



The Morbidity Patterns among Industrial Workers in Sulaymaniyah Governorate, Iraqi Kurdistan-Region: A Cross-sectional Study

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Abstract

Edited by: Sasho Stoleski
Citation: Ameen BB, Abdulsahib SH. The Morbidity Patterns among Industrial Workers in Sulaymaniyah Governorate, Iraqi Kurdistan-Region: A Cross-sectional Study. Open Access Maced J Med Sci. 2023 Jun 20; 11(E):354-361. https://doi.org/10.3889/oamjms.2023.11460
Keywords: Morbidity, Occupational hazards, Industries workers
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Received: 04-Mar-2023
Revised: 06-Jul-2023
Accepted: 10-Jul-2023
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Funding: This research did not receive any financial support
Competing Interests: The authors have declared that no competing interests exist
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BACKGROUND: The industry is one of the Kurdistan region's largest and most influential sectors. The number of workers in industrial factories increased by an average of 61.4% in 2019 compared to 2018. However, industrial workers are exposed to numerous risks in the workplace, which may have adverse effects on their health and increase the incidence of diseases among workers.

AIM: The aim of this study is to identify patterns of morbidity among industrial workers in Sulaymaniyah industries, as well as to find the relationship between disease patterns and some of the sociodemographic data of the study sample.

METHODS: A worker-based and cross-sectional study was conducted among ten large-scale industries. The ten participating factories have over 900-line workers. Three hundred were selected using Epi Info™ software. The correct number of employees per factory was determined using a proportionate method, and then the employees were chosen on purpose. The workers were interviewed using a developed questionnaire. The data were analyzed using descriptive and inferential statistics methods (Chi-square test).

RESULTS: Morbidity was noticed among 55.3% of participating workers. About 32.3% of the workers were found to be overweight, making it the most common health condition. Obesity came in second at 8%, then musculoskeletal problems at 3.7%. About 2.7% had vision problems. Younger age groups, who had worked in the industry for fewer years, showed lower percentages of morbidity patterns among them.

CONCLUSION: Industry workers must be aware of occupational health and safety measures to protect themselves from workplace hazards and reduce disease incidence.

Introduction

Work is essential in structuring the personal and social identities of individuals. Everybody needs a job to support themselves and their daily needs [1]. Meanwhile, industrial workers are regularly exposed to various health risks, including injuries, burning chemicals, and psychosocial variables. The risks vary depending on the type of job and environment [2].

Workplace hazards play a role in the development of various medical problems and injuries [3]. Nevertheless, only a small proportion of the world's population has access to occupational health facilities that specifically prevent and monitor occupational and work-related diseases and injuries. Many global health problems, such as non-communicable diseases, lead to higher rates of long-term illness and work absence. These problems challenge the ability of health systems to preserve and restore workers' ability to remain economically active [4].

Occupational diseases are those diseases caused by occupational activities and working conditions. An occupational disease is any illness that manifests in its early stages due to exposure to occupational (physical, chemical, or biological) risk

factors [5]. Occupational variables have a significant role in the worldwide disease burden and it is significantly more challenging to collect reliable data on occupational disease [6].

There have been numerous changes in the type of occupation and industry risks, workplace conditions, workforce composition and demographic trends, and health-care delivery mechanisms. An evolution of these trends proposes that work-health interactions will continue to increase in importance, affecting how work is done, how hazards are controlled or minimized, and how healthcare is managed and integrated into workplace health delivery strategies. Although a few workers may experience minor adverse health effects from workplace exposures, such as occasional eyestrain caused by poor office lighting, every industry has dealt with serious hazards [7].

Every year, occupational hazards lead to the early death, poor health, and disability of millions of people worldwide. Occupational injuries were included as one of the ten most frequent causes of sickness and death [8]. Every day, workers die due to workplace injuries or illnesses, resulting in more than 2.78 million deaths annually. Furthermore, there are 374 million occupational injuries annually [9].

