REFLECTION JOURNAL
https://journal-center.litpam.com/index.php/RJ
reflectionjournal21@gmail.com

Maret, 2026 Vol. 6, No. 1
e-ISSN: 2808-1501
pp. 14-26

Workload Dimensions of Kitchen Workers and Their Health Impacts: A Systematic Review Based on NASA-TLX

Neli Witasari[1], Yuniar Wardani[2], Widodo Hariyono[3]
[1]Magister Kesehatan Masyarakat, Fakultas Kesehatan Masyarakat, Universitas Ahmad Dahlan,
[2]Fakultas Kesehatan Masyarakat, Ahmad Dahlan, Yogyakarta
[3]Fakultas Kesehatan Masyarakat, Universitas Ahmad Dahlan, Yogyakarta, Indonesia
*Correspondence e-mail:: 2408053037@webmail.uad.ac.id

Accepted: December 2025; Revised: January 2025; Published: March 2024

Abstract

Kitchen workers face significant workloads due to exposure to high temperatures, long working hours, and non-ergonomic postures, putting them at risk of fatigue, musculoskeletal disorders, heat stress, and chronic exhaustion. This study aims to summarize the latest findings on the impact of workloads on kitchen workers based on the six dimensions of NASA-TLX. The study design is a quantitative systematic review of the last five years through PubMed and Google Scholar, following the PRISMA guidelines for the selection process. A total of 11 articles met the inclusion criteria. The results show that physical workload, including prolonged standing, repetitive movements, and non-ergonomic postures, is significantly associated with musculoskeletal disorders, with a prevalence of 92.3%. Working hours exceeding 8 hours are linked to fatigue, increased presenteeism, and a decreased quality of life, while heat stress was reported as a major health concern. Support from coworkers was found to mitigate the impact of physical and psychosocial workload. In conclusion, improvements in ergonomics, work hours and shift arrangements, increased ventilation, and enhanced psychosocial support are necessary to mitigate health risks associated with excessive workloads among kitchen workers.

Keywords: mental workload, kitchen workers, NASA-TLX, ergonomic factors, heat stress.

***How to** Cite:* Witasari, N., Wardani, Y. ., & Hariyono, W. H. (2026). Workload Dimensions of Kitchen Workers and Their Health Impacts: A Systematic Review Based on NASA-TLX. *Reflection Journal*, *6*(1), 14-26. https://doi.org/10.36312/rzkc5b96

https://doi.org/10.36312/rzkc5b96

INTRODUCTION

Kitchens are central workspaces in food preparation and processing, serving a crucial role in sectors such as catering services, restaurants, hotels, hospitals, and institutional food services. While kitchens are essential for ensuring food quality and safety, they are also recognized as high-risk occupational environments. The combination of intensive manual tasks, specialized equipment, and demanding environmental conditions exposes kitchen workers to various occupational hazards, making kitchen work an important concern in occupational safety and health studies.

Kitchen workers are routinely exposed to physical, chemical, and biological hazards arising from daily work activities and workplace conditions. Common occupational accidents include slips and falls due to wet or greasy floors, burns from heat, steam, and open flames, cuts caused by sharp tools, and fire-related incidents. Additional risks include electrical hazards, unsafe equipment operation, food contamination, and improper storage of food materials. These hazards may lead to minor injuries as well as serious injuries and, in severe cases, fatalities. In the United States, approximately half a million kitchen-related accidents occur each year, or about 1,300 incidents per day, including minor cases that do not require medical treatment (Grambart, 2024). This

evidence indicates that kitchens represent high-risk workplaces requiring systematic attention in occupational safety and health management.

Occupational risks in kitchen environments are further intensified by the nature of kitchen work, which is characterized by high workload demands. Kitchen workers, particularly professional cooks, often work in shift systems, perform long working hours, and operate under fast-paced conditions with high pressure during peak service periods. Most kitchen workers are employed full-time, although part-time workers also experience high work intensity (U.S. Bureau of Labor Statistics, 2025). At the global level, occupational safety and health remain critical issues. The International Labour Organization (ILO) reported that approximately 395 million workers experienced non-fatal occupational injuries in 2023, while in 2024 around 2.41 billion workers were exposed to excessive heat at work (International Labour Organization, 2025). Heat exposure is a defining characteristic of professional kitchens, placing kitchen workers among occupational groups that are particularly vulnerable to work-related health problems.

In this context, workload is a key concept for understanding the working conditions of kitchen workers. Workload refers to the level of physical, mental, and temporal demands imposed on workers within a given period (Hung et al., 2025). It reflects the volume, complexity, and intensity of tasks that must be completed and includes physical, cognitive, and emotional demands. Excessive workload has been associated with increased fatigue, work-related strain, reduced performance, and a higher risk of burnout when not adequately managed (Weni et al., 2023; Chireh et al., 2025). In kitchen work, which requires multitasking, strict time control, and sustained physical endurance, workload should be understood as a multidimensional construct rather than a purely physical burden.

