



Original Article

Trend of Occupational Injuries/Diseases in Pakistan: Index Value Analysis of Injured Employed Persons from 2001–02 to 2012–13



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ABSTRACT

Background: The present study aimed to analyze the index value trends of injured employed persons (IEPs) covered in Pakistan Labour Force Surveys from 2001–02 to 2012–13.

Methods: The index value method based on reference years and reference groups was used to analyze the IEP trends in terms of different criteria such as gender, area, employment status, industry types, occupational groups, types of injury, injured body parts, and treatment received. The Pearson correlation coefficient analysis was also performed to investigate the inter-relationship of different occupational variables.

Results: The values of IEP increased at the end of the studied year in industry divisions such as agriculture, forestry, hunting, and fishing, followed by in manufacturing and construction industry divisions. People associated with major occupations (such as skilled agricultural and fishery workers) and elementary (unskilled) occupations were found to be at an increasing risk of occupational injuries/diseases with an increasing IEP trend. Types of occupational injuries such as sprain or strain, superficial injury, and dislocation increased during the studied years. Major injured parts of body such as upper limb and lower limb found with increasing trend. Types of treatment received, including hospitalization and no treatment, were found to decrease. Increased IEP can be justified due to inadequate health care facilities, especially in rural areas by increased IEP in terms of gender, areas, received treatment, occupational groups and employment status as results found after Pearson correlation coefficient analysis.

Conclusion: The increasing trend in the IEP% of the total employed persons due to agrarian activities shows that there is a need to improve health care setups in rural areas of Pakistan.

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1. Introduction

Occupational injuries/diseases are always considered leading problems for workers, especially in less developed countries. The International Labour Organization (ILO) estimated that about 2.3 million people die due to occupational accidents and occupational diseases, 317 million suffer from serious nonfatal occupational injuries, and 160 million suffer from occupational illnesses and most of them belong to rural areas in less developed countries [1]. Workforce in less developed countries has always been under a great risk of occupational injuries/diseases due to poor working conditions and lack of social protection. The situation is even worse

in rural areas of less developed countries due to inadequate health care facilities.

In less developed countries, occupational injuries/diseases entail a high cost of the national social security system [2] due to poor health safety infrastructure. Occupational injuries are the major reasons of economic decline [3], as the economic costs of occupational injuries/diseases and illnesses, estimated by the ILO, account for an average of 4% of the national GDP [4]. Proper social insurance schemes are not consolidated in less developed countries, especially in rural areas, and limitations such as low-quality information are a reality there; hence, a typical data analysis would be useful to estimate occupational health safety

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Table 1
Index values of IEPs and annual IEP% with respect to the major industry divisions between the years 2001–02 and 2012–13

Industry divisions	2001–02	2003–04	2005–06	2006–07	2007–08	2008–09	2009–10	2010–11	2012–13	Slope	Annual IEP%
<i>Index value by time, 2001–02 = 100</i>											
Agriculture, forestry, hunting, & fishing	100	105	93	95	109	118	116	116	115	2.7	46.1
Manufacturing	100	101	118	105	88	96	88	109	92	-1.3	14.4
Construction	100	85	105	116	119	116	114	104	121	2.6	13.7
Community, social, & personal services	100	92	84	95	75	9	11	30	46	-10.6	6.7
Transport, storage, & communication	100	95	101	85	86	87	86	75	78	-3.0	8.3
Wholesale & retail trade, & restaurants & hotels	100	106	110	107	92	87	113	113	106	0.6	9.0
Electricity, gas, & water	100	130	79	119	70	97	51	27	68	-8.6	0.6
Mining & quarrying	100	0	433	242	75	275	100	192	167	3.5	0.2
Other industry divisions	100	883	583	567	933	5,633	5,867	7,317	167	586.7	1.5
<i>Index value by time, manufacturing = 100</i>											
Agriculture, forestry, hunting, & fishing	295.7	307.1	233.3	269.2	368.2	361.2	390.1	315.6	369.2	12.1	
Manufacturing	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	0	
Construction	86.5	72.9	77.3	95.7	117.4	104.2	111.3	82.4	114.3	3.6	
Community, social, & personal services	76.9	70.6	54.6	69.4	66.0	7.1	9.6	20.9	38.3	-7.6	
Transport, storage, & communication	64.7	61.2	55.3	52.5	63.1	58.3	62.7	44.7	54.9	-1.1	
Wholesale & retail trade, & restaurants & hotels	59.6	62.5	55.8	60.9	62.6	54.0	76.3	62.0	69.2	1.2	
Electricity, gas, & water	5.0	6.5	3.4	5.7	4.0	5.1	2.9	1.3	3.8	-0.4	
Mining & quarrying	0.8	0.0	3.0	1.9	0.7	2.4	0.9	1.5	1.5	0.1	
Other industry divisions	0.4	3.6	2.0	2.2	4.4	24.2	27.5	27.8	0.8	2.4	

IEP, injured employed person.

performance of the country [5]. Work-related injuries and deaths are higher in less developed countries where workers are involved in hazardous job activities mainly in agriculture, construction, fishing, and mining sectors [6]. Low-level social protection poses a high risk of harmful occupational exposure to rural area workers.

