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NUTRITIONAL STATUS AMONG WORKERS: IMPACT, INTERVENTIONS, AND GLOBAL IMPLICATIONS: A SYSTEMATIC REVIEW

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Abstract

The nutritional status of workers significantly influences occupational health, with both undernutrition and overnutrition posing substantial global challenges. Among the employed population, poor dietary practices, food scarcity, and strenuous work circumstances contribute to anemia, obesity, and various other health complications. This systematic review aim is to aggregate data on employee nutritional status, identify effective workplace interventions, and examine the global implications of worker nutrition on public health and productivity. A comprehensive literature search was conducted by PubMed, ScienceDirect, and Google Scholar with PRISMA guidelines. Papers examining dietary trends, nutritional status, and health impacts among workers published from 2015 to 2024 were included. After screening and comprehensive evaluation, ten studies met the inclusion criteria. The findings reveal a dual burden of malnutrition among employees: a significant prevalence of anemia among women and manual laborers, alongside rising rates of overweight and obesity among sedentary and night shift workers. Food insecurity and substandard nutrition quality were widespread among low-income and migrant workers. Despite long-term design and sustainability challenges, worksite nutrition interventions and educational programs demonstrated potential in altering workers' health outcomes. Employee nutrition is essential for sustaining health, enhancing productivity, and reducing health inequities. Multisectoral measures, such as modifications to the work environment, nutritional education, and the provision of healthy office lunches, are recommended. The cultivation of a productive and healthy global workforce hinges on the prioritization of public health issues, particularly the imperative to address workers' nutrition.

***Keywords*:** *Nutritional Status, Occupational Health, Workplace Intervention*

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INTRODUCTION

Occupational health is influenced by many factors, one of which is related to the nutritional status and eating habits of workers. In addition to increasing productivity, providing proper nutrition will also reduce the risk of chronic diseases and other work-related health problems. Based on the results of several the study, it is known that an inadequate and unbalanced diet in workers will cause impaired immune function, increase the number of worker absences due to illness, and reduce workplace efficiency.

Several studies have also explained that malnutrition is a significant public health problem among workers in both the undernourished and overnourished categories. Malnutrition does not only occur in workers in high-income countries but also in workers in middle- and low-income countries. A study of workers in Nepal revealed that although most workers have a normal body mass index (BMI), there are still workers who are underweight or overweight. This is due to an unhealthy diet, including high consumption of fast food.

Anemia is one of the common nutritional disorders experienced by workers, especially female workers. The same condition was also present among Malaysian migrant workers, where 57.6% of the households experienced food insecurity that had an impact on their food consumption and health status.

Also pinpointed as a risk factor for both metabolic disturbances and dietary imbalances is shift work—especially night work. Ulacia et al. (2021) described that night workers exposed to prolonged nocturnal work were at risk of abdominal obesity and elevated BMI, hence implying poor nutritional status.

Another nutritional issue among employees includes overweight and obesity. Correlated with age, ethnicity, and lifestyle choices, research among iron and steel workers in Nepal revealed 27.3% of them were overweight or obese. Sanchi & Borges, (2019) also discovered that bank staff members in Brazil had bad eating habits and a significant overweight rate. Furthermore, Sharma & Bajrcharya, (2024)stated that although most Nepalese working individuals have a normal BMI, poor eating habits including fast food and cereal intake are still rather high.

Dietary interventions in the workplace are essential if one is trying to solve this nutritional issue. Torres et al., (2020) demonstrated that a workplace food program improved folate levels but paradoxically decreased ferritin among manufacturing workers, indicating the need for balanced menu planning. Likewise, Makurat et al., (2019) stressed that systematic provision of nutritious meals can impact workers' micronutrient status.

These findings necessitate a systematic review of the literature on food habits, nutritional status, and their impact on health among working populations. Intervention aimed at improving the health and productivity of workers is founded on the knowledge of these determinants.

With a particular emphasis on food poverty, anemia, and nutrition status, this systematic literature review therefore aims to assess new evidence covering the link between dietary intake, nutrition status, and health outcomes in adult workers.

METHOD

This systematic review was conducted according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement checklist, which is a tool for reporting systematic reviews. For fulfilling the aims of this analysis, nutritional status among worker has been defined as the overall condition of health of an individual or a group of individuals in the workforce as determined by the intake, absorption, and utilization of nutrients, relative to their energy expenditure, occupational demands, and physical activity levels. It reflects the balance between dietary intake and the body's needs to maintain optimal physiological functioning, immune competence, and work productivity.