One of the most widely used instruments for assessing perceived workload is the NASA Task Load Index (NASA-TLX). NASA-TLX measures workload through six dimensions: mental demand, physical demand, temporal demand, performance, effort, and frustration (NASA, 2020; Said et al., 2020). Developed by Hart and Staveland, this instrument was designed to assess subjective workload in complex work systems. NASA-TLX produces an overall workload score based on the weighted contribution of each dimension (Cao et al., 2014). Due to its ability to capture cognitive, physical, and emotional aspects simultaneously, NASA-TLX has been widely applied in high-demand occupational settings (Wilson et al., 2011; Zehnder et al., 2020; Bell et al., 2022).

The multidimensional framework of NASA-TLX is particularly relevant to kitchen work. Kitchen tasks require sustained attention, rapid decision-making, effective team coordination, and strict time management. Previous studies have shown that NASA-TLX effectively captures variations in workload in high-pressure environments, including contexts with characteristics similar to professional kitchens, such as healthcare services and operating rooms (Zehnder et al., 2020; Bell et al., 2022; Junaedi et al., 2020). These findings suggest that NASA-TLX is a suitable framework for analyzing workload dimensions among kitchen workers.

Each NASA-TLX dimension has specific relevance in kitchen work. Mental demand reflects cognitive effort related to multitasking and decision-making. Physical demand represents prolonged standing, manual handling, and repetitive movements, which are associated with musculoskeletal strain. Temporal demand reflects time pressure, particularly during peak service hours. Effort describes the perceived level of exertion required to complete tasks, while frustration represents emotional responses to work pressure. Performance reflects workers' perceptions of task effectiveness. Together, these dimensions explain how workload demands may lead to work-related strain and subsequent health and performance outcomes.

Previous studies have reported consistent associations between workload dimensions and adverse outcomes. High physical demand is associated with musculoskeletal complaints among kitchen workers, while high mental and temporal demands contribute to fatigue and burnout, leading to reduced job performance and job satisfaction. Additionally, high effort and frustration are linked to presenteeism, where workers continue working despite health problems, negatively affecting productivity and service quality.

Despite increasing research on kitchen workload, systematic synthesis using a multidimensional framework such as NASA-TLX remains limited. Existing studies often emphasize physical workload, while mental, temporal, and emotional dimensions are less frequently examined in an integrated manner. This limitation highlights the need for a comprehensive review to clarify dominant workload dimensions and their relationships with work-related strain and health, safety, and performance outcomes.

Therefore, this systematic review aims to: (1) identify how the workload dimensions of kitchen workers are described in the literature, (2) examine which workload dimensions are most dominant, and (3) analyze the associations between workload dimensions and health, safety, and performance outcomes. By synthesizing findings based on the NASA-TLX framework, this review is expected to provide evidence-based insights to support occupational safety and health management in the culinary sector.

METHODS

This study employed a systematic literature review to identify and analyze workload characteristics among kitchen workers based on the dimensions of the NASA Task Load Index (NASA-TLX). The review process was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines to ensure transparency, rigor, and reproducibility in article identification, screening, and selection (Page et al., 2021).

Data Sources and Search Strategy

A comprehensive literature search was carried out using PubMed and Google Scholar databases. The search covered peer-reviewed publications published between 2020 and 2025. Keywords were developed using the PEO (Population–Exposure–Outcome) framework to structure the research question and search strategy (Audrey, 2025). The main search terms included combinations of *"workload"*, *"kitchen workers" OR "cooks" OR "chefs"*, and *"workload burden"*. Boolean operators were applied to refine the search and increase retrieval relevance.

The PEO framework was defined as follows: the population consisted of kitchen workers or cooks working in commercial kitchens or catering services; the exposure referred to workload as measured or conceptualized through NASA-TLX dimensions (physical, mental, temporal, effort, and frustration); and the outcomes included physical fatigue, work-related diseases, stress, burnout, and presenteeism. Based on this framework, the primary research question guiding the review was: *What are the impacts of excessive workload on kitchen workers or cooks?*

Inclusion and Exclusion Criteria

Clear inclusion and exclusion criteria were applied to ensure the relevance and quality of selected studies. Studies were included if they: (1) employed a quantitative primary research design; (2) involved kitchen workers or cooks, including chefs and professional cooks; (3) assessed workload or workload-related impacts aligned with NASA-TLX dimensions (mental, physical, temporal, performance, effort, and frustration); (4) were published between 2020 and 2025; (5) were available in full-text format; and (6) were written in English or Indonesian.

Studies were excluded if they: (1) were review articles, opinion papers, case reports, experimental studies, or qualitative and mixed-method designs; (2) involved occupational groups other than kitchen workers, such as waitstaff, food distribution workers, or administrative staff; or (3) reported outcomes unrelated to workload dimensions, such as health conditions not associated with work-related demands.

Operational Definitions

Key concepts were defined to ensure consistency across the review. Kitchen workers or cooks were defined as individuals, either professional or non-professional, engaged in food preparation activities in commercial kitchens, including ingredient preparation, cooking processes, equipment handling, and workplace sanitation. Workload referred to the level of physical, mental, and temporal demands imposed on workers during task performance. Work-related strain represented physiological and psychological responses resulting from excessive workload, including fatigue, stress, and burnout. Health and performance outcomes included musculoskeletal complaints, burnout, presenteeism, and perceived work performance.