According to the Pakistan Economic Survey 2013–14, Pakistan is the 10th largest country in the world in terms of labor force and its rural population accounts for 67.5% of the total population involved in agriculture activities [7]. Occupational health and safety (OHS) is miserable in Pakistan because of many factors such as inadequate medical facilities, lack of specific laws for OHS, and illiterate workforce. In Pakistan, there is no national system for recording occupational injuries and work-related causalities, and the majority of accidents are not reported to the labor department, so there is a lack of available data. OHS is not a top priority in the country due to the lack of resources and unavailability of professional skills. Employees' Social Security Institution (ESSI) at the provincial level, Saeed Ahmed Awan Centre for the Improvement of Working Conditions & Environment, and Directorate General of Labour Welfare of Punjab province are responsible for providing medical facilities and professional skills for the welfare of workers. Recently, Punjab Occupational Safety and Health Council has been formed in the most populated province of the country for the safety of workers. Pakistan's first labor policy was devised in 1972 and the latest national labor policy was announced in 2010; however, after the devolution of powers to the provinces, some steps have been taken regarding safety regulations in the country at provincial level to improve the working conditions for workers. Recently, Punjab [the biggest province of Pakistan in terms of population and share of employed persons (EP)] announced its first labor policy [8] and

Baluchistan (the smallest province of Pakistan in terms of population and EP share) reached a consensus on labor legislation and labor policy [9].

The ILO is also working with the government of Pakistan to deal with workplace issues, workers' rights, and improvement of workplace standards since the independence of the country in 1947; Pakistan has ratified 36 ILO conventions of which eight are core conventions [10]. As thousands of workers are routinely exposed to hazardous chemicals, the incidence of occupational diseases and injuries are very high in Pakistan. The majority of the workforce is not aware of the adaptation of protective measures during their jobs. Most of the workforce is not prepared to cope with the hazards posed by manufacturing and industrial processes. Specific safety regulations for different sectors are not available in the country to cope with the health safety issues of workers. The country lacks the basic infrastructure and qualified personnel for giving OHS services to the labor force. Therefore, a huge number of workers will be at risk if no future attempts are made to improve OHS [11].

Literature on national occupational injury/disease prevalence is deficient. A comprehensive analysis of the OHS profile of Pakistan has been performed [12], but there was no inclusive discussion about occupational injuries/diseases at national level in Pakistan in that study. The aim of the present study is to perform an index value trend analysis of injured employed persons (IEPs) suffering from occupational injuries/diseases in Pakistan from 2001–02 to 2012–13, in terms of different criteria such as area, gender, employment status, major industry division, major occupational groups, types of occupational injuries/diseases, injured body parts, and types of treatment received after getting an occupational injury/disease, especially for rural area workers. To the best of our

knowledge, this is the first national-level study of occupational injuries/diseases in Pakistan.

2. Materials and methods

In this study, the Labour Force Survey (LFS) data published by the Pakistan Bureau of Statistics (PBS) in the form of Pakistan statistical year books have been used. Since 1963, the PBS has been carrying out LFSs, and in the 2001–02 LFS, the scope of the LFS was extended to cover data on occupational injuries/diseases of EPs in the country. PBS collects these data from households using the questionnaire methodology. Up to this study, data of a total of nine LFSs (2001–02, 2003–04, 2005–06, 2006–07, 2007–08, 2008–09, 2009–10, 2010–11, and 2012–13) have been published by the administration of PBS.

We used index value calculation method based on the year 2001–02 and also based on a reference group in each variable, such as manufacturing in industry divisions, craft and related trade workers in major occupational groups, fracture (broken bones) in types of occupational injuries, head in injured body parts, consulting a doctor or other medical professionals in types of treatment, self-employed in employment status, male workers in gender, and urban area in areas.

The index value calculation method was used to investigate occupational accident trends and their profiling in Turkey [13] and Korea [14]. In this study, the index value calculation method investigates two types of implications: the first is the percentage distribution of IEPs by status of occupational injuries/diseases trend, based on the reference year 2001–02, and the second is the percentage distribution of IEPs suffering occupational injuries/diseases based on a reference group in each variable as mention above.

In this study, the term IEP was used to analyze the trend of occupational injuries/diseases among EPs in the country. Occupational injuries/diseases were expressed in terms of percentages of the EPs in each group in the published LFS reports. Therefore, IEP is the percentage of total EPs suffering occupational injuries/diseases in each variable. We calculated and analyzed the trend of index values by slope value (*S*) calculation in order to check the downward and upward trends of the IEP. In statistics, the slope of a data set (line) is a number that describes both the direction (positive or negative) and the steepness (downward or upward) of the data set (line). The trend of index values of different variables highlights the problematic population, in terms of occupational injuries, in the country. Pearson correlation coefficients were also calculated to investigate the inter-relationship between different occupational groups in terms of gender, area, medical treatment received, and employment status of IEPs.

A total of 438.4 million EPs were covered in all selected nine LFSs, with an annual mean of 48.4 million in Pakistan; Table 1 shows the EP distribution in terms of gender, area, employment status, and industry divisions from 2001–02 to 2012–13. Annual distribution of male EPs accounts for 80.0% and female EPs for 19.7% of the country's workforce, which dominated by male EPs. Being an agrarian country, 69.6% of the EPs belong to rural areas and the majority of them are working in the agriculture sector, which accounts for a high share (44.0%) of the total EPs in the country. The high employment percentage share of the agriculture sector is because agriculture has important direct and indirect roles in generating economic growth of Pakistan.

