

REVIEW ARTICLE

FACTORS ASSOCIATED WITH CUT INJURIES AMONG RESTAURANT WORKERS: A SYSTEMATIC REVIEW

Mohd Faheem Md Yid¹, Aasha Nagaraju¹, Khairul Nadzry Mohamad¹, Siti Raihan Binti Adnan¹, Rahmat Dapari^{*1}, Mohd Rohaizat Hassan², Nazri Che Dom³ and Syed Sharizman Syed Abdul Rahim⁴

¹Department of Community Health, Faculty of Medicine and Health Sciences, 43400 Universiti Putra Malaysia Serdang, Selangor, Malaysia.

²Department of Community Health, Faculty of Medicine, National University of Malaysia, 56000 Cheras, Kuala Lumpur, Malaysia.

³Faculty of Health Sciences, Universiti Teknologi MARA, 42300 Puncak Alam, Selangor, Malaysia.

⁴Public Health Medicine Department, Faculty of Medicine and Health Sciences, Universiti Malaysia Sabah, 88400 Kota Kinabalu, Sabah, Malaysia.

* Corresponding author: Rahmat Dapari

E-mail: drrahmat@upm.edu.my

ABSTRACT

The global food service market is projected to grow from USD\$2,540.05 billion in 2022 to USD\$5,194.60 billion by 2029, a Compound Annual Growth Rate (CAGR) of 10.76% in the forecast period. Because the industry is highly lucrative, it is critical to understand the prevalence and risk factors of work-related injuries among workers in this sector to implement safe working conditions and reduce costs associated with workplace injuries. However, it has been reported that restaurant or kitchen workers have high risks of work-related disease and injuries. In the United States, occupational injuries were estimated to cost the industry approximately USD\$250 billion in 2010, which were largely contributed by food production and food preparation industries (Forum, 2009). In this study, potential associated factors are job demands, physical stress and psychological stress. This systematic review aims to present and systematically determine the factors associated with cut injuries among restaurant workers. Articles related to factors associated with cut injuries among restaurant workers were collected electronically from three different databases (Medline, ScienceDirect and SpringerLink). Two pairs of independent reviewers screened the titles and abstracts of the collected data, stored in Microsoft Excel Version 16.68 against the inclusion and exclusion criteria. Afterwards, the included articles were critically appraised to assess the quality of the studies using the Mixed Method Appraisal Tool (MMAT). Of the 13 articles identified, four reports were included in the final review. The non-modifiable factors (gender and age) and modifiable factors (years of working experience, workplace environment and work description) are associated with cut injuries among restaurant workers. To reduce cut injuries among restaurant workers, safety and hazard reduction programs can be developed by tailoring it according to modifiable factors and non-modifiable factors.

Keywords: Cut injuries, restaurant workers, occupational injury

INTRODUCTION

The global food service market is projected to grow from USD\$2,540.05 billion in 2022 to USD\$5,194.60 billion by 2029, a Compound Annual Growth Rate (CAGR) of 10.76% in the forecast period¹. This huge market means that there is a significant demand for workers in the industry. As of September 2021, the number of workers in this sector was estimated at nearly 11.38 million people in the United States of America alone². Due to it being such a lucrative sector, it is important to understand the prevalence and risk factors of work-related injuries among workers in this industry.

Cut injury happens due to hazards in the workplace especially in high-risk workplaces such as restaurants and commercial kitchens. A cut is a break or opening of the skin³. Cuts are usually caused by a sharp object like a knife and glass. A deeper cut is called laceration and may cause jagged edges. Work-related cut injury is when a worker experiences cut injury resulting from an

occupational accident³. In a restaurant or kitchen, workers routinely use sharp tools such as knives, cleavers, grinders, and choppers. Due to this work nature, the workers are exposed to cut injuries. It has been reported that restaurant or kitchen workers have high risks of work-related diseases and injuries⁴. In the United States of America, the cost of occupational injuries was estimated at approximately USD\$250 billion in 2010 which was largely contributed by food production and food preparation industries⁵⁻⁶. Furthermore, injuries among food service workers that result in absenteeism will reduce productivity. In a report by the United States Department of Labor, a rate of 77.9 incidents per 10,000 workers resulted in work related injuries that required workers to take days away from work in 2017⁹.