Article Selection Process

The initial search yielded 726 articles, comprising 31 from PubMed and 695 from Google Scholar. After removing duplicate records (n = 12), titles and abstracts were screened, resulting in 38 potentially relevant articles. Full-text assessment led to the exclusion of articles due to incomplete data (n = 3), remaining duplication (n = 4), and population mismatch (n = 7). Ultimately, 11 studies met all inclusion criteria and were included in the final synthesis. The selection process is illustrated using a PRISMA flow diagram.

Data Extraction and Synthesis

Data were extracted using a structured summary form that included author names, publication year, study design, sample size, measurement instruments, and key findings related to workload dimensions. The extracted data were synthesized narratively by grouping findings according to the NASA-TLX workload dimensions. This approach facilitated the identification of recurring patterns and cross-study consistency without conducting a meta-analysis. Results were organized in comparative tables to enhance clarity and interpretation.

Data Analysis

Data analysis was conducted using a descriptive–narrative approach by comparing findings across studies based on NASA-TLX workload dimensions. The analysis focused on identifying dominant workload demands, associated work-related strain, and subsequent health and performance outcomes among kitchen workers. A meta-analysis was not performed due to heterogeneity in study designs, measurement tools, and outcome indicators.

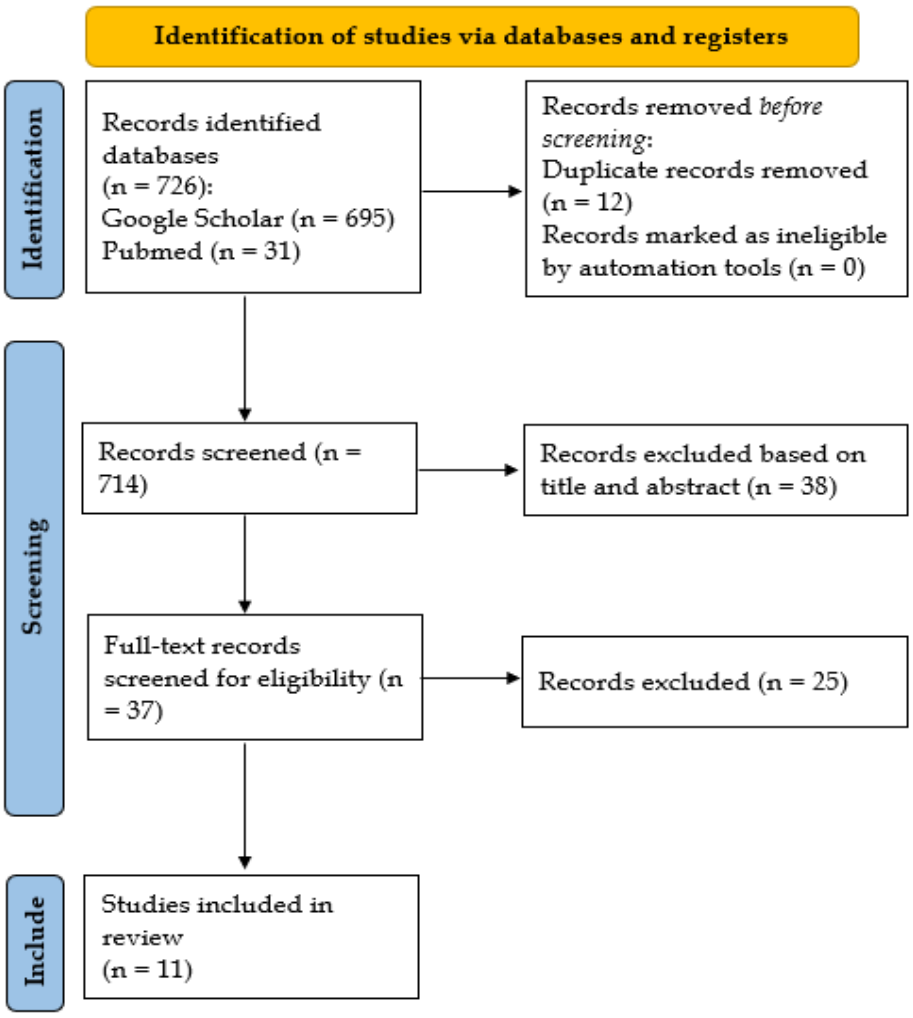

Figure 1. PRISMA diagram

RESULTS AND DISCUSSION

This systematic review synthesizes empirical evidence on the workload experienced by kitchen workers and its implications for health, safety, and work performance. Across the reviewed studies, kitchen work consistently emerged as a high-demand occupation characterized by substantial physical, mental, temporal, effort-related, and emotional (frustration) demands, as conceptualized within the NASA Task Load Index (NASA-TLX) framework. These workload dimensions were found to interact and collectively contribute to work-related strain, which in turn influenced a range of adverse health and performance outcomes.