In the LFS, the terms defined by the PBS are as follows. An occupational injury/disease is defined as any personal injury or disease resulting from an occupational accident/disease, i.e., an individual occurrence or event arising out of or during the course of work. An occupational accident is defined as an unexpected and

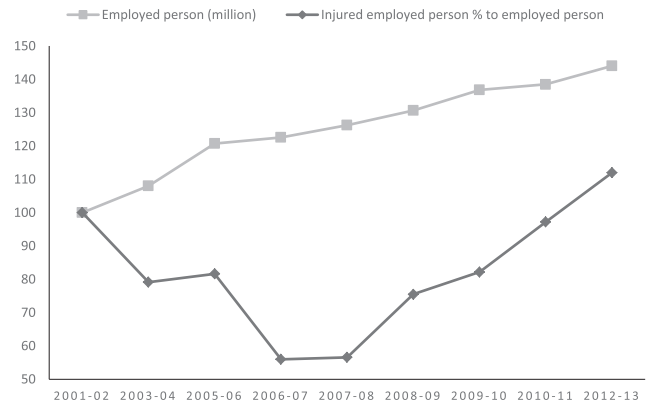


Fig. 1. Index value trends of EPs and IEP percentage to the EP in Pakistan from 2001–02 to 2012–13. EP, employed person; IEP, injured employed person.

unplanned occurrence, including acts of nonconsensual violence, arising out of or in connection with work, which results in personal injury, disease, or death. An occupational disease is defined as a disease contracted as a result of an exposure to risk factors associated with work activities. Self-employed is defined as a self-employment job where the remuneration is directly dependent upon the profits, or the potential profits, derived from the goods and services produced. An employee is defined as a person who works for a public or a private employer, and receives remuneration in wages, salary, commission, tips, piece rates, or pay in kind. A contributing family worker is defined as a person who works without any pay in cash or kind, in an enterprise operated by a member of his/her household or other related persons. An employer is defined as a person working during the reference period, on their own account or with one or a few partners, in a “self-employment job” with one or more employees engaged on a continuous basis.

3. Results

The annual percentage of IEP to the EP was found to be 3% in Pakistan from 2001–02 to 2012–03. The trend of index values of IEP percentage to the EP increased from 2006–07 to 2012–13; Fig. 1 shows the trend of index values of EP (million) and IEP percentage to the EP. The trend of IEP percentage to the EP decreased in the early years from 2001–02 to 2006–07, but bounced back in the year 2008–09. The highest annual IEP% was found in Punjab province (1.9%), followed by in Sindh (1.1%), Khyber PK (0.3%), and Baluchistan (0.03%). Index values of the IEPs by areas in Pakistan from 2001–02 to 2012–13 are shown in Table 2. Occupational injuries/diseases among EPs of rural areas were found to be more than threefold of those among EPs of urban areas. Occupational injuries/diseases among EPs of rural areas were increased considering the year 2001–02 as a reference year. Occupational injuries/diseases among EPs of rural areas reached 422.2% taking urban areas as a reference group.

Index values of IEPs by gender in Pakistan from 2001–02 to 2012–13 are shown in Table 3. Occupational injuries/diseases among male EPs were found to be very high as compared to those among female EPs. Occupational injuries/diseases decreased among male EPs and increased among female EPs, considering the year 2001–02 as a reference. Considering male EPs as a reference group, occupational injuries among female EPs increased by more than double in 2012–13 as compared to that in 2001–02.

Index values of the IEPs by employment status from 2001–02 to 2012–13 are shown in Table 4. Both self-employed persons and employees were found to be at higher risk of occupational injuries/

Table 2

Index values of injured employed persons by area between the years 2001–02 and 2012–13

Area	2001–02	2003–04	2005–06	2006–07	2007–08	2008–09	2009–10	2010–11	2012–13	Slope
<i>Index value by time, 2001–02 = 100</i>										
Rural	100	101.5	95.6	101.4	103.4	107.8	109.2	108.0	108.3	1.4
Urban	100	95.7	113.0	95.8	90.1	77.1	72.9	76.4	75.5	-4.2
<i>Index value by area, urban = 100</i>										
Rural	294.0	311.9	248.6	311.4	337.3	411.0	440.5	415.5	422.2	21.8
Urban	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	0.0

diseases as compared to others in Pakistan. Occupational injuries/diseases among contributing family workers increased by 181.7% ($S = 13.6$) taking the year 2001–02 as a reference. Considering the self-employed persons as the reference group, occupational injuries among contributing family workers increased by 57.7% ($S = 4.8$), which is more than half of the occupational injuries among self-employed people.

Index values of the IEPs by major industry divisions from 2001–02 to 2012–13 are shown in Table 5. Occupational injuries/diseases in agriculture, forestry, hunting, and fishing sectors were found to be higher than in the rest of the industry divisions. Taking the year 2001–02 as a reference, occupational injuries/diseases increased in agriculture, forestry, hunting, fishing, construction, wholesale and retail trade, restaurants and hotels, and in other industry divisions and decreased in manufacturing, community, social and personal services ($S = -10.1$), transport, storage, and communication divisions. Considering manufacturing as a reference, occupational injuries/diseases increased in the agricultural, forestry, hunting, fishing (369.2%), and construction (114.3%) sectors. The figures of industry divisions such as community, social and personal services ($S = -7.2$), transport, storage, and communication decreased.

Index values of the IEPs by major occupation groups from 2001–02 to 2012–13 are shown in Table 6. Skilled agricultural and fishery workers were found with the highest number of occupational injuries/diseases. Occupational injuries among craft and related trade workers and those in elementary (unskilled) occupations were found to be equal. Taking the year 2001–02 as a reference, occupational injuries/diseases increased among skilled agricultural and fishery workers and those in elementary (unskilled) occupations. Occupational injuries/diseases increased again, both among skilled agricultural and fishery workers and those in elementary (unskilled) occupations, considering craft and related workers as a reference group. Furthermore, we observed that occupational injuries increased by 231.4% ($S = 8.4$) among skilled agricultural and fishery workers.