It is important to identify factors affecting cut injury among workers in high-risk places such as restaurants because this information can be used to develop a better policy on work safety and hazard reduction programs to achieve safe work conditions. Hence, in this review, we aim to

present and systematically review the factors associated with cut injuries among restaurant workers.

METHODS

This systematic review is prepared in accordance with the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta Analyses) updated guideline. The objective of this review is to identify the factors associated with cut injuries among restaurant workers. The components of mnemonic PEO (population, exposure, outcome) were established as follows:

- Population: Restaurant workers
- Exposure: Factors associated with cut injuries
- Outcome: Cut injuries

Search Strategy

The literature search was conducted from 15th October 2022 until 30th November 2022, using Medline, ScienceDirect and SpringerLink databases. The following were keywords used for searching of related articles: “associated factor” OR “predictor” OR “determinant” OR “correlate” AND “cut injur” OR “laceration” OR “penetration” OR “abrasion” OR “puncture” OR “wound” AND “food worker” OR “food handler” AND “restaurant” OR “kitchen”. All retrieved articles were imported into Microsoft Excel Version 16.68 and any duplication was removed manually.

Eligibility Criteria

The inclusion criteria were: (1) publication in the English language; (2) original articles including cohort, case-control, and cross-sectional studies investigating the associated factors with cut injuries among restaurant workers. In contrast, mixed methods, and qualitative studies as well as non-original articles such as conference proceedings, perspectives, commentaries, opinions, reports, systematic reviews, and meta-

analyses were excluded. The publication period was taken from the year 2000 onwards to get adequate samples.

Study Selection

Two independent reviewers screened the titles and abstracts of the retrieved materials against the inclusion and exclusion criteria. The potential articles identified during the main screening were retained, and the full text of the studies were reviewed independently by the same reviewers in detail according to the inclusion and exclusion criteria. Another third reviewer were assigned to resolve any disagreements that arose between the first pair of reviewers.

Critical Appraisal and Data Extraction

Quality appraisal was conducted using the Mixed Method Appraisal Tool (MMAT)⁸. The MMAT evaluates the article quality. It focuses on methodological criteria and includes five core quality criteria for each of the selected articles⁸. One reviewer extracted the data, which was then assessed independently by the second reviewer. Eligible articles were analysed in detail using the content analysis method without any statistical tests.

RESULTS

The search yielded 137 articles from Medline, 52 articles from SpringerLink and 50 articles from ScienceDirect databases resulting in 239 unique hits. Only four articles were included in the full-text assessment after a rigorous selection screening, as shown in the PRISMA flow diagram (Figure 1). A descriptive summary of the included studies in this review vis a vis study location and design are presented in Table 1. The findings from four studies were included in this systematic review, as shown in Table 2. Of the eligible articles, two were from Japan and one each from Iran and South Korea. The analysed articles were published between 2000 and 2022. All articles selected were cross sectional studies.

Table 1. Summary of study location and study design

Authors, (Year)	Study Location	Study design
Tomita et al. (2013) ⁹	Japan	cross sectional studies.
Haruyama et al. (2014) ¹⁰	Japan	cross sectional studies.
Jahangiri et al. (2019) ¹¹	Iran	cross sectional studies.
Jeong, (2015) ¹²	South Korea	cross sectional studies.

