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ÖZGÜN ARAŞTIRMA

Determinants of Occupational Injuries in Pakistan: Evidence From Pakistan Labor Force Survey

Rabia KHALİD [1]

Abstract

A healthy and safe work environment plays a crucial role in achieving maximum productivity of workers. Present study intends to find out the factors responsible for work related injuries in Pakistan by employing nationally representative micro level dataset, Pakistan Labor force Survey 2017-18. Occupational injuries have been taken as dependent variable whereas independent variables include various socio-demographic characteristics of workers such as gender, age, marital status, province, region, level of education and hours worked. As the outcome variable is binary so, Binary Logistic Regression method has been adopted to study the association among variables. Findings of logistics regression analysis concluded that the incidence of work-related injuries is higher among those workers who are either illiterate or have low level of education, whereas workers who work more than 35hours per week have higher likelihood of being injured at workplace. This study stresses on raising workers level of education in order to increase awareness regarding safety standards, it further suggested that workers working hours must be reduced up to 35 hours per week.

Anahtar kelimeler: Occupational Injuries, Socio-demographic characteristics, Logistic regression, longer work hours, education
Jel Kodu: J20, J21, J29

Pakistan'da Mesleki Yaralanmaların Belirleyicileri: Pakistan İşgücü Anketinden Kanıtlar

Özet

Sağlıklı ve güvenli bir çalışma ortamı, işçilerin maksimum verimliliğe ulaşmasında hayati bir rol oynamaktadır. Bu çalışma, Pakistan'da iş ile ilgili yaralanmalardan sorumlu olan faktörleri belirlemeyi amaçlamakta ve ulusal düzeyde temsil niteliği taşıyan mikro verileri içeren Pakistan İşgücü Anketi 2017-18 verilerini kullanmaktadır. Mesleki yaralanmalar bağımlı değişken olarak ele alınırken, bağımsız değişkenler arasında işçilerin cinsiyet, yaş, medeni durum, eyalet, bölge, eğitim seviyesi ve haftalık çalışma süresi gibi çeşitli sosyo-demografik özellikleri yer almaktadır. Bağımlı değişken ikili (binary) bir yapıda olduğundan, değişkenler arasındaki ilişkiyi incelemek amacıyla İkili Lojistik Regresyon yöntemi uygulanmıştır. Lojistik regresyon analizinin bulguları, okuryazar olmayan ya da düşük eğitim seviyesine sahip işçiler arasında iş ile ilgili yaralanma olasılığının daha yüksek olduğunu ortaya koymuştur. Ayrıca, haftada 35 saatten fazla çalışan işçilerin iş yerinde yaralanma olasılıklarının daha fazla olduğu tespit edilmiştir. Bu çalışma, işçilerin güvenlik standartları konusundaki farkındalıklarını artırmak amacıyla eğitim seviyelerinin yükseltilmesi gerektiğini vurgulamakta; ayrıca işçilerin haftalık çalışma sürelerinin en fazla 35 saatle sınırlandırılması gerektiğini önermektedir.

Keywords: Mesleki Yaralanmalar, Sosyo-demografik Özellikler, Lojistik Regresyon, Uzun Çalışma Saatleri, Eğitim
Jel Codes: J20, J21, J29

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[1] 1Rabia Khalid: PhD. candidate, Department of Economics, Ibn Haldun University, Istanbul, Turkey, **EMAIL:** rabia.khalid@stu.ihu.edu.tr **ORCID:** 0000-0003-1238-928X

1. INTRODUCTION

Injury at workplace refers to any physical wound, disease or death resulting from an occupational accident (ILO). A safe and healthy work environment is pivotal for productive work outcome. Workers physical and mental health is closely related to their contribution at work. Unfavorable work environment has led to human, social and economic cost to individual as well as to society. According to a report of International Labor Organization titled as " A call for safer and healthier working environment" (ILO 2023) each year around 2.93 million workers die each as a result of work-related injuries whereas, 395 million workers come across with the non-fatal work injuries each year. Whereas another report titled as " Ensuring safety and health at work in a changing climate (ILO 2024) explained that 2.41 billion workers are exposed to excessive heat each year.