Professional kitchens represent dynamic and intensive work environments where workers are required to maintain productivity, speed, and accuracy under conditions of heat exposure, time pressure, and limited recovery opportunities. The synthesis of findings indicates that workload among kitchen workers cannot be understood through a single dimension; rather, it reflects a multidimensional burden that affects physical health, mental well-being, emotional stability, and overall job performance.

Synthesis of Included Studies

Table 1 presents a structured synthesis of the included studies, highlighting key characteristics, measurement instruments, major findings, and the dominant NASA-TLX workload dimensions identified in each study.

Table 1. Synthesis of Empirical Studies on Kitchen Workers' Workload and Health Outcomes

Author & Year	Country, Sample, Design	Instruments	Key Findings	Dominant NASA-TLX Dimensions
Alagöz et al., 2025	Turkey; n=387; survey	WO Scale, UWES-3, SPS-6	Excessive workload increased presenteeism; coworker support mitigated negative effects	Physical, Mental, Temporal
Rehman et al., 2025	Pakistan; n=169; cross-sectional	NMQ, FAS	High MSD prevalence (50–54% neck, back, shoulder); 38.3% fatigue; need for ergonomic improvement	Physical, Mental, Temporal, Effort, Frustration
Melaku et al., 2024	Ethiopia; n=605; cross-sectional	HOTHAPS, WBGT	67.1% experienced heat stress; poor ventilation and high temperature increased fatigue and dizziness	Physical, Effort
Abebaw et al., 2024	Ethiopia; n=422; cross-sectional	NMQ, SF-36	WMSD prevalence 82.7%; risk factors included prolonged standing and awkward reach	Physical, Temporal
Park et al., 2021	South Korea; n=1,909; cross-sectional	KWCS Questionnaire	Insufficient rest increased MSD risk by 57.6%; women more vulnerable	Physical, Temporal
Geyser et al., 2023	South Africa; n=150; comparative cross-sectional	CBI	Shifts >8 hours significantly increased burnout and personal fatigue	Temporal, Effort, Mental, Physical
Nazar et al., 2023	Pakistan; n=178; cross-sectional	NPRS	63.5% worked 8–10 hours/day; 58.4% reported mild pain	Physical, Effort
Kohli et al., 2022	India; n=30; descriptive quantitative	Occupational hazard questionnaire	100% heat stress; 70% muscle tension; 53% low back pain	Physical, Mental, Temporal, Effort, Frustration
Tan et al., 2021	Malaysia; n=104; cross-sectional	DMQ	MSD prevalence 92.3%; ergonomic posture and	Physical, Temporal, Effort

Author & Year	Country, Sample, Design	Instruments	Key Findings	Dominant NASA-TLX Dimensions
			repetitive motion as key risks	
Cerasa et al., 2020	Italy; n=710; cross-sectional	JCQ, ERI, SF-36	47% reported ≥2 health complaints; stress mediated workload–QoL relationship	Mental, Temporal, Effort, Frustration
Ariani et al., 2022	Indonesia; n=134; cross-sectional	Demographic & work questionnaire	Standing >8 hours increased varicose vein risk 3.7 times	Physical, Temporal

The synthesis demonstrates that physical demand is the most frequently reported workload dimension, followed by temporal and mental demands. However, effort and frustration also emerged as critical contributors to work-related strain, particularly in studies addressing burnout, presenteeism, and reduced quality of life.

Physical Demand and Musculoskeletal Strain

Physical demand was the most dominant workload dimension identified across the reviewed studies. Kitchen work involves prolonged standing, repetitive upper-limb movements, manual material handling, and sustained awkward postures, all of which are well-established risk factors for musculoskeletal disorders (MSDs). High prevalence rates of MSDs were consistently reported, ranging from moderate discomfort to chronic pain affecting the neck, shoulders, back, and lower extremities.

Rehman et al. (2025) reported that more than half of kitchen workers experienced musculoskeletal complaints in critical body regions, while Kohli et al. (2022) found that 70% of participants reported muscle tension and over half experienced lower back pain. These findings are consistent with Abebaw et al. (2024) and Tan et al. (2021), who identified prolonged standing and repetitive movements as primary contributors to physical strain.

In addition to biomechanical stressors, thermal exposure significantly amplified physical workload. Melaku et al. (2024) reported that over two-thirds of kitchen workers experienced heat stress, particularly in poorly ventilated environments. Heat exposure exacerbates fatigue, dehydration, and muscular discomfort, thereby accelerating physical exhaustion and reducing work tolerance. From an ergonomic perspective, excessive physical demand represents a critical pathway through which workload leads to work-related strain and adverse health outcomes.

Temporal Demand and Time Pressure

Temporal demand emerged as another dominant workload dimension, reflecting the intense time pressure experienced by kitchen workers, particularly during peak service hours. The requirement to prepare and serve food rapidly, often under strict deadlines, leaves little opportunity for rest or recovery. Several studies highlighted that long working hours, extended shifts, and insufficient breaks significantly increased health risks.