Index values of the IEPs by types of occupational injuries/diseases from 2001–02 to 2006–07 are shown in Table 7. The most common types of occupational injuries/diseases that were found included another wound (lacerations, cuts, etc.) and occupational injuries/diseases due to the effect of weather, exposure, or related conditions. Taking the year 2001–02 as a reference, types of injuries such as contusion, amputation, sprain or strain, superficial injury,

concussion or other internal injury, and fracture (broken bone) increased. Index values of contusion or crushing, and amputation reached 339.2% and 221.4%, respectively. Considering fracture (broken bone) as a reference, other wounds (lacerations, cuts, etc.), other diseases, and multiple injuries of different natures decreased. Moreover, we observe increased sprain or strain ($S = 12.8$) and superficial injuries ($S = 9.6$), with high slope values.

Index values of the IEPs by injured body parts due to occupational injuries/diseases from 2001–02 to 2006–07 are shown in Table 8. The most commonly injured parts were general injured parts, followed by the lower and upper limbs. Taking the year 2001–02 as a reference, index values of the lower limb ($S = 40.3$), upper limb ($S = 43.7$), and trunk increased. General injured parts decreased to 54.8%, maybe it's due to integration in recording of survey data into defined injured body parts categories. Considering the head as a reference, values of the lower and upper limbs were < 430% together.

Index values of IEP by types of treatment received after suffering from occupational injuries/diseases are shown in Table 9. The most common types of treatment received were consulting a doctor or other medical professionals (54.2%) and taking time off work (21.0%). The index values of types of treatment types such as took time off decreased and no treatment type increased when we take the year 2001–02 as reference. Index values of consulting a doctor or other medical professionals and of hospitalization decreased. Considering consulting a doctor or other medical professionals as a reference, again we observed that index values increased for taking time off work and no treatment received types.

Pearson correlation coefficients between 12 occupational variables of gender, area, treatment received, and employment status for IEP% are shown in Table 10. A higher correlation was discovered between the following occupational groups: urban IEP% and employees (average $r = 0.95$), indicating that the high IEP% of paid salary workers mainly belong to urban areas working in both private and government organizations; employee IEP% and hospitalization IEP% (average $r = 0.91$), indicating that the hospitalization type of treatment for employees positively correlate in case of an occupational injury/disease as negatively correlate with contributing family workers, it is due to the social security benefits for employees working in an organization and contributing family workers are deprived from those social security benefits; rural IEP% and contributing family worker IEP% (average $r = 0.86$), indicating

Table 3

Index values of injured employed persons by gender between the years 2001–02 and 2012–13

Gender	2001–02	2003–04	2005–06	2006–07	2007–08	2008–09	2009–10	2010–11	2012–13	Slope
<i>Index value by time, 2001–02 = 100</i>										
Male	100.0	100.1	100.8	102.2	98.4	97.5	99.5	96.1	93.0	-0.8
Female	100.0	98.2	88.2	67.2	123.8	138.2	107.8	158.9	207.0	12.0
<i>Index value by gender, male = 100</i>										
Male	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	0.0
Female	6.6	6.5	5.8	4.3	8.3	9.3	7.1	10.9	14.7	0.9

Table 4
Index values of injured employed persons by employment status between the years 2001–02 and 2012–13

Employment status	2001–02	2003–04	2005–06	2006–07	2007–08	2008–09	2009–10	2010–11	2012–13	Slope
<i>Index value by time, 2001–02 = 100</i>										
Self-employed	100.0	106.1	91.7	93.8	84.1	84.4	90.5	89.1	84.5	–2.1
Employees	100.0	98.8	110.8	102.3	97.8	93.5	91.8	88.1	92.9	–1.8
Contributing family workers	100.0	81.5	96.8	118.2	166.3	183.8	164.1	178.4	181.7	13.6
Employers	100.0	98.7	68.0	54.7	102.7	29.3	77.3	133.3	93.3	1.2
<i>Index value by employment status, self-employed = 100</i>										
Self-employed	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	0.0
Employees	89.3	83.2	107.8	97.4	103.9	98.9	90.5	88.4	98.2	0.0
Contributing family workers	26.9	20.6	28.3	33.9	53.1	58.4	48.7	53.8	57.7	4.8
Employers	1.6	1.5	1.2	1.0	2.0	0.6	1.4	2.4	1.8	0.1

the higher likelihood of IEP% of contributing family workers to belong to rural areas; taking time off work IEP% and rural IEP% (average $r = 0.86$), indicating the severity of occupational injuries/diseases in rural areas leading to loss of time; and urban IEP% and hospitalization IEP% (average $r = 0.87$), indicating good medical facilities in urban areas. A strong positive correlation was found between the following occupational groups: IEP% for worker receiving no treatment and rural IEP% (average $r = 0.67$), indicating a lack of medical facilities in rural areas, and rural area IEP% and female IEP% (average $r = 0.68$), indicating the likelihood of home-based female workers or female agricultural workers suffering from occupational injuries/diseases. A higher negative correlation was found between female IEP% and male IEP% (average $r = -1$), indicates that the occurrence of occupational injury/disease both in male and female EPs are not dependent to each other which may be due to difference in types of jobs involved during work or types of employment status. In general, the results suggest the inadequacy of medical facilities in rural areas, high severity of occupational injuries/diseases in rural areas, and that contributing family workers of rural areas are at greater risk of occupational injuries/diseases compared to those of urban areas.

4. Discussion

Epidemiological analysis of the data on occupational injuries/diseases can be useful to make prevention policies and identify the areas for resource allocation on a priority basis [15]. This study analyzed the IEP index value trends in order to find the most

problematic population in terms of occupational injuries/diseases in Pakistan. The index value analysis and correlations between different occupational variables show the inadequacy of health facilities and increased occupational injuries/diseases among workers, especially in rural areas.