A report titled: "Safety in numbers: pointers for a global safety culture" highlighted that in countries such as Pakistan, Bangladesh, Mali, and Nepal 70percent workers worked in the informal sectors where work environment is hazardous and unsafe.

The importance of occupational health and safety can be acknowledged from the fact that it has been included in one of the projected measures of progress towards the achievement of Sustainable Development Goal where SDG goal 8 stresses upon decent work and economic growth. Target goal 8.8 protect labor rights and promote safe and secure work environments for all workers, including migrant workers, in particular women migrants, and those in precarious employment. Goal 8.8.1 deals with fatal and non-fatal occupational injuries per 100,000 workers, by gender and migrant status. Figure 1 shows the incidence of injury rate among different income countries. including migrant workers, in particular women migrants, and those in precarious employment.

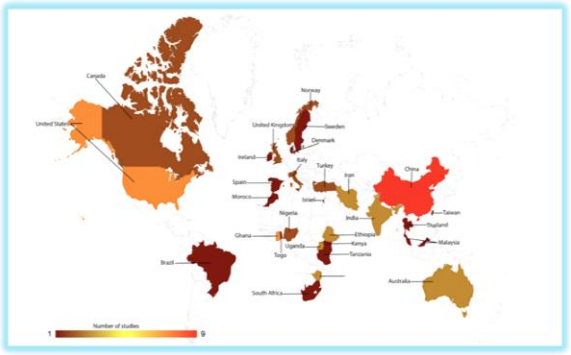

Figure 1: Distribution of Studies on Occupational Injuries World Wide

Figure 2: Percentage Of Work-Related Deaths

The above graphs represent the percentage of deaths occurrence due to work related injuries worldwide. It is the Meta analysis conducted by Malta et al., (2024) which indicate that the highest number of deaths due to occupational injuries is reported by Iran (44.3%) followed by US (17.1%), Italy (14.5%), Tanzania (7.3%), China (2.6%), India (2.8%), Brazil (2.5%) and a percentage of less than one is reported on other countries.

Although most of the manual jobs have a risk of injury but its magnitude varies significantly across region, geography, and job sector. The rates of occupational injuries is high in low income as well as in middle income countries whereas it has a declining trend in high income countries. The reason of low work-related injuries in developed world is because these countries have placed the labor intensive and hazardous industrial production units in the low-income countries where salaries are low and work condition is unsafe. In order to deal

the with the complex work environment human resource management plays a critical role to cope up with the workplace challenges Amirul et al., (2023). Workplace and strong organizational hierarchy help to work without stress Uddin et al., (2020).

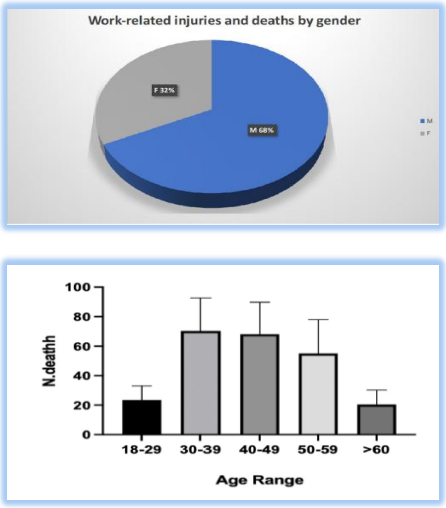

Figure 3&4: Occupational Injuries By Age And Gender

The meta-analysis of previous studies shows that the incidence of occupational injuries is very high among male workers as compared to female workers Jung et al., (2023); Malta et al., (2024) whereas age group 30 to 59 are more prone to occupational injuries Kyung et al., (2023). There are several other determinants of work-related injuries as Aderson et al., (2021) found that contributing factors in work related injuries are fear and lack of knowledge whereas Lee et al., (2021) concluded that lack of education is the major cause of occupation injuries.