Literature Search Method

The databases used for the literature search included Pubmed, Scopus, ScienceDirect, Google Scholar, ProQuest and Web of Science, utilizing a combination of keywords as shown in Table 1.

Table 1. Search Terms for nutritional status among workers

No	Keywords	*Search Terms*
1	Nutritional status	*"nutritional status" OR "nutrition assessment" OR "anemia" OR "overweight" OR "obesity" OR "malnutrition"*
2	Workers	*"workers" OR "working adults" OR "employees" OR " occupational healt"*
3	Dietary habits	*"dietary habits" OR "food consumption" OR "nutrition behavior"*
4	Research Methods	*"Quantitative Methods" OR "Qualitative Methods" OR "Mix-Methods"*

The order of the keywords used to search the literature was (1) Keyword 1 AND Keyword 2 AND Keyword 3, (2) Keyword 1 AND Keyword 2 and (3) Keyword 1 AND Keyword 3. These combinations were employed to narrow the search and identify pertinent articles for the purpose of this systematic review.

Study Selection

The studies included in the systematic review were: (1) Studies examining the nutritional status among workers, (2) Studies written in English, (3) studies with a quantitative, qualitative and mix-methods (4) Studies published between 2015-2024. The studies excluded from the systematic review were: (1) Studies with operational definitions differing from the desired criteria, (2) Studies not available in full-text form, (3) Studies using a case study design or methods that differ from the desired approach, (4) Anonymous studies, (5) Duplicated studies or studies previously published.

Data Abstraction

Studies that met the inclusion criteria and were relevant for article review were subsequently grouped into a table based on the researcher's name, study location, study design, sample, main focus and recommendation.

RESULT AND DISCUSSION

Study Selection

A literature search was done via an electronic web-based search using databases from Pubmed, Scopus, ScienceDirect, Google Scholar, ProQuest and Web of Science. The flow chart of the selection process of studies is shown in Figure 1. This search with keywords across databases yielded a total of 19.691 articles. after the removal of 19.601 duplicate records, 90 titles and abstracts were screened. Based on relevance to the inclusion criteria, 80 articles were excluded for not addressing nutritional status among workers. Ultimately, 10 studies were included in the final review. These studies varied in design, including quantitative surveys, qualitative interviews, and mixed-method approaches, and were conducted in diverse settings such as Asia, Africa, and Latin America. Each selected study was evaluated for relevance, methodological rigor, and contribution to understanding the nutritional status among workers