This study shows the rising trend of IEP% to EP at the end of the study year (2012–13), expressing the increasing risk of occupational injuries/diseases among the EPs in the country. Although the incidence of occupational injuries/diseases showed a declining trend in the initial years of the study period, it increased again in the year 2008–09, indicating a weakness in the OHS infrastructure of the country. In this study, male workers were found at a higher risk of occupational injuries than female workers in Pakistan, but occupational injuries/diseases among female workers increased to double the original value from 2001–02 to 2012–13. Occupational injuries/diseases were reported to be high among male workers as compared to female workers [16,17] mainly due to the high employment share of male workers of the total workforce. The increase or decrease of IEP% of female workers cannot be associated with the IEP% of male workers due to their negative correlation results found in this study.

The highest share of occupational injuries/disease found in agriculture, forestry, hunting, and fishing industry division with increased trend as employment share of this industry division also account highest as compared to rest of the industry divisions. Globally, occupational injuries were found to be high in the agriculture sector as compared to other industries taken together [18,19]. The agriculture sector of Pakistan has undergone technical

Table 5
Index values of injured employed persons by major industry divisions between the years 2001–02 and 2012–13

Industry divisions	2001–02	2003–04	2005–06	2006–07	2007–08	2008–09	2009–10	2010–11	2012–13	Slope
<i>Index value by time, 2001–02 = 100</i>										
Agriculture, forestry, hunting, & fishing	100.0	104.6	93.0	95.5	109.2	117.6	116.9	116.2	114.5	2.7
Manufacturing	100.0	100.8	117.9	104.9	87.7	96.3	88.3	108.8	91.7	–1.3
Construction	100.0	84.9	105.3	116.0	119.1	115.9	113.6	103.7	121.2	2.6
Community, social, & personal services	100.0	92.5	83.8	94.7	75.2	8.9	11.0	40.4	45.7	–10.1
Transport, storage, & communication	100.0	95.3	100.9	85.1	85.5	86.8	85.5	75.3	77.8	–3.0
Wholesale & retail trade, & restaurants & hotels	100.0	105.7	110.4	107.2	92.1	98.8	122.3	119.0	106.5	1.4
Other industry divisions	100.0	162.6	159.3	164.8	127.5	386.8	324.2	349.5	11.0	12.6
<i>Index value by time, manufacturing = 100</i>										
Agriculture, forestry, hunting, & fishing	295.7	307.1	233.3	269.2	368.2	361.2	391.6	315.8	369.2	12.1
Manufacturing	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	0
Construction	86.5	72.9	77.3	95.7	117.4	104.2	111.3	82.4	114.3	3.6
Community, social, & personal services	76.9	70.6	54.6	69.4	66.0	7.1	9.6	28.5	38.3	–7.2
Transport, storage, & communication	64.7	61.2	55.3	52.5	63.1	58.3	62.7	44.7	54.9	–1.1
Wholesale & retail trade, & restaurants & hotels	59.6	62.5	55.8	60.9	62.6	61.2	82.6	65.1	69.2	1.7
Other industry divisions	6.3	10.1	8.5	9.9	9.1	25.2	23.0	20.2	0.8	0.9

Table 6

Index values of injured employed persons by major occupation groups between the years 2001–02 and 2012–13

Major occupation groups	2001–02	2003–04	2005–06	2006–07	2007–08	2008–09	2009–10	2010–11	2012–13	Slope
<i>Index value by time, 2001–02 = 100</i>										
Skilled agricultural & fishery workers	100.0	103.1	91.4	99.0	107.9	119.2	115.5	118.6	115.6	3.0
Craft & related trade workers	100.0	102.1	102.6	114.2	102.7	105.6	90.2	97.9	89.8	-1.4
Elementary (unskilled) occupations	100.0	108.2	121.9	96.9	111.0	100.2	112.5	112.7	105.6	0.3
Plant/machine operators & assemblers	100.0	77.3	82.7	84.2	72.5	75.5	74.7	66.7	89.8	-1.6
Legislators/senior officials & managers	100.0	93.0	112.0	110.7	80.2	61.2	82.3	60.9	68.4	-5.5
Service workers/shop & market sales workers	100.0	74.8	90.3	96.9	86.4	54.9	82.2	49.9	97.1	-2.4
Technicians & associate professionals	100.0	97.4	74.6	50.9	52.6	41.8	40.5	51.7	56.0	-6.5
Clerks	100.0	85.2	27.8	57.4	57.4	28.7	14.8	17.4	17.4	-9.8
Professionals	100.0	139.3	325.0	182.1	14.3	46.4	42.9	107.1	142.9	-10.4
<i>Index value by occupation group, craft, & related trade workers = 100</i>										
Skilled agricultural & fishery workers	179.7	181.3	160.1	155.8	188.7	202.9	230.1	217.6	231.4	8.4
Craft & related trade workers	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	0
Elementary (unskilled) occupations	94.5	100.1	112.3	80.2	102.2	89.7	117.8	108.8	111.2	1.9
Plant/machine operators & assemblers	35.1	26.6	28.3	25.9	24.8	25.1	29.1	23.9	35.1	-0.1
Legislators/senior officials & managers	32.1	29.3	35.1	31.2	25.1	18.6	29.3	20.0	24.5	-1.4
Service workers/shop & market sales workers	18.2	13.3	16.0	15.4	15.3	9.5	16.6	9.3	19.7	-0.2
Technicians & associate professionals	11.1	10.6	8.1	4.9	5.7	4.4	5.0	5.9	6.9	-0.6
Clerks	5.5	4.6	1.5	2.8	3.1	1.5	0.9	1.0	1.1	-0.5
Professionals	1.3	1.8	4.2	2.1	0.2	0.6	0.6	1.5	2.1	-0.1

transformation and rapid mechanization, resulting in increased risk of occupational injuries/diseases to unskilled workers. Pakistan is a semi-industrialized country as Table 1 shows manufacturing industry division account of 13.5% EPs share to the total employment in the country. Decreased IEP% in the manufacturing industry division in Pakistan can be due to the ongoing energy shortage

leading to unemployment in this sector. The manufacturing division was found to be the second most risky industry division in terms of the percentage of occupational injuries/diseases, followed by the construction industry division. This study found that manufacturing industry division are more prone to occupational injuries/disease as compare to construction industry division. A