In case of Pakistan few studies find out the extent of occupational injuries such as Hira et al (2020) identified the preventive measure that ensures occupational health and safety in healthcare sector. Another study conducted by Farhad et al (2018) examined the factors that reduce the incidence of hand injuries among industrial workers in Peshawar where results of subjective approach concluded that by using personal protective equipment, proper supervisions of workers reduce the extent of occupational injuries. In developing countries like Pakistan, the ratio of unskilled workers is far greater than the skilled workers. Where the unskilled workers lack the awareness related to the protective use of instruments such as the absence of awareness related to proper dress, no training related to the use of harmful material.

Noman et al (2021) assessed the occupational injuries of workers (OIW) in Pakistan by employing index value calculation (IVC) over the years 2001-2008. Indicators used for occupational injuries include industry division, employment status, occupational distribution, adopted treatment, rationality and gender. Findings concluded that there exist heterogeneity both at industrial and occupational level. By carefully reviewing the existing literature it has been observed that no study seems to find out the factors responsible for occupational injuries in Pakistan. Present study contributed to the existing literature by focusing on the factors related to occupational injuries such as workers age, gender, Marital Status, Level of Education, Hours Worked, province, region in case Pakistan that has huge labor force. The estimation methodology employed by this study is binary logistic regression due to the binary nature of dependent variable.

Structure of this paper is as follow: Section 2 explains review of previous studies, section 3 demonstrates material and method. Section 4 explains results of logistic regression whereas section 5 concluded the study findings.

2. LITERATURE REVIEW

Ona et al., (2024) examined the socio-demographic, workplace and behavioral factors behind work related injuries in a large-scale factory worker in Ethiopia. A cross-sectional survey has been carried out by the large-scale factory workers in Addis Ababa. The survey includes demographic characteristics, safety and health condition and behavioral factors. The findings of logistic regression concluded that excessive work hours, manual

work and smoking are the major factors causing workplace injuries.

Mezentseva et al., 2024 find out the factors responsible for and ways to eradicate occupational injuries in Ukraine. Results demonstrate that a large number of injuries happen due to organizational factors such as failure to comply with the requirement of labor protection. Violation of safety standards and violation of technological processes. Whereas the substantial number of injuries happen in mining sector.

Nuarko (2022) find out the determinants of occupational injuries among health workers in the University of Ghana. Health workers in Sub-Saharan Africa are at the higher risk of hazards. The findings of cross-sectional survey find out that almost 30 percent of health workers have experienced various forms of injury whereas the risk factors include work stress and being over-worked.

Ephraim et al., 2021 studied the prevalence and determinants of occupational injuries among the solid waste workers in Ghana. Where the factors related to occupational health and safety have been analyzed through questionnaire. The study concluded that the most prevalent kind of occupational injury is cuts, puncture and leg injury was the most prevalent form of injury faced by solid waste management workers.

In Asia, several studies have find out the factors related to occupational fatalities where the countries include Thailand, China, Pakistan, Hong Kong, India, Singapore, Malaysia etc. A significant number of studies have found out the major cause of occupational injuries are the absence of protective clothing, unhealthy work conditions such as insufficient lighting, congested space etc. (Hon et al. 2010; Huang et al. 2016). Apart from this, injuries happen due to organizational factors such as stress, lack of supervision, absence of training and insufficient pay.

Noman et al (2021)., assessed the occupational injuries of workers in case of Pakistan. This study used trend analysis and index value calculation from various issues of LFS 2001-2008. Findings concluded that injury rate is higher among male workers as men workers are more exposed to involve in dangerous and risky task as compared to female workers. Growth rate of injuries is lower in urban areas because of better medical and work facilities of workers in urban areas.