The industrial sector is among the most important components of the Kurdistan Region Government's (KRG) economic development. There is a significant increase in the number of engaged workers each year. For instance, the number of employed people increased by 61.4% in 2019 compared to 2018 [10]. Industrial worker well-being is essential to both financial and societal advancement and general well-being. However, there is no particular research on morbidity patterns among factory workers in the KRG. Approximately 69% of accidents and illnesses related to occupational diseases go unreported, which shows how underreported they are [11]. Workplace safety assessments can reduce industrial incidents and improve workplace safety performance [12].

The study aimed to identify the morbidity patterns among industry workers at Sulaymaniyah Industries and find the association between morbidity patterns and some of the sociodemographic data of the study sample, such as (Age, sex, level of education, running shifts, number of working hours, duration of working, and body mass index [BMI]).

Materials and Methods

Study design and ethical approval

A worker-based and cross-sectional study was conducted from June 2020 to March 2021 among ten large-scale industries in Sulaymaniyah provenance. Ethical approval for this study was obtained by the ethical committee of the College of the Nursing/University of Raparin and the research center department at the University of Raparin with ID number (7/29/150). Informed consent was obtained from participants. The present study was written according to STROCSS 2021 guidelines [13].

Industries classifications and study sample

Based on the capital value of the plants, the Iraqi Kurdistan region's industries are grouped into three categories: Low, moderate, and large. Small-scale industries are made up of establishments costing between 1,000,000 and 75,000,000 Iraqi dinars (ID), medium-sized establishments costing between 75,000,000 and 2.5 billion IDs, and large establishments costing over 2.5 billion IDs. The Industrial Development Directorate registers medium-sized industries; the Chambers of Commerce and Industry record small factories; and the Board of Investment registers large-scale industries.

The study was carried out among large-scale industries in the Sulaymaniyah province. The

participating factories revolved around the following fields: Oil and gas, petrochemicals and chemicals, construction materials, food processing, services, and metal fabrication/processing. Of the 30 large-scale factories listed with the Board of investment and approached to participate in this study, 20 factories refused for two main reasons.

First, because of COVID-19 issues, the industry administration managers declared a lockdown for visitors, including researchers, as a precautionary procedure to protect the workers from being exposed to the coronavirus. Second, most factories had issues relating to being involved in the research study. They attributed the reason to the policy of the industries. Ten industries were permitted to carry out this study. The factories include construction materials, food processing, and metal fabrication and processing industries. The ten participating factories have over 900-line workers. The ten participating factories have over 900-line workers. Managers, executives, custodial staff, and administrative staff were excluded from the study.

Of the 900 workers in these factories, 300 were selected, including rotational shift workers and those who had worked at the firm for several months using Epi Info™ software. "Epi Info™ is a set of software tools for health-care practitioners and researchers" [14]. Based on the Epi Info™ software, a minimum sample size of 270 respondents is required. The sample was increased to account for a chance of non-response of 10%. The resulting final sample size was 300 participants. The proportionate sampling technique is used for selecting workers from each factory, with workers assigned from each factory proportional to the total number of workers. The proportionate sampling method was used to select workers from each factory in proportion to the total number of workers [15]. Later, the workers are selected per factory purposefully.

The number of workers chosen from each participating industry was 44 from the Aluminum Extrusion and Custom Sandwich Panel Production, 44 from soft drinks and drinking water, ten from the Sarchnar Flour Milling factories, and five from Asos Flour Milling. Steel structure company provided 44 workers, the Cement company 33 workers, Manufacturing supplying, medical and Specialty Gases Industry 5, Combined Cycle Power 49, Shampoo Manufacturer 53, and Yogurt and its product factories 13 workers.

Data collection and the study instrument

The data were collected using a constructed questionnaire. A questionnaire was constructed from a literature review and previous studies [16], [17], [18], [19]. The questionnaire consisted of two sections. Section 1 gives the sociodemographic data of the respondents. The questionnaire includes questions related to age, sex, level of education, working shifts, number of working hours/

weeks, duration of working/years, and industry health charts. Section two relates to morbidity patterns among industry workers. Informed consent from the workers was obtained before including them in the study. Interviewing techniques (face-to-face approach) was used to collect data from June 14, 2020, to December 16, 2020.