Table 7

Index values of injured employed persons by types of occupational injuries between the years 2001–02 and 2006–07

Types of occupational injuries	2001–02	2003–04	2005–06	2006–07	Slope
<i>Index value by time, 2001–02 = 100</i>					
Other wounds (lacerations, cut, etc.)	100.0	100.5	96.2	98.6	-0.9
Effect of weather, exposure, or related condition	100.0	110.5	114.0	105.2	1.9
Fracture (broken bone)	100.0	128.9	129.8	132.9	10.0
Other diseases	100.0	75.0	49.2	22.4	-25.9
Sprain or strain	100.0	127.6	188.1	199.2	35.8
Superficial injury	100.0	130.6	154.3	194.3	30.7
Concussion or other internal injuries	100.0	93.6	101.8	137.5	12.1
Dislocation	100.0	140.9	202.2	180.4	30.3
Multiple injuries of different natures	100.0	25.4	0.5	29.7	-23.6
Burn (burn, scald, friction burn, radiation burn)	100.0	147.6	117.5	114.1	1.2
Contusion or crushing	100.0	354.1	285.1	339.2	64.9
Amputation	100.0	125.5	225.5	221.4	46.4
Other defined injuries	100.0	93.0	104.2	120.0	7.1
<i>Index value by type of injury, fracture (broken bone) = 100</i>					
Other wounds (lacerations, cut, etc.)	384.3	299.5	284.6	284.9	-31.3
Effect of weather, exposure, or related condition	136.4	117.0	119.8	108.0	-8.3
Fracture (broken bone)	100.0	100.0	100.0	100.0	0.0
Other diseases	240.6	139.9	91.2	40.5	-64.9
Sprain or strain	65.7	65.1	95.2	98.5	12.8
Superficial injury	61.4	62.3	73.0	89.8	9.6
Concussion or other internal injuries	60.6	44.0	47.5	62.7	1.0
Dislocation	37.1	40.6	57.8	50.4	5.7
Multiple injuries of different natures	105.5	20.8	0.4	23.6	-26.6
Burn (burn, scald, friction burn, radiation burn)	27.7	31.7	25.1	23.8	-1.8
Contusion or crushing	9.9	27.3	21.8	25.4	4.1
Amputation	13.2	12.8	22.9	21.9	3.6
Other injuries	108.9	78.5	87.4	98.3	-2.3

Table 8
Index values of injured employed persons by injured body parts due to occupational injuries between the years 2001–02 and 2006–07

Injured body parts	2001–02	2003–04	2005–06	2006–07	Slope
<i>Index value by time, 2001–02 = 100</i>					
General injured parts	100.0	86.3	58.9	54.8	–16.3
Lower limb	100.0	156.2	231.4	209.3	40.3
Upper limb	100.0	136.5	200.1	224.6	43.7
Multiple locations	100.0	72.0	57.0	75.4	–8.9
Head	100.0	84.7	85.9	76.8	–6.8
Trunk	100.0	92.5	94.1	117.7	5.5
Neck	100.0	141.9	77.2	82.4	–11.8
<i>Index value by injured body parts, head = 100</i>					
General injured parts	664.9	677.5	456.0	474.5	0.00
Lower limb	160.8	296.4	433.3	437.9	96.8
Upper limb	148.6	239.3	346.2	434.3	96.4
Multiple locations	157.1	133.5	104.3	154.1	–3.8
Head	100.0	100.0	100.0	100.0	0.0
Trunk	23.7	25.8	25.9	36.3	0.0
Neck	17.3	29.0	15.6	18.5	–1.0

study reported the deficiency of competent professional safety staff to implement safe work practices in construction sites of Pakistan [20]. Decreased occupational injuries/diseases in community, social, and personal services may be due to unemployment in these industry divisions or other factors.

The present study found skilled agricultural and fishery workers with an increasing IEP trend, and a recent study from Korea also found that the rate of occupational injuries among skilled

agricultural and fishery workers was 4.5%, which is highest among all classified occupations [21]. Occupational injuries/diseases increased among skilled agricultural and fishery workers and those in elementary (unskilled) occupations only, but decreased in the other occupations of the country. Both skilled agricultural and fishery workers and workers in elementary (unskilled) occupations account for more than half (53.9%) of the employed population in the country, according to LFS 2012–13. A positive step toward the health safety of agricultural and fishery workers has been taken recently, as the first agricultural and fishery workers' trade union "The Sindh Agriculture and Fishing Workers Union" has been registered in Pakistan (Karachi) by the office of the Registrar Trade Unions, Karachi, under the provisions of Sindh Industrial Relations Act, 2013 [22].