Yamauchi et al., (2019) find out industrial workers who worked more than 51 hours per week are more prone to report work related injuries as compared to those who worked 35-40 hours per week.

Ali et al., (2018) analyzed the incidence of hand injuries and responsible factors in case of Peshawar, Pakistan. A cross-sectional study was conducted by interviewing 154 industrial workers at Social Security Hospital, Hyderabad, Peshawar. Overall prevalence of hand injuries is 16.23%. Findings concluded that prevalence of work-related injury is higher among male, married workers, those with lower level of education. It is higher among unskilled workers.

Obi et al., (2017) examined the factors associated with work related injuries among industry workers in Malaysia. Among total 652 workers a sample of 215 workers has been selected from simple random samplings. Results concluded that prevalence of work-related injuries is 73.5% whereas factors that affect work related injuries include: ethnicity, educational background, unit of operation, limited workspace, and noise. Occupational factors include type of machine used and behavioral factors include tiredness and sleeplessness contributed to the major factors of work-related injuries.

Simiyu and Cholo (2017) analyzed the determinants of occupational injuries in case of Kamukunji. Factors responsible for occupational injuries include poor lightning, human errors, and tiredness, lack of training and supervision and working long hours. Results of descriptive cross section design concluded that tiredness and lack of training are the leading cause of occupational injuries. Most of the literature regarding impact of gender on work injuries showed that likelihood

of fatal injuries is higher among men Moradhaseli et al., (2017).

Several studies examined the age-related risk of occupational injuries. Tonozzi and Layne (2016) find out that older workers have more occupational injuries due to long working hours and tiredness. On contrary Gholipour et al (2015) were of the view that occupational death happens among young workers due to poor work experience and lack of attention towards work.

Workers' level of education plays vital role in the prevalence of work- related injuries. Individuals who have lower level of education may have higher likelihood of being occupationally injured. Pickett et al., (2015) find out the risk of injuries is higher among those who have low level of education. Long working hours have an adverse effect on workers' safety.

Serkalem et al., (2014) find out the determinants of occupational injury in North-East Ethiopia. This study took occupational injury as dependent variable whereas independent variables include socio economic factors such as age, gender, educational status, monthly income, marital status, employment pattern and work experience. Work environment and agronomic factors include: health and safety training, hours worked per week, supervision, and machine maintenance. Workers' behavioral factors include alcohol consumption, use of personal protective equipment, sleep disorder and job satisfaction. Results of logistic regression concluded that working long hours, sleep disorder cause occupational injury in textile industries in Ethiopia.

Berecki-Gisolf et al., (2013) find out the determinants of workplace injury among Thai workers. This study used self-reported injury incidence over the past 12 months. Results of logistic regression concluded that incidence of work-related injuries is higher among those working more than 49 hours per week.

Adnan et al., (2013) studied the reasons of injuries among building construction sector in Ethiopia. The determinants include gender, age group, and job satisfaction. The findings of multiple logistic regression showed that there has been an increase of 38.7 percent in the occupational injuries as compared to the previous year. Out of which 68.4 percent cases were reported in males.

Garg et al., (2012) studied the incidence of occupational hand injuries in Hong Kong. Data was collected through predesigned questionnaire. Workers who received injuries treatment from 1999 to 2001 was selected for follow up data to access return to work and any secondary injuries. Personal characteristics include various socio-demographic characteristics. Results concluded that prevalence of occupational injuries is higher among men who have drug addiction and those who have long working hours. In addition to this, inadequate training also led to occupational injuries.

Anderaw et al., (2011) analyzed the determinants of occupational injury in case of textile factory workers in Ethiopia. A case control study was done among 456 textile factory workers. Results of logistic regression concluded that young and male workers are more prone to injuries whereas incidence of work-related injury is higher among those who have sleep disorder and job stress.

Malik et al., (2010) examined the role to harzard control measures on occupational health and safety in the textile industry in Pakistan. There are certain factors that are responsible for behind the word related injuries such as harmful chemicals, workload, insufficient light at the workplace, and illiteracy.