Validation, reliability, and statistical data analysis

The questionnaire was validated by 20 experts regarding the content and relevance of the items and was used to achieve the objective of the study. The experts included public and environmental health medicine specialists; community and family medicine specialists; community health nursing specialists; biochemistry specialists; biostatistics, and data analyst specialists. Based on the experts' comments, minor modifications to the wording of the content were required. A pilot study was conducted from May 7 to June 7, 2020, to estimate the proportion of workers suffering from morbidity patterns. The sample consisted of 30 workers who work in these ten factories and was selected according to a proportionate sampling technique. Of the 30 industrial workers, 15 (50%) were found to be suffering from one or more morbidity conditions. Thus, the person's prevalence of morbidities was calculated to be 50%. The sample has been asked if they have any health problems. The problem was to account for when the doctor had diagnosed the workers or if they had any clinical records or industry health charts. The data were analyzed using descriptive and inferential statistics methods (Chi-square test). In addition, BMI was used to identify any abnormality in the worker's weight.

Results

Characteristics of the study population

Of the 300 participant workers, 53.7% were aged between 21 and 30. Most of the study sample was male (87.7%) and 32% were college graduates. More than half (52.3%) of the workers had a rotation shift, and less than half (47.3%) worked 48 h/week. The study also observed that most workers (53.7%) had worked between 1 and 5 years. Using BMI, the study showed that 32.3% were overweight. In addition, 18.3% of the participants had occupational health charts, as shown in (Table 1).

Morbidity patterns among workers

Among the 300 participating workers, 134 (44.7%) were healthy. The morbidity patterns among workers showed 97 (32.3%) were overweight and 24 (8.0%) were

Table 1: Sociodemographic characteristics of 300 workers among 10 participated industries

Sociodemographic characteristics	Frequency	Percent
Age		
≤20	17	5.7
21–30	161	53.7
31–40	94	31.3
>40	28	9.3
Total	300	100
Sex		
Male	263	87.7
Female	37	12.3
Total	300	100
Level of education		
Illiterate	10	3.3
Able to read and write	21	7.0
Primary school graduated	43	14.3
Secondary school graduated	33	11.0
Intermediate school graduated	41	13.7
Institute graduated	56	18.7
College graduated	96	32.0
Total	300	100
Running shifts		
Morning shift	137	45.7
Night shift	6	2.0
Rotation-shift	157	52.3
Total	300	100
Number of working hours/weeks		
<48	93	31.0
48	142	47.3
>48	65	21.7
Total	300	100%
Duration of working/years		
<1	24	8.0
1–5	161	53.7
5–10	63	21.0
11–15	39	13.0
≥16	13	4.3
Total	300	100
Industry health charts		
Yes	55	18.3
No	245	81.67
Total	300	100

obese; 11 (3.7%) were identified with musculoskeletal problems; 8 (2.7%) with eye problems, and 6 (2.0%) had gastrointestinal problems. In addition, 3 (1.0%) workers had musculoskeletal and eye problems and 5 (1.7%) were underweight. Three (1.0%) workers had skin problems, the same percentage for hypertension, injury, and skin problems among participants. Other problems included: Hypotension in one worker, respiratory problems in one worker, and mild anemia in one worker, representing 1.0% of the study sample (Table 2).

Table 2: Morbidity patterns among 300 workers at ten industries

Morbidity pattern	Number of workers	Percent
None (healthy persons)	134	44.7
Over weight	97	32.3
Obesity	24	8
Musculoskeletal problems	11	3.7
Eye problems	8	2.7
Gastrointestinal problems	6	2
Underweight	5	1.7
Skin problems	3	1
Hypertension	3	1
Injuries	3	1
Musculoskeletal and eye problems	3	1
Other problems (hypotension, respiratory problem and mild anemia)	3	1
Total	300	100