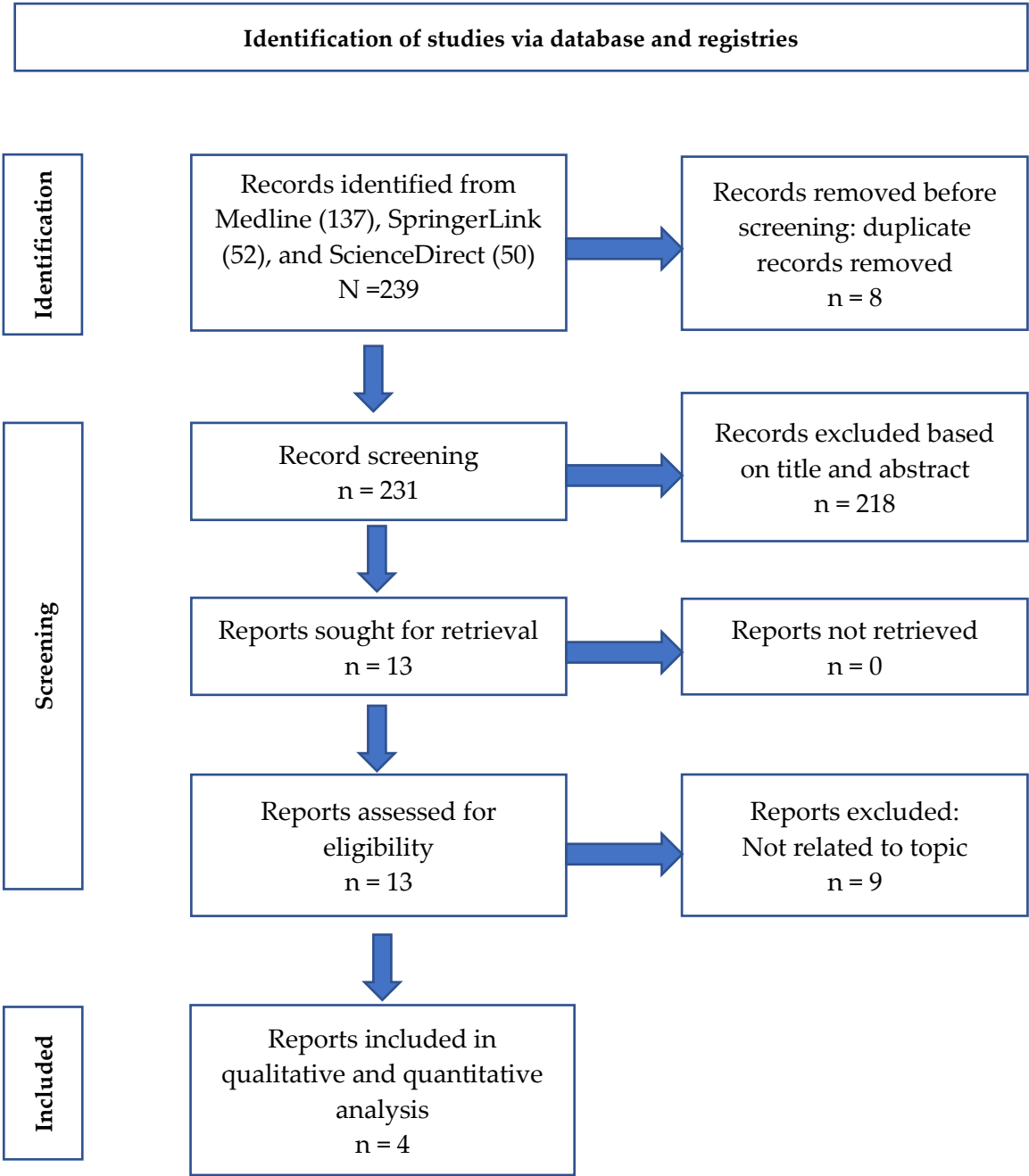


Figure 1. PRISMA flow diagram for the systematic review.

Table 2. Summary of accepted articles

Author (Year)	Title	Study Design	Sample Size	Population	Outcome	Risk Factors associated with cut injuries
Tomita et al. (2013) ⁹	Risk factors for frequent work-related burn and cut injuries and low back pain among commercial kitchen workers in Japan	Cross sectional	991	Kitchen workers in central Japan	1. Prevalence of cut injuries 2. Association of risk factors with work-related cut injuries	Gender: Female (25.3%) has higher prevalence than male (18.8%) and the odds are nearly twice as high in female (OR = 1.82, 95% CI = 0.95-3.50) than in male. Age: Workers aged less than 40 years old are associated with higher cut injuries (OR = 1.20, 95% CI = 0.75 - 1.94) Years of employment: Workers with less than 5 years of experience are associated with risk of cut injuries (OR = 1.41, 95% CI = 0.81-2.46). Meal production: Higher meal production (> 150 meals/day) has higher risk of being involved in cut injuries (OR = 1.65, 95% CI = 0.96-2.82) Kitchen area: Smaller kitchen increases risk of cut injuries among workers (OR = 1.25, 95% CI = 0.78-2.02)
Haruyama et al. (2014) ¹⁰	Burn and cut injuries related to job stress among kitchen workers in Japan	Cross sectional	991	Kitchen workers in Central Japan	1. Prevalence of cut injuries	Gender: Prevalence in females (25.3%) who had frequent cut injuries (> 5 times/year) were higher than males (18.8%) but prevalence of males (81.2%) having cut injuries fewer than 5 times per year were higher as compared to females (74.7%). However, this is statistically not significant (P = 0.083, 95% CI) Health condition: Workers who had arthralgia had higher risk of cut injuries (P = 0.014, 95% CI).