3. THEORETICAL FRAMEWORK

There are several theories that build the foundation of occupational injuries theoretical literature such as danger factor theory, sociological theory, human error theory, Heinrich Domino theory and Michel Shuster and Susan Rhodes. According to danger factors, theory accidents occur when a worker or a danger factor meet such that the workers injure themselves. Here accident is a stochastic event whose probability is determined by the number of danger factors. This theory is mostly based

on practical experience. The most erudite version of this theory is ergonomic approach. It assumes that any fluctuation in the flow of information increases the risk of accidents occurrence. Hence the efficient flow to information between employer and employee is the precondition to accident avoidance.

The sociological theory of occupational injuries emphasis that injuries are caused by the social relations at work. The assumption of social theory states that social relations at workplace are the major cause of generating errors that lead to occupational injuries. To avoid the risk of injuries there should be more focus on the auto control of workers.

Another theory discussed in the occupational injury literature is human error theory. This theory has been developed to assess the injuries occurrence due to human error. Here human error has been used as an instrument to identify the chain of events that led to error or injury. To reduce the causes of incidents it is pertinent to reduce break the series of events.

Heinrich Domino theory explains that occupational injury happens due to five factors such as social environment, fault of a person, exposure of harmful equipment, accident, and injury.

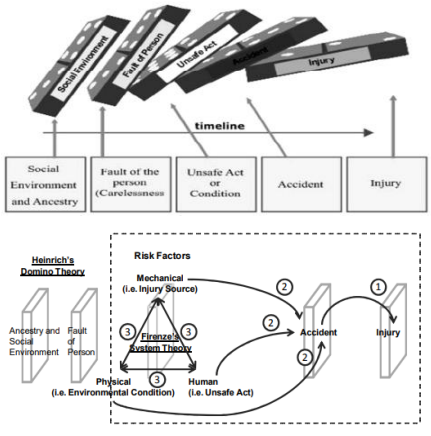

Figure 5: Domino Theory of Accident Causation

Heinrich believed that the unsafe act causes more accidents than unsafe environment. Hence this theory stresses more on the elimination of unsafe that lead to Injuries (Rahiman 2018). This theory further highlights that accidents or injuries are due to three risk factors such as human factors that include unsafe acts, mechanical factors such as the use of tool and equipment and physical factor such as environmental condition.

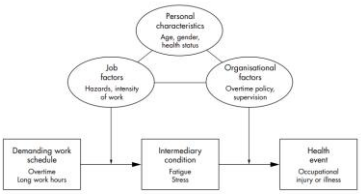

Figure 6: Schuster And Rhodes Model

Another model based on overtime and long work hours is developed by Michel Shuster and Susan Rhodes in 1985. This model assumes that being over worked and long work hours increase the risk of workplace injuries through the intermediary factors such as stress, fatigue, tiredness, and drowsiness. The association between demanding work schedules and intermediary factors becomes severe due to several attributes such as individual demographic characteristics (gender, marital status, age, health status), job factors such as extreme workload and exposure to hazardous work environment and organizational factors that include strict supervision and overtime work policy.

4. MATERIAL AND METHOD

To access the determinants of occupational injuries in Pakistan. This study has utilized the data of Pakistan Labour Force Survey 2017-18. The data collection was carried out through Pakistan Bureau of Statistics. It has used structured questionnaire to collect a comprehensive data that has an extensive section regarding occupational injuries such as incidence of occupational injuries, its reasons, type of treatment received, unsafe act that led to occupational injuries, how soon the worker would be able to return after injury.

In order to find out the factors responsible for occupational injuries, effect of various socio-demographic characteristic have been examined

such as respondent's age, gender, marital status, region, Province, level of education and hours worked. In order to measure occupational injury variable, the following question was asked from the respondents "In the past 12 months did you receive any occupational injury/disease that caused to take time off work and/or consulted a doctor?" which is coded as "1" if there is occupational injury or "0" otherwise.