Association between morbidity patterns and sociodemographic characteristics

Table 3 shows a significant association between the morbidity pattern and their age, BMI, number of working hours in a week, and duration of working years. However, no significant association has

Table 3: Association between morbidity patterns and sociodemographic characteristic (n = 300)

Sociodemographic characteristic	Total No.	Morbidity pattern		Chi-square test/fisher test value	p-value
		No No. (%)	Yes No. (%)		
Age					
≤20	17	12 (70.6)	5 (29.4)	28.154 X ² test	0.001
21–30	161	87 (54.0)	74 (46.0)		
31–40	94	28 (29.8)	66 (70.2)		
>40	28	7 (25.0)	21 (75.0)		
Sex					
Male	263	115 (43.7)	148 (56.3)	0.763	0.382
Female	37	19 (51.4)	18 (48.6)	X ² test	
Level of education					
Illiterate	10	4 (40.0)	6 (60.0)	11.825	0.66
Able to read and write	11	11 (52.4)	10 (47.6)	X ² test	
Primary school graduated	43	23 (53.5)	20 (46.5)		
Secondary school graduated	33	14 (42.4)	19 (57.6)		
Intermediate school graduated	41	26 (63.4)	15 (36.6)		
Institute graduated	56	22 (39.3)	34 (60.7)		
College graduated	96	34 (35.4)	62 (64.6)		
Number of working hours/weeks					
<48	93	38 (40.9)	55/93 = (59.1)	20.814	0.001
48	142	51 (35.9)	91 (64.1)	X ² test	
>48	65	45 (69.2)	20 (30.8)		
Duration of work/years					
<1	24	21 (87.5)	3 (12.5)	31.562	0.001
1–5 years	161	80 (49.7)	81 (50.3)	X ² test	
6–10 years	63	18 (28.6)	45 (71.4)		
11–15 years	39	12 (30.8)	27 (69.2)		
16+	13	3 (23.1)	10 (76.9)		
BMI					
Healthy weight	152	18 (11.8)	134 (88.2)	235.79	0.001
Unhealthy weight	148	(100.0)	148 (0.0)		

BMI: Body mass index.

been seen in the morbidity pattern with sex and level of education. It is noted from the study results that the lower percentages of morbidity were observed within the younger age groups, those who worked more than 48 h a week, those who had been working at the factory for fewer years, and those with healthy weights.

Uses of personal protective equipment (PPE) and the causes of not using it by the workers (n = 300)

The finding of Table 4 reveals a high percentage of factory workers use some form of PPE. About 76.7% of workers wear gloves and (73.7%) wear masks. While uses of industry uniforms or work aprons, safety helmets, safety boots or shoes, safety glasses or goggles, and earmuffs and earpieces among workers were (54.7%), (56.3%), (63.7%), (45.3), and (34.7%), respectively. In addition, non-availability of PPE, not being comfortable using PPE, and ignorance were the main reasons for not wearing or using PPE (37.7%), (16%), and (15%), respectively, among participants.

Table 4: Uses of personal protective equipment and the causes of not using it by the workers (n = 300)

Use of personal protective equipment PPE	F	p-value
Industry uniforms or work apron	164	54.7
Gloves	230	76.7
Masks	221	73.7
Safety helmets	169	56.3
Safety boots or shoes	191	63.7
Safety glasses or goggles	136	45.3
Earmuffs and earpieces	104	34.7
Reason for not use of PPE		
Non-available PPE	113	37.7
Not comfort	48	16
Ignorance	45	15
Skin irritant	3	1
On need	12	4
Hinder the work	10	3.3

F: Frequency, %: Percentage, PPE: Personal protective equipment.