Author (Year)	Title	Study Design	Sample Size	Population	Outcome	Risk Factors associated with cut injuries
Jahangiri et al. (2019) ¹¹	Self-reported, work-related injuries and illnesses among restaurant workers in Shiraz city, south of Iran	Cross sectional	300	Restaurant workers in city of Shiraz, Iran	1. Association of cut injuries with socio-demographic factors 2. Association of cut injuries with job activities in the restaurant	Working experience: Least work experience associated with higher risk of cut injuries (P = 0.012, 95% CI). Job activities: Chef (53.7%, P < 0.001)) and kitchen workers (32.7%, P = 0.011) were associated with higher risk of cut injuries.
Jeong, (2015) ¹²	Cooking processes and occupational accidents in commercial restaurant kitchens	Cross sectional	100	Restaurant workers in South Korea	1. Prevalence of cut injuries according to work process	Work process: Workers who did food preparation had the highest prevalence of cut injuries (43.9%) followed by non-heated cooking process (21.8%) and dish washing and cleaning (13.9%).

Work-related Cut Injuries

In this review article, four studies that investigated work-related cut injury among restaurant workers were included⁹⁻¹². Factors that facilitate work-related cut injury among restaurant workers are divided into gender, age, years of working experience, kitchen environment and job activities. Most of the studies included in this review showed a significant effect on work-related cut injury. However, these studies did not discuss protective factors to prevent work-related cut injury.

Gender

Gender is associated with work-related cut injury. According to a study done in Japan, the prevalence of female injured at work (25.3%) is higher than male (18.8%)⁹. The odds of a female being injured at work is nearly two times higher than male (OR = 1.82)⁹. However, the study done in the same country showed that the prevalence of male injured at work (81.2%) is higher than female (74.7%) but it is statistically not significant¹⁰.

Age

Age has an impact on work-related cut injury among restaurant workers. A study in Japan showed that workers younger than 40 years old have a higher prevalence of cut injury⁹. This finding is consistent with study in Iran in which 75.4% of workers below 40 years old receive cut injury as compared to older workers¹¹. However, the study in South Korea found that more workers above 40 years old (74%) have work-related cut injury compared to younger workers (26%). This study found that there is a significant difference in the distributions of injured persons between cooking process and age ($\chi^2 = 115.767$, $P < 0.001$)¹².

Years of working experience

Three studies included in this systematic review had investigated the association between years of working experience with work-related cut injury incidents. It was found that less experienced workers are more susceptible to injuring themselves at work. Study in Japan found that the odds of workers who have working experience of less than 5 years getting injured at work is 1.41⁹. Meanwhile, according to study in Iran, there is a significant mean difference between workers who have experience of less than 2 years in the restaurant ($P = 0.012$)¹¹. This finding is also similar with the study in South Korea ($\chi^2 = 75.574$, $P < 0.001$)¹².

Kitchen environment

Kitchen environment plays an important risk factor role in work-related cut injury among restaurant workers. Kitchen environment includes kitchen size, floor conditions and type of kitchen. The study in Japan showed that the prevalence of cut injury is higher in smaller kitchens⁹. Contrary to this finding, the study in same country found

that the prevalence of cut injury is higher in larger kitchens¹⁰. However, both studies did not take into account the proportion of number of workers to kitchen size.

Job activities

Different job activities in the restaurant pose different risks of cut injury. For example, workers are divided according to their tasks such as cooking, food preparation, serving, dishwashing and waiting tables. The studies investigated the association of job activities with incidents of cut injury has found that cooking (51.3%, $P < 0.001$) and food preparation (30%, $P = 0.011$) have the highest risk of cut injury as compared to other job activities and are statistically significant¹¹. This finding is similar to the study among commercial restaurant kitchens which showed that workers who do food preparation (43.9%) have the highest prevalence of cut-injury¹³.