Park et al. (2021) demonstrated that inadequate rest periods were associated with a substantially higher risk of MSDs, while Geyser et al. (2023) found that working shifts longer than eight hours significantly increased burnout and emotional fatigue. Temporal demand not only intensifies physical exertion but also compounds mental and emotional strain, as workers must maintain speed and accuracy simultaneously.

Time pressure also encourages maladaptive work behaviors, such as skipping breaks or working through pain, which further elevates the risk of cumulative fatigue and injury. These findings underscore temporal demand as a central workload dimension that directly contributes to both short-term strain and long-term health deterioration.

Mental Demand and Cognitive Load

Kitchen work requires sustained attention, rapid decision-making, multitasking, and effective coordination among team members. High mental demand was reported in several studies, particularly those examining stress, burnout, and perceived workload. Mental workload arises from the need to process multiple orders simultaneously, manage workflow disruptions, and maintain quality standards under pressure.

High cognitive load has been associated with mental fatigue, reduced concentration, and increased likelihood of errors. When combined with physical exhaustion and time pressure, elevated mental demand may accelerate the onset of burnout and reduce job satisfaction. Cerasa et al. (2020) highlighted that stress mediated the relationship between workload and quality of life, suggesting that mental strain plays a pivotal role in translating workload demands into adverse outcomes.

Effort, Frustration, and Emotional Strain

The effort dimension reflects the perceived level of physical and mental exertion required to complete tasks. Studies such as Kohli et al. (2022) and Nazar et al. (2023) reported that excessive effort was associated with headaches, muscle fatigue, and general exhaustion. High effort often indicates an imbalance between job demands and available resources, which increases vulnerability to burnout.

Frustration, as an emotional dimension of workload, was less frequently measured but emerged as a critical factor influencing job satisfaction and presenteeism. High frustration levels were linked to feelings of stress, dissatisfaction, and emotional exhaustion. Alagöz et al. (2025) demonstrated that excessive workload increased presenteeism, while social support from coworkers reduced its negative impact. This finding emphasizes the importance of psychosocial factors in moderating workload-related strain.

Health and Work Performance Outcomes

Across the reviewed studies, excessive workload was consistently associated with adverse health and performance outcomes, including MSDs, fatigue, stress, burnout, and presenteeism. Workers experiencing high workload demands were more likely to report reduced productivity, lower job satisfaction, and diminished service quality. Presenteeism emerged as a particularly concerning outcome, as workers continued working despite health problems, potentially compromising both personal well-being and organizational performance.

The findings suggest a clear pathway: high workload demands → work-related strain → negative health and performance outcomes. This pathway highlights the cumulative nature of workload exposure and underscores the importance of early intervention.

Implications and Recommendations

Based on the synthesized evidence, several intervention strategies are recommended:

1. Ergonomic improvements: Optimizing kitchen layout, providing adjustable workstations, and introducing ergonomic tools can reduce physical demand and musculoskeletal strain.

2. Work time management: Ensuring adequate rest breaks and balanced shift schedules can mitigate temporal demand and fatigue.
3. Stress management training: Programs aimed at enhancing coping strategies may reduce mental strain and frustration.
4. Psychosocial support: Supportive leadership and positive coworker relationships can buffer the negative effects of high workload.
5. Regular health monitoring: Routine health assessments and wellness programs can help identify early signs of workload-related health problems.

Kitchen workers experience high multidimensional workload, encompassing physical, mental, temporal, effort-related, and emotional demands. These workload dimensions collectively contribute to work-related strain, leading to adverse health and performance outcomes such as MSDs, burnout, and presenteeism. Addressing these challenges requires integrated interventions targeting ergonomic, organizational, and psychosocial factors. Improving workload management is essential not only for protecting workers' health but also for enhancing productivity and service quality in the culinary sector.

CONCLUSION

This literature review demonstrates that kitchen workers are exposed to a substantially high workload that adversely affects both their physical and mental health. Physical workload characterized by prolonged standing, repetitive movements, and non-ergonomic working postures contributes significantly to the high prevalence of musculoskeletal disorders (MSDs), with reported rates reaching up to 92.3%. In addition, high time pressure and extended working hours, particularly shifts exceeding eight hours per day, increase the risk of fatigue, burnout, and presenteeism, ultimately leading to a decline in workers' quality of life and job performance. Heat stress in kitchen environments also emerges as a critical occupational health issue, resulting in symptoms such as exhaustion, dizziness, and muscle cramps. Importantly, psychosocial support, especially from coworkers, has been shown to mitigate the negative effects of physical and mental workload and to enhance overall worker well-being. Therefore, improvements in ergonomic kitchen design, more effective management of working time, and the provision of adequate psychosocial support are essential to reduce workload-related risks among kitchen workers. This review underscores the importance of adopting a multidimensional approach to workload assessment in kitchen settings by integrating physical, mental, temporal, and psychosocial factors. Further empirical research employing the NASA-TLX instrument directly is recommended to obtain a more comprehensive understanding of kitchen workers' workload and its implications for health and work outcomes.