Occupational health and safety among blue-collar and unskilled workers in Pakistan are inadequate due to various factors such as unemployment and technical transformations. Economic growth accelerated in the country by replacing labor with machines, but unemployment and industrial accidents increased in Pakistan. The agriculture sector is not covered by labor laws in Pakistan, so agricultural workforce remains deprived of the available compensations or financial benefits provided by different organizations. In the most recent labor policy (2010), the government of Pakistan projected to extend the coverage of the Workmen's Compensation Act 1923 to the injured agricultural workers and mechanized farmers of the rural areas in case of work-related death. The situation of elementary (unskilled) occupations is not good as their income level is below to the national income level of sales and services elementary occupations, agricultural, fishing and related workers, construction workers, manufacturing workers, transport

Table 9
Index values of injured employed persons by types of treatment received between the years 2001–02 and 2012–13

Types of treatment received	2001–02	2003–04	2005–06	2006–07	2007–08	2008–09	2009–10	2010–11	2012–13	Slope
<i>Index value by time, 2001–02 = 100</i>										
Consulted a doctor or other medical professionals	100.0	125.3	133.4	125.5	109.9	104.7	105.1	107.9	95.1	–2.5
Took time off work	100.0	98.1	77.4	97.9	124.7	133.8	121.1	120.8	116.2	4.3
Hospitalized	100.0	83.2	107.5	92.9	71.4	74.3	74.8	60.1	74.0	–4.3
No treatment	100.0	44.9	24.5	36.1	68.6	70.7	83.4	88.6	117.9	5.9
<i>Index value by type of treatment, consulted a doctor or other medical professionals = 100</i>										
Consulted a doctor or other medical professionals	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	0.0
Took time off work	39.6	31.0	23.0	30.9	44.9	50.6	45.6	44.4	48.4	2.3
Hospitalized	30.2	20.0	24.3	22.3	19.6	21.4	21.5	16.8	23.5	–0.7
No treatment	35.2	12.6	6.5	10.1	22.0	23.8	27.9	29.0	43.7	2.3

Table 10
Pearson correlation coefficients between occupational variables of gender, area, treatment received, and employment status for IEP%

Occupational variables	1 (male)	2 (female)	3 (rural)	4 (urban)	5 (cons.)	6 (tim.)	7 (hosp.)	8 (none)	9 (self.)	10 (emp.)	11 (CFW)	12 (empr.)
(1) Male	1.00											
(2) Female	–1.00	1.00										
(3) Rural	–0.68	0.68	1.00									
(4) Urban	0.68	–0.68	–1.00	1.00								
(5) Consulting a doctor	0.71	–0.71	–0.72	0.72	1.00							
(6) Taking time off work	–0.58	0.58	0.88	–0.88	–0.72	1.00						
(7) Hospitalization	0.66	–0.66	–0.87	0.87	0.53	–0.86	1.00					
(8) No treatment	–0.76	0.76	0.67	–0.67	–0.97	0.58	–0.50	1.00				
(9) Self-employed	0.58	–0.58	–0.52	0.52	0.42	–0.61	0.49	–0.32	1.00			
(10) Employees	0.67	–0.67	–0.95	0.95	0.74	–0.85	0.91	–0.72	0.35	1.00		
(11) Contributing family workers	–0.74	0.74	0.86	–0.86	–0.67	0.87	–0.81	0.59	–0.87	–0.76	1.00	
(12) Employers	–0.32	0.32	0.08	–0.08	–0.22	0.01	–0.35	0.40	0.19	–0.32	0.01	1.00

CFW, contributing family workers; Cons., consulted a doctor or a medical professional; Emp., employees; Empr., employers; Hosp., hospitalized; IEP, injured employed person; Self., self-employed; Tim., took time off work.

workers and others workers [23]. For enhancing rights at work and extending legal coverage to the vulnerable workers of informal sectors, the first ever trade union for domestic workers in Pakistan has been registered in Lahore by the Department of Labour, Punjab, under the provisions of the Industrial Relations Act 2010 [24].

The most common types of occupational injuries/diseases found such as other wound (laceration, cut, etc.), the effect of weather, exposure, or related condition, other disease, and fracture (broken bone). Use of cutting implements such as knives and scythes, and effects of weather and exposure to pesticides are obvious in the agriculture sector. Cuts and open wounds (bites) are the most common types of occupational injuries, both in agricultural (39%) and nonagricultural workers (33%) [25]. The increased index values of sprain or strain and superficial injury in both ways of index support the studies made in Turkey [26] and Malaysia [27] in which it was found that most common types of occupational injuries were sprain or strain and superficial injuries among agriculture workers.

The most frequently injured body parts were found to be the upper and lower limbs, with high slope values, which is mainly due to exhaustive physical work activity especially demanded in the agriculture sector [23]. It was also found that musculoskeletal disorders of the upper and lower limbs are caused by physical work activity [24]. A retrospective study of work-related upper extremity and low back injuries found that workers experienced anxiety and pain at the end of the working day [25]. The dominance of the agriculture industry by its huge employment share in Pakistan can be associated with increased upper and lower limb injured body parts as [26] also identified that upper and lower limbs injured body parts in workers in the agriculture sector are most common in winter and summer months.

IEP of rural area workers reached 422.2% as compared to urban area workers which shows rural area workers in Pakistan are at great risk of occupational injuries/diseases which is may be due to the availability of poor medical facilities as compared to urban area workers. One of the main reasons behind it is the weaker rural health care setup in the country. The results of Pearson correlation in this study identified that workers in rural areas are not availing of health care as a higher non-type of receiving treatment and minus hospitalized IEP% of them. Traditionally, first aid measures at home are used in rural area workers after an occupational injuries/diseases as proper medical aid is more accessible in urban areas. The number of EPs receiving no treatment after getting an occupational injury increased in the country. Taking time off work coupled with rural area IEP% indicated a high severity rate, resulting in loss of time. In contrast to rural area workers, urban area workers have advantages such as visiting doctors or medical professionals and city-based hospitals.