Risk of Bias

The authors conducted quality appraisal of all four studies using the Mixed Method Appraisal Tool (MMAT). The methodology quality of qualitative study can be appraised using this tool. Five criteria are used to assess the quality of the study⁸. The details of this assessment for the studies selected are reported in Table 3.

DISCUSSION

A few factors contributed to the cut injuries among restaurant workers. They were classified into three categories: (1) individual characteristics and (2) workplace environment and work description

Individual characteristics

There is a relationship between gender and an increased risk of cut injuries on the job. The study that was carried out in Japan found that the prevalence of female workplace injuries (25.3%) is higher than that of male workplace injuries (18.8%)⁹. The odds of a female worker being hurt on the job are nearly two times higher than the odds of a male worker getting harmed on the job (OR = 1.82)⁹. However, the study carried out by different researcher in Japan found that the prevalence of male workers being injured on the job is higher than that of female workers (81.2% versus 74.7%), but the difference is not statistically significant¹⁰. According to the studies that have been reviewed, gender difference has an associated risk of work-related cut injury and showed that the prevalence of female workers being injured at work is slightly higher than male workers. This might be due to various factors including stress and mental conflicts. There are no previous studies that directly studied cut injuries but in a previous study on lower back pain in kitchen, the higher risk of injuries among female workers has been linked to various reasons such as pregnancy, postmenopausal osteoporosis, and more domestic

work. It was thought that there were many workers who might be affected by postmenopausal osteoporosis. In addition, many of them were considered to be affected by household work as a housewife¹⁴. Other than that, study among 56,510 working Canadians aged 15 years and over found that for men, adjusting for job characteristics substantially reduced, but

did not eliminate the elevated risk status of adolescent and young adult workers. For women, only young adult women showed an elevated risk of work injury with job characteristics controlled¹⁵.

Table 3. Details of the MMAT assessment

Author	Type Study	1.1 Is the sampling strategy relevant to address the research question?	1.2 Is the sample representative of the population?	1.3 Are measurements appropriate?	1.4 Is the risk of bias low?	1.5 Is the statistical analysis appropriate to answer the research question?
Tomita et al. (2013) ⁹	Quantitative	Yes	No	Yes	Yes	Yes
Haruyama et al. (2014) ¹⁰	Quantitative	Yes	No	Yes	Yes	Yes
Jahangiri et al. (2019) ¹¹	Quantitative	Yes	Yes	Yes	Yes	Yes
Jeong, (2015) ¹²	Quantitative	Not mentioned	Yes	Yes	Nil	No

This systematic review analysed the findings of three separate studies that investigated the correlation between years of working experience and incidences of cut injuries that occurred on the job. It was discovered that people with less experience are more prone to injuring themselves while they are on the job. According to the research conducted, the probability of a person being hurt on the job is 1.41 if they have fewer than 5 years of experience in the workforce⁹. According to study in Iran, there is a statistically significant mean difference between employees who have less than 2 years of experience working in the restaurant ($P = 0.012$)¹¹. This finding is similarly consistent with study in South Korea ($X^2 = 75.574$, $P 0.001$)¹². Other studies mentioned that unskilled employees with a short duration of employment, workers who are not full-time employees and shift schedule workers have been shown to have a higher rate of work-related injuries¹⁶.

workplace environment and work description
When it comes to injuries suffered on the job because of cuts, the atmosphere of the kitchen is a significant risk factor. The environment of the kitchen includes the dimensions of the space, the state of the flooring, and the types of kitchens. According to the findings of the study conducted in Japan the incidence of cut injuries is significantly more common in kitchens with more limited space⁹. However, another study in similar country came to the opposite conclusion, showing that the occurrence of cut injuries is higher in kitchens that are larger in size¹⁰. However, neither of these studies considered the ratio of

the number of people working in the kitchen to the total square footage of the kitchen.

As stated in the study conducted Japan, scheduled overtime and lengthy working hours of more than 12 hours per day have a significant impact on work injuries⁹. Previous studies found a greater risk of work-related injuries in unskilled employees with a short period of employment, those who are not full-time workers, and shift schedule workers¹⁷.

Study in Japan showed that workers with high job demands and psychological and physical stress have much greater rates of burns and cuts¹⁰. Job stress has been linked to work-related injuries in the industrial business. Previous research found that occupational stress has a negative impact on job performance as well as cognitive functioning such as attention, activity, and memory. In the study, cuts are the most common incidents inflicting restaurant workers. Aside from restaurant and job type, the most common causes are knife cuts and shattered glass objects. As claimed by the workers' statements, the usage of knives and meat grinders is the cause of cuts and lacerations in this research¹¹.

