should take steps to reduce or eliminate them. In the general health questionnaire (GHQ-12), high scores of the questionnaire are indicative of high levels of psychological distress that occur in the upper deciles. in the ERI questionnaire, high scores of efforts represent a high effort in the workplace that has occurred in the upper deciles of psychological distress, in other words, high effort in the work environment is associated with high levels of psychological distress, so there is a positive relationship between effort and psychological distress. High reward scores represent a low reward in workplace (In the form of salary, respect, and Promotion) that have occurred in the upper deciles of psychological distress, in other words, low reward in the work environment is associated with high levels of psychological distress, so there is a negative relationship between reward and psychological distress. Low overcommitment scores represent a high level of overcommitment that has occurred in the high levels of psychological distress, in other words, high overcommitment in the work environment is associated with high levels of psychological distress, so there is a positive relationship between overcommitment and psychological distress.

It is important to recognize some strengths and limitations of the present study. A major strength of our large population-based study is the application of a statistical method in which the relationship between variables can be studied in more detail. However, due to the cross-sectional nature of study design, we could not infer cause-effect relationships from our findings. All used information in the present analysis was collected by self-administered questionnaires that might lead to misclassifying the participants. Finally, because this study is limited to Isfahan's steel employees, thus, a generalization of the present findings to the Iranian general population must be done with caution.

Footnotes

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Conflict of Interest:

The authors declared no conflict of interest.

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