RECOMMENDATIONS

Based on the findings of this review, several integrated recommendations can be proposed to improve the well-being of kitchen workers and to mitigate the negative impacts of excessive workload. First, ergonomic improvements in kitchen layout and work equipment should be prioritized, including adjustable worktables, ergonomically designed tools, and optimized workstation arrangements, to reduce physical strain associated with prolonged standing, repetitive movements, and awkward postures that commonly lead to musculoskeletal disorders. Second, better management of working time and shift schedules is essential; implementing adequate rest breaks, avoiding shifts exceeding eight hours, and ensuring balanced workload distribution can help reduce fatigue, stress, burnout, and presenteeism. Improving kitchen ventilation and thermal control systems is also strongly recommended to minimize heat exposure and prevent

heat stress, which poses significant risks to workers' physical health. In addition, stress management training should be provided to equip workers with coping strategies for high mental demands, multitasking requirements, and time pressure inherent in kitchen work. Psychosocial support from supervisors and coworkers should be strengthened through supportive leadership, effective communication, and conflict management practices, as such support has been shown to buffer the adverse effects of high workload and enhance job satisfaction. Finally, regular health and nutrition education programs are recommended to support workers' physical resilience and overall well-being. For future research, the direct application of the NASA-TLX instrument and longitudinal study designs are recommended to capture workload dimensions more precisely and to examine the long-term effects of excessive workload on health and work outcomes among kitchen workers.

BIBLIOGRAPHY

Abebaw, T., Destaw, B., Yenealem, D. G., Tesfaye, A. H., Melaku, C., Mamaye, Y., Bezie, A. E., & Abere, G. (2024). Work-related Musculoskeletal Disorders: Prevalence, Associated Factors , and Impact on Quality of Life Among Kitchen Workers in Hospitality Industry , Bahir Dar City , Northwest Ethiopia , 2023. *Frontiers*, *12*(May), 1–13. https://doi.org/10.3389/fpubh.2024.1358867

As'adi, M. and Rizal, R. (2023). Mental workload analysis using NASA-TLX method and Maslach burnout inventory at PT. XYZ (East Kalimantan Exitu Dumping Case Study). Technium: Romanian Journal of Applied Sciences and Technology, 17, 387-395. https://doi.org/10.47577/technium.v17i.10112

Arefian, S., Laybidi, M. I., Vahedi, M., Melloh, M., & Mokhtarinia, H. R. (2025). Impact of mental and physical workload on work function in office workers with musculoskeletal disorders. BMC Musculoskeletal Disorders, 26(1). https://doi.org/10.1186/s12891-025-09147-0

Alagöz, G., Pekerşen, Y., & Baybal, S. (2025). The effect of work overload on presenteeism of chefs: A moderated mediation model of colleague support and work engagement. *European Journal of Tourism Research*, *d*, 1–27. https://doi.org/10.54055/ejtr.v40i.3720.

Ariani, Vera; Novendy, N. (2022). Pengaruh Berdiri Lama Saat Bekerja dengan Kejadian Varises Vena Tungkai Bawah pada Juru Masak. *E-Journal Untar*, *28*(1), 92–100. https://doi.org/10.24912/ep.v28i1.19425

Audrey, Q. (2025). *PEO Framework for Developing Answerable Research Questions | A Guide to Formulating Qualitative and Quantitative Research Questions with PICO and Literature Searching*. https://systematicliteraturereviews.com/peo-framework

Aunang, D. C., Suoth, L. F., Punuh, M. I., Kesehatan, F., Universitas, M., & Ratulangi, S. (2019). Hubungan Antara Beban Kerja Fisik dan Status Gizi dengan Kelelahan Kerja pada Pekerja Bagian Produksi di PT. Industri Kapal Indonesia (Persero) Kota Bitung. *KESMAS*, *8*(7), 388–394.

Bell, S., Kong, J. C., Clark, D. A., Carne, P., Skinner, S., Pillinger, S., … & Brown, W. A. (2022). The National Aeronautics and Space Administration-task load index: NASA-TLX: evaluation of its use in surgery. ANZ Journal of Surgery, 92(11), 3022-3028. https://doi.org/10.1111/ans.17830

Cao, Al., Chintamani, K. K., & Pandya, Abhilash K.Ellis, R. D. (2014). *NASA TLX : Software for assessing subjective mental workload*. *March 2009*. https://doi.org/10.3758/BRM.41.1.113

Cerasa, A., Fabbricatore, C., Ferraro, G., Pozzulo, R., Martino, I., & Liuzza, M. T. (2020). Work-Related Stress Among Chefs: A Predictive Model of Health Complaints.