Discussion

Hazards are just a reflection of the possibility of harm. The health threat's toxicity, the amount of exposure, the severity of the risk factors, and the duration of exposure to the risks are all factors that affect whether or not harm occurs [20]. Risks, accidents, and injuries in the workplace are all common concepts that must be known. The occupational safety and health administration has characterized an accident or disease as work-related if an incident or exposure in the workplace either contributed to the condition that resulted from it or significantly worsened a pre-existing condition [21]. This study observed that more than half of the participating workers have some form of morbidity pattern, with the most common morbidity being overweight (32.3%), followed by obesity (8%). Working adults spend a quarter of their lives at work and the stress and demands of their jobs can influence their eating habits and activity patterns, leading to being overweight and obese [22]. After the depression, obesity and its poor health implications are the second most expensive medical issue for employers [23]. This result is similar to other study done in Brazil among Brazilian industrial workers, which shows obesity is prevalent among industrial workers and sociodemographic characteristics are important factors related to obesity [24].

Another study regarding the morbidity pattern among salt workers showed that of a total of 331 salt workers interviewed in the study, 19.3% of them suffered from being underweight and 14.8% from obesity [25]. The prevalence of musculoskeletal problems among participating workers was 3.7%.

As known, most musculoskeletal disorders (MSDs) progress over time. A mix of risk factors, including physical and biomechanical factors, workplace conditions, and psychological and individual factors, typically cause MSDs [26]. Occupations such as the flour production industry and cement industries have higher musculoskeletal morbidity [27].

In contrast, a number of studies have found that other occupations, such as truck drivers, textile workers, fishermen, and workers in outdoor occupations, have higher musculoskeletal morbidity [28], [29], [30], [31], [32]. This implies that certain types of morbidity patterns are more likely in particular types of industries or jobs.

Gastrointestinal problems have been reported among 2.0% of those who participated in this study. Another study regarding morbidity patterns and occupational hazards among road sweepers shows that 9.7% had gastrointestinal problems [16]. Various occupational exposures, such as turning shifts, job stress, changing patterns of eating, immobile work conditions, hot environment temperatures, exposed to dust, and noise, have also been linked to the incidence of gastrointestinal diseases. Yet, research on the link between occupational exposure and the incidence of gastrointestinal illnesses is limited [33].

The findings of this study also show that 2.7% of the study sample had eye problems and 1% had hypertension compared to another study regarding the morbidity pattern among iron and steel workers, which observed that 5.5% of workers had eye problems and 23% of them had hypertension [6]. Occupational eye disorders or injuries can result from a variety of factors. The most significant component is the setting where people work or do their occupational tasks. While it is widely recognized that high-risk places include those near dangerous equipment or heavy machinery and those near hazardous chemicals or toxicants, extended screen exposure is also becoming a high-risk factor. Furthermore, poor management and a lack of focus on worker or employee safety have emerged as major factor in most incidents [34]. Moreover, Pang *et al.*'s study shows the prevalence of hypertension is 12.1% among mechanic factory workers [35].

Despite the fact that the situations and circumstances of workers in the studies mentioned above differ from those of the workers in this study, the workers at any workplace could be exposed to a variety of occupational hazards such as chemicals, biological agents, physical factors, poor ergonomic conditions, and a wide range of psychosocial factors, in addition to a vast system of safety risks. There are many harmful effects of occupational diseases and illnesses on human health, including respiratory disease, persistent cough, skin-related effects, reproductive effects, recurring trauma disorder, musculoskeletal problems, cancer, injuries brought on by cataract/poor vision, and genetic mutation brought on by nuclear radiation [36].

The risk factors in the workplace are also represented worldwide by several other forms of morbidity, "including 37% back pain, 16% hearing loss, 13% chronic obstructive lung disease, 11% asthma, 10% injuries, 9% cancer, and 2% leukemia" [37].

The present study shows a low percentage of morbidity patterns, with nearly 55% of workers having health problems, of which only 13% were unrelated to weight. Unfortunately, the reason for this is not clear. It could be because the sample is relatively young or because only diagnosed conditions were reported. This leads to the assumption that respondents who did not have access to healthcare or who did not utilize health care and those who did not have health charts would not have reported a health condition from which they suffered. Or perhaps people with health problems were less likely to be among the participating workers. Speculating about this is unwise. However, the low distribution of morbidity patterns among workers in this study may be because most of the factories that agreed to participate are new, and the majority of workers who participated in the survey were contracting (61.7%). They would probably not stay for a long time at the same job. Besides that, the duration of working or service in the factory was short, and most of the diseases needed a long time to appear. Furthermore, the probability of their working at the factory for a long time was low and most of the diseases only occurred after long service.