As dependent variable occupational injuries is binary so binary logistic regression model has been employed to find out the relationship between independent and dependent variable. In this econometric technique both categorical and continuous variables can be used as independent variables. The functional form of logistic regression is as follows:

$$Ki = \ln\left[\frac{Pi}{1-Pi}\right] = \alpha + \beta Xi + \partial Zi + \varepsilon i$$

Where Ki is log of odds ratio and β and ∂ are the co-efficients of independent variables and εi is the error term. Hence to interpret the model, log of odds can be converted into odds ratio through exponential function. To do the data analysis STATA 17 version has been used. Hence the functional form of odds ratios is as follows:

$$\text{Odds ratio} = \ln\left[\frac{Pi}{1-Pi}\right] = e^{\alpha + \beta Xi + \partial Zi + \varepsilon i}$$

The proposed model is as follows:

Occupational Injury = β0 + β1 age + β2 gender + β3 marital status+ β4 region+ β5 province+ β_6 level of Education+ β6 hour's worked+ μ_i

Table 1: Variables Description

Variables	**Description/coding**
Occupational injuries	No=0, Yes=1
Age	Measured in years
Gender	Female=0, Male=1
Marital status	Unmarried =0, Married=1
Region	Rural =0, Urban=1
Province	KPK=0, Punjab=1, Sindh=2, Baluchistan=3
Level of education	Above High School=0, No formal education=1, Primary=2, Middle=3, High School=4,
Hours worked	1h-35hrs =0, 36hrs-48hrs = 1, 49hrs-99hrs=2,

Table 2: Descriptive Statistics

Variable	Frequency	mean	**Percentage**	std. Dev.	min	max
Occupational injuries	616122619	0.041	95.92	0.198	0	1
Not injured			4.08			
Gender (Male)	4713417097	0.734	73.38	0.442	0	1
Female			26.62			
Age	64231	34.231		13.569	10	99
Marital status (Married)	46207118024	0.719	71.94	0.449	0	1
Unmarried			28.06			
Region (Urban)	2480839423	0.386	39.62	0.487	0	1
Rural			61.38			
Province (KPK)	10399	2.288	16.19	0.865	0	3
Punjab	32004		49.83			
Sindh	14788		23.02			
Balochistan	7040		10.96			
Hours worked (1h-35h)	12778	2.163	19.89	0.731	0	2
35h-48h	28237		43.96			
48h-99h	23216		36.14			
Level of education (above high school)	184	1.859	0.29	1.14	0	4
No formal education	63338		98.61			
Primary	111		0.17			
Middle	187		0.29			
High School	224		0.35			

This study has taken occupational injuries as dependent variable. Labor Force Survey of Pakistan defined occupational injuries as any personal injury or disease resulting from an occupational accident/ disease which occurs to employed person (s) i.e., an individual occurrence or event arising out of or in the course of work. Distribution of data shows that among the total sample 4percent workers faced with occupational injuries in Pakistan.

5. RESULTS AND DISCUSSION

Table 3: Results Of Logistic Regression Analysis

Occupational injuries	Odds ratio	Std. Err.	z	P>|z|	[95% conf. Interval]	
Gender (female)						
Male	1.589	0.081	9.00	0.000***	1.436	1.758
Age	-0.994	0.001	-2.80	0.005***	0.991	0.998
Marital status (unmarried)						
Married	1.268	0.072	4.13	0.000***	1.133	1.419
Region (rural)						
Urban	0.75	0.033	-6.50	0.000***	0.687	0.818
Province (kpk)						
Punjab	1.516	0.098	6.43	0.000***	1.335	1.721
Sindh	1.822	0.123	8.87	0.000***	1.596	2.081
Balochistan	0.331	0.041	-8.72	0000***	0.258	0.425
Hours worked (1hr-35hrs)						
35hrs-48hrs	1.459	0.084	6.54	0.000***	1.302	1.634
48hrs-99hrs	1.228	0.074	3.38	0.001***	1.09	1.384
Level of education (> high school)						
No formal edu.	1.135	0.083	1.73	0.084*	0.982	1.312
Primary	1.059	0.075	0.81	0.418	0.921	1.217
Middle	0.977	0.086	-0.25	0.802	0.821	1.163
High school	1.067	0.093	0.75	0.455	0.899	1.266
Constant	0.017	0.002	-34.9	0.000***	0.014	0.022
**** p<0.01, ** p<0.05, * p<0.1*						
Data source: Pakistan labor force survey 2017-18						