Frontiers in Public Health, *8*(March), 1–8. https://doi.org/10.3389/fpubh.2020.00068

Chireh, B., Kwaku, S., Swerhun, K., Arcy, C. D., & Acharibasam, J. W. (2025). Workplace Stressors and Mental Health Outcomes Among Personal Support Workers: A systematic review. *International Journal of Nursing Studies*, *168*(September 2024), 105093. https://doi.org/10.1016/j.ijnurstu.2025.105093

Dunn, T. J., Terao, M., Blazin, L., Spraker-Perlman, H., Baker, J. N., Mandrell, B. N., … & Burlison, J. D. (2021). Associations of Job Demands and Patient Safety Event Involvement on Burnout among a Multidisciplinary Group of Pediatric Hematology/Oncology Clinicians.. https://doi.org/10.22541/au.161783002.23803990/v1

Farihatin, A., & Subandriani, D. N. (2023). Hubungan Status Gizi, Beban Kerja, Asupan Energi Dan Zat Gizi Makronutrien Dengan Kelelahan Kerja Pada Tenaga Produksi Di Pt. Selaras Citra Lestari Bawen. *Journal of Comprehensive Science*, *2*(6), 1907–1920. https://doi.org/10.31983/jrg.v10i2.10744

Geyser, I., Wakelin-Theron, N., & Esterhuyse, N. (2023). The influence of work shifts on burnout for millennial chefs in The Western Cape , South Africa. *Journal of Applied Sciences in Travel and Hospitality*, *6*(2), 60–71. https://doi.org/10.31940/jasth.v6i2.60-71

Grier, R. A. (2015). How High is High? A Meta-Analysis of NASA-TLX Global Workload Scores. Proceedings of the Human Factors and Ergonomics Society Annual Meeting, 59(1), 1727-1731. https://doi.org/10.1177/1541931215591373

Grambart, R. M. (2024). *10 Kitchen Accident Statistics, Trends, and Predictions for 2024*. Https://Www.Worldcoppersmith.Com/. https://www.worldcoppersmith.com/articles/kitchen-accidents-statistics

Hidayati, S., Hendarta, A. S. D., & Dewita, T. (2023). Hubungan Status Gizi, Stres Kerja, dan Beban Kerja dengan Kelelahan Kerja pada Pekerja di PT. X Kota Batam Tahun 2023. *Journal Occupational Health Hygiene Adn Safety*, *1*(1), 75–83. https://doi.org/10.60074/johhs.v1i1.8706

Harris, D., Wilson, M. C., & Vine, S. J. (2019). Development and validation of a simulation workload measure: The Simulation Task Load Index (SIM-TLX).. https://doi.org/10.31234/osf.io/pm5ht

Hung, W., Chang, I., & Hsiao, Y. (2025). The impact of workload and emotional demands on turnover intentions: The mediating and moderating effects of job burnout. *Frontiers in Psychology*, *December*. https://doi.org/10.3389/fpsyg.2025.1699421

International Labor Organization (ILO). (2025). *Safety and health at work*. Https://Www.Ilo.Org/. https://www.ilo.org/topics-and-sectors/safety-and-health-work

Isseldyk, F. V., Chavalparit, P., Bassani, J., Sattler, L., Serra, M. V., Leal, J. S., … & Kim, J. S. (2025). Low-Cost Augmented Reality System in Endoscopic Spine Surgery: Analysis of Surgeon Ergonomics, Perceived Workload and A Step-by-Step Guide for Implementation. Global Spine Journal. https://doi.org/10.1177/21925682251359298

Junaedi, D., Rizkiyah, N. D., & Pratya, D. B. (2020). Determination of the Optimal Number of Workers Usingthe NASA-TLX Method in Chemical Company, Indonesia. International Journal of Engineering Research and Advanced Technology, 06(07), 51-56. https://doi.org/10.31695/ijerat.2020.3627

Kohli, N., & Mehta, M. (2022). Occupational Stress: A Case Study among Chefs and Kitchen Workers. *International Journal of Advances in Engineering and Management (IJAEM)*, *4*(March), 970–977. https://doi.org/10.35629/5252-0403970977

Melaku, C., Abere, G., Zele, Y. T., Mamaye, Y., Abebaw, T., Bezie, A. E., Tesfaye, A. H., & Worede, E. A. (2024). Occupational Heat Exposure-related Symptoms Prevalence and Associated Factors Among Hospitality Industry Kitchen Workers in Ethiopia: Wet Bulb Globe Temperature. *Safety and Health at Work*, *15*(4), 472–480. https://doi.org/10.1016/j.shaw.2024.08.002

NASA. (2020). *NASA TLX: Task Load Index*. Https://Humansystems.Arc.Nasa.Gov/. https://humansystems.arc.nasa.gov/groups/tlx/

Nazar, Z., Shakeel, S., Naseer, A., & Razzaq, R. (2023). Prevalence of Musculoskeletal Pain among Chefs Working in Restaurants of Sialkot. *Journal of Health Science*, *4*(12), 134–139. https://doi.org/10.54393/pjhs.v4i12.1164

Nurmasari, E., Ushada, M., & Suwondo, E. (2018). Analysis of the influence of physical and mental workload on worker productivity in bakery SME. *UGM Digital Press*, *1*, 21–29. https://doi.org/10.29037/digitalpress.21248

Page, M. J., Mckenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, C., Mulrow, C. D., Shamseer, L., Tetzlaff, J. M., Akl, E. A., Brennan, S. E., Chou, R., Glanville, J., Grimshaw, J. M., Hróbjartsson, A., Lalu, M. M., Li, T., Loder, E. W., Mayo-wilson, E., Mcdonald, S., … Moher, D. (2021). The PRISMA 2020 statement: An updated guideline for reporting systematic reviews Systematic reviews and Meta-Analyses. *The BMJ*, *372*. https://doi.org/10.1136/bmj.n71