Concha-Barrientos *et al.* indicated the health problems initiated by the length of the latent period, the extent of the excess risk varies depending on the individual's age at the time of exposure, the length and intensity of the exposure, and other concurrent exposures [38]. Furthermore, Rushton's (2017) study about the "global burden of occupational disease" published by current environmental health reports stated significant data gaps were noticed, especially when it came to exposure data. Reliable data on employee disease are lacking, especially in developing countries [39].

Regarding the association between morbidity patterns and sociodemographic characteristics, this study revealed a highly significant association between morbidity patterns and age, BMI, number of working hours per week, and work duration per year. While the study found no significant relationship between morbidity patterns and gender or education level, we can indicate from this result that older age groups had higher percentages of morbidity patterns than those in lower age groups. This is consistent with Amabye, the study that found exposure to occupational risks and hazards significantly associated with age among workers [40].

The lower morbidity percentages were also observed for those who worked more than 48 h a week, those who had worked at the factory for fewer years, and those with a healthy weight. There is an evidence indicating an association between morbidity

pattern and age, number of working hours in a week, and duration of working per year, but no association with gender, as in Budhathoki's *et al.* study regarding morbidity among welders; the welders' morbidities were linked to their age, length of employment, and number of welding hours a day [17]. Mohankumar *et al.*, found a high link between the existence of any morbidity patterns with the type/nature of work they did and the diet they ate [18].

Despite the health problems initiated by the length of the latent period, the extent of the excess risk varies depending on the individual's age at the time of exposure, the length and intensity of the exposure, and other concurrent exposures [41]. PPE directly safeguards a person from hazards in the workplace. Further, the study shows that most workers used some form of PPE. Most of them wear gloves, masks, industry uniforms, work aprons, safety helmets, etc., protecting them from workplace hazards. Meanwhile, some of them did not pay attention to using PPE for reasons like ignorance about their usefulness, or they are not comfortable using it, and unavailability of PPE in the workplace. This might be because the industries have not had enough income to supply all workers with all protective equipment.

Several studies showed that workers clearly understand precautionary safety issues and the usage of PPE and that many use PPE, too [42]. In contrast, Budhathoki *et al.* observed a lack of awareness regarding workplace risks and the usage of PPE among welders [43]. Additionally, Ibrahim *et al.* identified that most workers did not use different types of PPE. Furthermore, workers' lack of PPE, ignorance, and not being comfortable with using PPE were the reasons for not wearing or using PPE [44].

In addition, some factories do not provide PPE or provide workers with only some types of PPE, such as gloves or masks; as this study finds, one of the reasons for not wearing PPT is that it was not available. Factories should mandate providing necessary PPE for their workers, and the workers should be educated and trained to use PPE too. If not, workers who did not use PPE at the workplace were more liable to get injured [45].

Limitations of the study

There were several limitations to the study. Occupational diseases have many possible causes, including lifestyle factors and a long latency period, making it difficult to prove whether the condition is work-related.

Many factories and companies refused to participate in the study due to the spread of the Covid-19 pandemic in Kurdistan as a precautionary measure to protect workers from exposure to the Coronavirus. In addition, the government in the Kurdistan Region has

closed the main roads between cities due to Covid-19 problems, which made it difficult for the researcher to move and go to the factories regularly.

Conclusion

The majority of the study sample experienced health issues, with being overweight being the most prevalent among industry workers, followed by obesity and musculoskeletal issues. In addition, there were associations between the pattern of morbidity and various sociodemographic factors, including age, BMI, the number of hours worked per week, and length of employment per year. To raise knowledge of issues related to occupational health and safety, educational health programs must be offered. Regular investigation and prompt action are required to safeguard the employee's health.

Inform Consent

Inform consent was obtained from all participants.

Provenance and Peer Review

Not commissioned, internally peer-reviewed.

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