Both government and nearby private hospitals provide medical treatment to injured workers in Pakistan. Provincial ESSI in Pakistan provide medical care and financial benefits to secured workers of industrial or commercial establishments and their dependents. According to ESSI the employer of any registered establishment (having five or more employees) are legally obliged to pay contribution of 6% of the salary and wages of his employees drawing wages up to PKR. 18,000/- Per Month (\$176.46) or PKR. 750/- Per Day (\$7.35) by cheque or pay order. In Punjab province, which is the biggest province in Pakistan, the Punjab Employees Social Security Institution (PESSI) provides these services under the provision of the Provincial Employees Social Security Ordinance, 1965 (X of 1965). As per the Social Security Scheme, all secured workers are entitled to avail these services in case of illness, maternity, injury, disablement, or death. The PESSI has established 15 main hospitals, two mini hospitals, 40 medical centers, 142 dispensaries, and 88 emergency centers. In 2012–13, the PESSI secured 836,085 workers (a total of 35.71 million

workers in Punjab in 2012–13) of 54,797 registered establishments [28].

In terms of employment status, this study examined that self-employed workers are at the highest risk of occupational injuries/diseases, as a literature review indicated that the rate of occupational injuries and death may be higher among self-employed workers as compared to salaried or wage workers [29]. In this study, occupational injury/disease risk to employees was found to be next to that of self-employed workers. The result of the Pearson correlation shows the positive relationship between contributing family workers and rural area workers, in other words in rural areas agriculture is a family business which involve majority of family members in most of the cases. Contributing family workers, also known as unpaid family workers, are historically dominated by female workers. Increased IEP% of contributing family workers can be associated with the fact that a large number of female workers in rural areas work as contributing family worker in agriculture sector; Table 1 shows an increased employment share by contributing family workers ($S = 2.7$). Therefore, increased IEP% both in female and rural area workers has a meaningful relationship with an increased annual IEP in both agriculture sector and contributing family workers. The Millennium Development Goal (MDG1) classified contributing family workers and self-employed workers to be in “vulnerable employment” in the employment-related target due to formal work arrangements, lack of social security benefits, etc. [30].

As mentioned earlier, in Pakistan employment share is dominated by rural area workers, as most of the people are engaged with agriculture as their primary occupation. A household survey study showed that there is the annual injury rate of more than fourfold higher in rural areas than in urban areas [31]. It is a big challenge to provide health care in rural areas. According to the ILO, health facilities in rural areas are not fully equipped as compared to urban areas, because cities are preferred for resource allocations in most of the cases. Unfortunately primary health care setup in rural areas neglected due to infrastructure developmental gaps between rural and urban areas. The available public medical facilities in urban areas such as specialized medical disciplines, improved hospital facilities, genetic screening or research etc. are not fully accessible in emergency cases to the rural area workers. Secondary and tertiary health care services are remote to rural areas and difficult to access for injured workers. In both developing and developed countries, the health status in rural areas is lower than that in urban areas; the situation is worse in developing countries [32].

The rising trend of occupational injuries and occupational accidents in construction sector observed in the present study was similar to the studies in Turkey [10] and Korea [11]; construction sector is considered one of the hazardous sectors globally regarding occupational injuries and occupational accidents. Agriculture and forest sector employees were found to be the target population for the strategies of occupational safety in Korea [11], which agrees with our findings of the rising trend of occupational injuries/diseases in the agriculture and forest sectors of Pakistan.

As a good sign of economic development in Pakistan, the European Union granted Generalized System of Preferences (GSP) Plus status to Pakistan recently, which offers immense benefits in terms of increase in exports; eight out of 27 core conventions on the GSP status are directly related to the rights of workers. The primary objective of the GSP is to reduce poverty and promote sustainable development and good governance. However, implementation of its conventions for the improvement of health and safety has yet reached a satisfactory level, which may deprive the country of the GSP Plus status [33].

The index value analysis of the IEPs is an attempt to find the most problematic working population of Pakistan in terms of the prevalence of occupational injuries/diseases. Increasing trend of IEP

in different industry divisions can associate with the poor health safety status of Pakistan. This study concludes that the highest occupational injuries/diseases occur in the agriculture sector, mainly associated with rural areas with fragile health care facilities. Rural area workers are deprived of the available benefits in case of work-related injuries/diseases, which poses a high burden on the national social security system in Pakistan. The steps taken recently are encouraging, but efforts are still required for the implementation of proposed policies and their transformation into safe practices in each economic sector. This study also has some limitations such as analysis of occupational injuries/disease in terms of age groups, injury causes, occupational deaths, and recovery of occupational injuries. Being an agrarian country, Pakistan needs serious efforts to develop its comprehensive health care system. The following recommendations can be useful for strengthening the OHS infrastructure in the country: (1) development of a strong rural health care system, as most of the agricultural labor force belongs to rural areas; (2) specific legislation for rural area workers and at the economic sector level; (3) maximization of professional cooperation of global organizations such as the ILO and World Health Organization for enhancing health safety status of workers and spreading safety awareness and safety knowledge; (4) extending ESSI coverage to both self-employed workers and contributing family workers; (5) development of injury surveillance and injury prevention programs, especially for rural area workers; (6) investigation of ESSI-nominated and other civilian hospital visit data for development of safety research in the country; and (6) allocation of safety budget or making investments for the enforcement of health safety policies such as using safety equipment and training workers regarding new work technologies.

Conflicts of interest

No potential conflicts of interest related to this article were reported.

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