Recommendation
Based on our findings, there are modifiable factors related to cut injuries among restaurant kitchen workers such as kitchen environment and working hours. Type of kitchen flooring, space area and work process arrangement in the kitchen can be improved during the planning phase. In terms of work process arrangement, restaurant managers may allocate a bigger space and better

equipment to the food preparation area. Furthermore, the risk of cut injuries can be reduced by using modern and safer equipment especially for grinding, cutting, and slicing.

As for less experienced workers, restaurant managers may assign them to less risky work first. This will reduce the risk of cut injuries among these workers. Furthermore, working hours should be revised by the manager. The manager may consider a shift system to provide better working hours for the workers with a higher risk of cut injuries. This is important as longer working hours increase the risk of work error, resulting in accidents.

It is important for each workplace to develop a risk reduction program according to the nature of workplace and hazard involved. One of the risk reduction programs that can be implemented is by training workers especially with those non-modifiable factors. Sending workers for courses to increase their knowledge and skills and master a better and safer technique is important. This better technique and knowledge can reduce the risk of cut injuries.

In addition, future systematic reviews could explore the variation in risk factors across different types of restaurants, such as fast food, fine dining, and casual dining, to provide a comprehensive understanding of how contextual differences influence cut injuries. These reviews could also assess the effectiveness of tailored interventions for each restaurant category to improve risk management practices across diverse settings. Furthermore, future systematic reviews could also include quantitative data on cut injury prevalence across different restaurant types. This would clarify the scope of the issue and highlight the need for targeted interventions.

Limitation

Although this review was based on a systematic and validated procedure, it has some limitations. The role of publication bias in this systematic review must be acknowledged as grey literature was not included. Furthermore, language bias should also be considered as we only included articles published in English, although our search strategy resulted in literature sourced from several countries where English is not the primary language (Indonesia, China and Japan). The factors identified are based on studies done in Asia, hence the findings might be different and not applicable to western countries. Despite these limitations, this systematic review synthesizes research evidence regarding the factors associated with cut injuries among restaurant workers, which may serve as a guide to improving delivery strategies for reducing cut injuries among restaurant workers.

CONCLUSIONS

Based on our findings, the identified factors that are associated with cut injuries among restaurant workers are gender, age, years of working experience, workplace environment and work description. These identified factors are important in order to reduce the rate of cut injuries among restaurant workers. Therefore, understanding the factors associated with this type of injury is critical. These findings may be utilised to improve the implementation of prevention programs of cut injuries among restaurant workers. This will maximise the successful reduction of cut injury rates among restaurant workers. However, the findings need to be re-evaluated for reduction of cut injuries among local restaurant workers.

Author Contributions:

Conceptualisation: RD, MRH, NCD, SSSAR

Methodology: MFMY, AN, KNM, SRA, RD, MRH, NCD, SSSAR

Writing—original draft: MFMY, AN, KNM, SRA, RD

Writing—review & editing: MFMY, AN, KNM, SRA, RD, MRH, NCD, SSSAR

Funding: This research received no external funding

Data Availability Statement: The data that support the findings of this study are available from the corresponding author upon reasonable request.

Conflicts of Interest: The authors declare no conflict of interest.

REFERENCES

1. Insight, F. B. (2022). *Food Service Market Size, Share & COVID-19 impact analysis, By Type (Full Service Restaurants, Quick Service Restaurants, Institutes, and others), By Service Tye (Commercial and Institutional), and Regional Forecast, 2022-2029* (FBI106277). <https://www.fortunebusinessinsights.com/food-service-market-106277>
2. Statista. (2022). *Food service industry in the U.S - Statistics & Facts*. https://www.statista.com/topics/4476/restaurant-and-foodservice-industry-in-the-us/#topicHeader__wrapper
3. Borke, J. (2021, 13 November 2021). *Cuts and Puncture wounds*. National Library of Medicine. Retrieved 22 December 2022 from <https://medlineplus.gov/ency/article/000043.htm#:~:text=A%20cut%20is%20a%20break,%2C%20blood%20vessels%2C%20or%20bone.>
4. Buchanan, S., Vossenas, P., Krause, N., Moriarty, J., Frumin, E., Shimek, J. A., Mirer,