Results of logistic regression shows that the likelihood of occupational injuries is 1.6 times higher among men workers as compared to female because men are more exposed to involve in vulnerable occupation as compare to women [Malta et al., 2024] find out similar results.

As worker's age increases the probability of occupational injuries decreases. Because young workers have to face higher injuries due to less work experience, absence of training, higher workload. The other reason behind this is that young workers lack workplace maturity thus more prone to injury.

Married workers have 1.3 times more likelihood of being injured as they are involved in vulnerable or risky task just to raise their income. In urban areas the probability of occupational injuries is 0.75 times higher because, major factories are located in urban areas and people from rural migrate toward urban areas in search of job.

In Punjab the likelihood of occupational injuries is 1.5 times higher as compared to those working in KPK. Because majority of workers work in Punjab therefore the probability of occupational injuries is higher among them. Similarly in Sindh the chances of occupational injuries are 1.8 times higher because major industries also located in this province. In Baluchistan the probability of occupational injuries is low because large majority of workers migrate to Punjab where due to lack of proper training about the use of equipment they are exposed to occupational injuries.

Workers who work long hours are more exposed to occupational injuries as compared to those who work up to 35 hours per week. Results indicated that workers who work between 35 to 48 hours per week have 1.4 times more likelihood of being occupationally injured. Whereas those who work more than 48 hours have 1.23 times more occupationally injured. The reason behind is that working long hours led to fatigue, sleeplessness which ultimately reduce productivity and led to occupational injuries. This result clearly supports Schuster and Rhodes Model that assumes that longer work hours indirectly increases the risk of occupational injuries through fatigue and stress.

Results of variable level of education shows those who have no formal education have 1.14 times more likelihood of being occupationally injured because workers with less education are more prone to injuries due to less information about safety standards but with the increase in level of education the chances of occupational reduces. Ali et al (2018) concluded the same findings.

6. CONCLUSION AND RECOMMENDATION

The aim of this study is to find out the determinants of occupational injuries among workers in Punjab by employing Labour Force dataset over the year 2017-18. Estimates of logistic regression concluded that incidence of occupational injuries is higher among men and young workers. Workers who reside or work in urban areas are more exposed to occupational injuries whereas all the provinces exposed Baluchistan have shown the prevalence of work-related injuries.

Apart from this, working long hours leads to a higher rate of occupational injuries. This is since working long hours leads to sleeplessness, depression, and other health-related problems. Level of education also plays significant role in occurrence of injuries. As longer work hours triggers that the risk of workplace injuries. In order to reduce its incidence European Union has introduced a uniform labour standard that restrict the normal work hours for workers up to 48 hours per week besides other work requirements such as short rest breaks, shift work, paid annual leaves, night work, Results of logistic regression shows illiterate workers are more vulnerable and exposed to higher occupational injuries.

This study is the first attempt to examine the impact of long working hours on occupational injuries in Pakistan by using Labour Force Survey 2017-18. Findings of this study suggested that there must be higher emphasis on raising workers education and training about safety standards and there must be a

proper check and balance on firms, industries that hire labours in order to reduce the workers exploitation regarding long working hours. Future research can be done by focusing on safety measure that may be adopted in order to reduce the incidence of occupational injuries.

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