Park, S., Lee, J., & Lee, J. (2021). Insufficient Rest Breaks at Workplace and Musculoskeletal Disorders Among Korean Kitchen Workers. *Safety and Health at Work*, *12*(2), 225–229. https://doi.org/10.1016/j.shaw.2021.01.012

Putri, A. S., Dwiyanti, E., Rido, A., & Istiqomah, F. (2023). Correlation between Individual Factors and Mental Workload with Work Fatigue in Nilam Terminal Surabaya. *The Indonesian Journal of Occupational Safety and Health*, *12*(April), 1–9. https://doi.org/10.20473/ijosh.v12i1.2023.1-9

Phillips, R. R. and Madhavan, P. (2009). Effects of Secondary Task Processing Code on Human-Automation Interaction in a Cross-Modal Experimental Paradigm. Proceedings of the Human Factors and Ergonomics Society Annual Meeting, 53(4), 334-338. https://doi.org/10.1177/154193120905300436

Rambe, D., Utami, T. N., Arrazy, S., Islam, U., & Sumatera, N. (2024). Relationship between Workload and Work Fatigue in Employees of Company's Production Department. *Journal La Medihealtico*, *05*(03), 622–629. https://doi.org/10.37899/journallamedihealtico.v5i3.1425

Rehman, A., Muneer, M., & Anjum, O. (2025). Prevalence of Ergonomic Related Health Concerns among Culinary Professionals. *ACADEMIA International Journal for Social Sciences*, *4*(3), 257–279. https://doi.org/10.63056/ACAD.004.03.0357

Rubio-Valdehita, S., Díaz, E. M., Martín, J. A. M., & Puente, J. M. (2003). Evaluation of Subjective Mental Workload: A Comparison of SWAT, NASA-TLX, and Workload Profile Methods. Applied Psychology, 53(1), 61-86. https://doi.org/10.1111/j.1464-0597.2004.00161.x

Said, S., Gozdzik, M., Roche, T. R., Braun, J., Julian, R., & Kaserer, A. (2020). Validation of the Raw National Aeronautics and Space Administration Task Load Index (NASA-TLX) Questionnaire to Assess Perceived Workload in Patient Monitoring Tasks: Pooled Analysis Study Using Mixed Models Corresponding Author : *Journal of Medical Internet Research*, *22*(9), 1–13. https://doi.org/10.2196/19472

Sumantri, S., Utami, T. N., & Astuty, D. A. (2024). The Relationship Between Workload and Work Fatigue Among Inpatient Unit Nurses at Malahayati Islamic Hospital in Medan. *Jurnal Kesehatan Komunitas*, *10*(2), 315–323. https://doi.org/10.25311/keskom.Vol10.Iss2.190

Tan, S., Muniandy, Y., & Vasanthi, T. K. (2021). Prevalence of Musculoskeletal Disorders and Associated Work-Related Risk Factors among Pastry Chefs in Malacca, Malaysia. *International Journal of Aging Helath and Movement*, *3*(2), 20–30.

Ulasawini, A. A., Hamzah, M. M., & Murid, I. (2021). Analisis Status Gizi dan Beban Kerja Terhadap Tingkat Kelelahan Juru Masak pada Catering X di Kota Makassar. *JoPHIN: Journal of Public Health and Industrial Nutrition*, *1*(6), 1–9.

U.S Bureau of Labor Statistic. (2025). *Occupational Outlook Hanbook*. Https://Www.Bls.Gov/. https://www.bls.gov/ooh/food-preparation-and-serving/cooks.htm

Vogel-Walcutt, J. J., Schatz, S., Bowers, C., Gebrim, J. B., & Sciarini, L. W. (2008). Augmented Cognition and Training in the Laboratory: DVTE System Validation. Proceedings of the Human Factors and Ergonomics Society Annual Meeting, 52(3), 187-191. https://doi.org/10.1177/154193120805200308

Weni, N. N., Kawiana, I. G. P., & Astrama, I. M. (2023). The Effect of Workload and Work Stress on Employee Performance with Burnout as A Mediation Variable (Case Study at a Health Laboratory in Denpasar City). *Sinomics Journal*, *2*(2), 397–410. https://doi.org/10.54443/sj.v2i2.145%25250A9

Wilson, M., Poolton, J., Malhotra, N., Ngo, K., Bright, E., & Masters, R. S. (2011). Development and Validation of a Surgical Workload Measure: The Surgery Task Load Index (SURG-TLX). World Journal of Surgery, 35(9), 1961-1969. https://doi.org/10.1007/s00268-011-1141-4

Zehnder, E., Law, B. H. Y., & Schmölzer, G. M. (2020). Assessment of Healthcare Provider Workload in Neonatal Resuscitation. Frontiers in Pediatrics, 8. https://doi.org/10.3389/fped.2020.598475