- F., Orris, P., & Punnett, L. (2010). Occupational injury disparities in the US hotel industry. *Am J Ind Med*, 53(2), 116-125. <https://doi.org/10.1002/ajim.20724>
5. Leigh, J. P. (2011). Economic burden of occupational injury and illness in the United States. *Milbank Q*, 89(4), 728-772. <https://doi.org/10.1111/j.1468-0009.2011.00648.x>
6. Forum, I. o. M. U. F. (2009). *Managing Food Safety Practices from Farm to table: Workshop Summary*. National Academic Press (US). <https://www.ncbi.nlm.nih.gov/books/NBK26433/>
7. Statistics, U. S. B. o. L. (2019, 30 October 2019). *Injury and illness rates higher in special food services than in broader food services industry*. Retrieved 11 December 2022 from <https://www.bls.gov/opub/ted/2019/injury-and-illness-rates-higher-in-special-food-services-than-in-broader-food-services-industry.htm>
8. Hong, Q. N., Fàbregues, S., Bartlett, G., Boardman, F., Cargo, M., Dagenais, P., Gagnon, M.-P., Griffiths, F., Nicolau, B., O'Cathain, A., Rousseau, M.-C., Vedel, I., & Pluye, P. (2018). The Mixed Methods Appraisal Tool (MMAT) version 2018 for information professionals and researchers. *Education for Information*, 34, 1-7. <https://doi.org/10.3233/EFI-180221>
9. Tomita, S., Muto, T., Matsuzuki, H., Haruyama, Y., Ito, A., Muto, S., Haratani, T., Seo, A., Ayabe, M., & Katamoto, S. (2013). Risk factors for frequent work-related burn and cut injuries and low back pain among commercial kitchen workers in Japan. *Ind Health*, 51(3), 297-306. <https://doi.org/10.2486/indhealth.2012-0134>
10. Haruyama, Y., Matsuzuki, H., Tomita, S., Muto, T., Haratani, T., Muto, S., & Ito, A. (2014). Burn and cut injuries related to job stress among kitchen workers in Japan. *Ind Health*, 52(2), 113-120. <https://doi.org/10.2486/indhealth.2013-0143>
11. Jahangiri, M., Eskandari, F., Karimi, N., Hasanipour, S., Shakerian, M., & Zare, A. (2019). Self-Reported, Work-Related Injuries and Illnesses Among Restaurant Workers in Shiraz City, South of Iran. *Ann Glob Health*, 85(1). <https://doi.org/10.5334/aogh.2440>
12. Jeong, B. Y. (2015). Cooking processes and occupational accidents in commercial restaurant kitchens. *Safety Science*, 80, 87-93. <https://doi.org/https://doi.org/10.1016/j.ssci.2015.07.014>
13. Jeong, B. Y. (2015). Cooking processes and occupational accidents in commercial restaurant kitchens. *Safety Science*, 80, 87-93. <https://doi.org/https://doi.org/10.1016/j.ssci.2015.07.014>
14. Nagasu, M., Sakai, K., Ito, A., Tomita, S., Temmyo, Y., Ueno, M., & Miyagi, S. (2007). Prevalence and risk factors for low back pain among professional cooks working in school lunch services. *BMC Public Health*, 7, 171. <https://doi.org/10.1186/1471-2458-7-171>
15. Breslin FC, Smith P. Age-related differences in work injuries: a multivariate, population-based study. *Am J Ind Med*. 2005 Jul;48(1):50-6. doi: 10.1002/ajim.20185. PMID: 15940721.
16. Chau, N., Wild, P., Dehaene, D., Benamghar, L., Mur, J. M., & Touron, C. (2010). Roles of age, length of service and job in work-related injury: a prospective study of 446 120 person-years in railway workers. *Occup Environ Med*, 67(3), 147-153. <https://doi.org/10.1136/oem.2008.043281>
17. Lee WT, Lim SS, Kim J, Yun S, Yoon JH, Won JU. Work Schedule Irregularity and the Risk of Work-Related Injury among Korean Manual Workers. *Int J Environ Res Public Health*. 2020 Oct 19;17(20):7617. doi: 10.3390/ijerph17207617. PMID: 33086683; PMCID: PMC7589804.