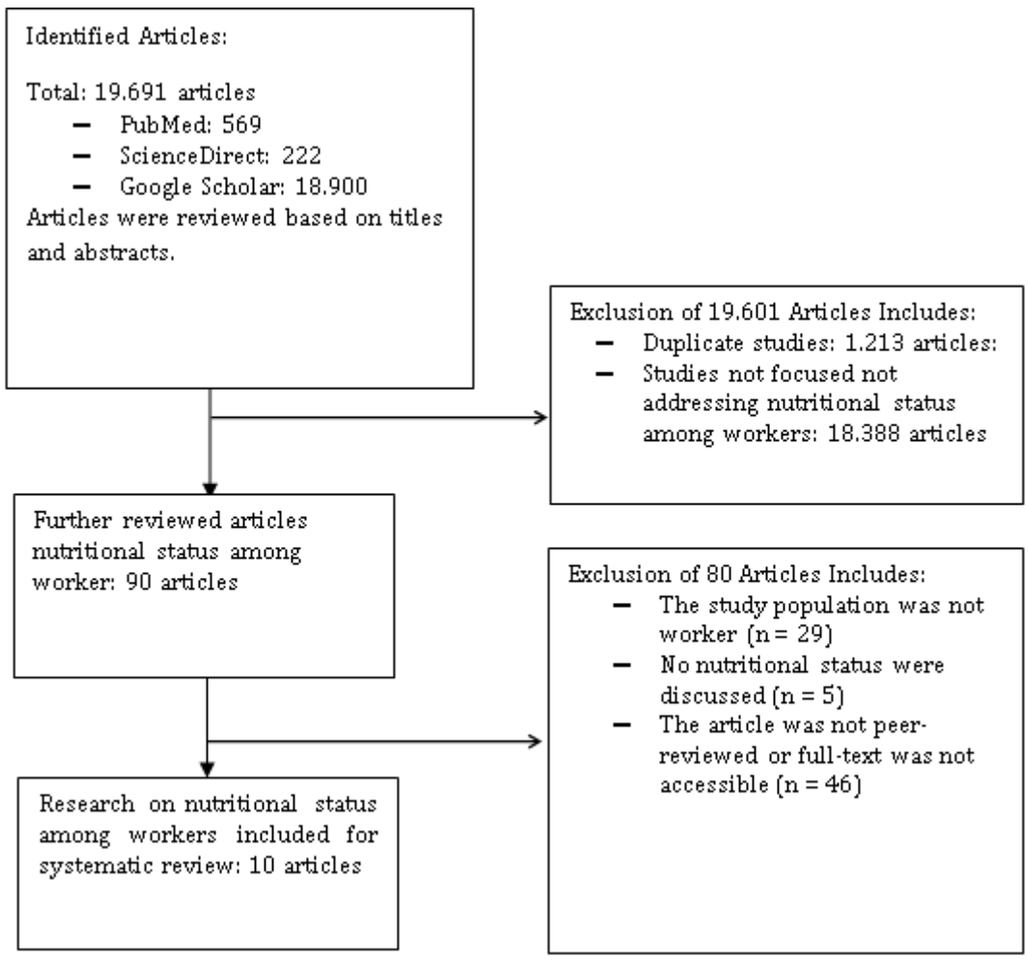

Figure 1. Flow Chart of the Systematic Review of Nutritional Status Among Workers

Systematic Review

The systematic review included 11 articles of behavior of personal protective equipment use among waste collector. Articles were subsequently screened and categorized according to their study design, which were quantitative and qualitative study or mix-methods. We have observed that all articles used a quantitative.

Tabel 2. Summary of Studies on Nutritional Status among Workers

Author (Year)	Method	Sample	Findings	Recommendations
Yasmin et al. (2022)	Cross-sectional	468 tea plantation workers in India	High anemia prevalence (87.9%), undernutrition (36.1%)	Public health interventions targeting nutrition and chronic conditions
Torres et al. (2020)	Prospective cohort	273 manufacturing workers in Brazil	Increased BMI and waist circumference in both groups, higher in WFP	Routine evaluation and workplace nutrition education
Makurat et al. (2019)	Randomized controlled trial	223 female garment factory workers in Cambodia	Canteen lunch improved folate levels, decreased ferritin	Enhance iron content in workplace meal programs
Sanchi & Borges (2019)	Cross-sectional	82 bank employees in Brazil	Poor diet and low physical activity, high overweight/obesity prevalence	Implement workplace health promotion programs
Sangroula et al. (2020)	Cross-sectional	271 iron and steel workers in Nepal	27.3% overweight/obese; linked to age, ethnicity, smoking	Provide nutrition education for industrial workers
Ulacia et al. (2021)	Cross-sectional	529 night shift nurses in Brazil	Long-term night shift linked to overweight and abdominal obesity	Regulate long working hours and shift rotations
Mei et al. (2020)	Cross-sectional	125 migrant workers in Malaysia	57.6% households food insecure; majority had normal BMI	Implement food choice education and supportive policies
Kim et al. (2023)	Comparative cross-sectional	163 migrant workers and 163 Korean citizens	Migrant workers had poorer nutritional markers and higher hepatitis rates	National-level health protection policies for migrant workers
Shah et al. (2023)	Cross-sectional	180 working women in Karachi	41.7% prevalence of anemia; most had mild anemia	Awareness programs on anemia prevention and dietary improvement
Sharma & Bajracharya (2023)	Cross-sectional	200 working adults in Nepal	78% normal BMI; cereal-heavy diet; unhealthy fast food consumption observed	Behavioral change strategies to improve diet and activity

According to ten studies examining nutritional status among workers shows that poor nutrition in workers is associated with a high prevalence of anemia, overweight and obesity, and other nutritional conditions, which can compromise health and work productivity. Several studies have shown anemia to be an increasing problem among workers.

Nutritional Deficiencies and Anemia

Multiple studies have underscored anemia as a persistent issue among workers. Yasmin et al., (2022) found that nearly 88% of tea plantation

workers in India suffered from anemia, reflecting severe nutritional deprivation. Shah et al., (2023) similarly reported that 41.7% of working women in Pakistan were anemic, with most cases classified as mild. These findings support the broader literature indicating that women of reproductive age, especially those from low-income occupational sectors, are at high risk for iron-deficiency anemia due to inadequate intake of iron-rich foods, menstruation, and limited health access.

Overweight and Obesity in the Workforce

Although undernutrition is still a significant issue, an increasing body of research indicates that overweight and obesity are emerging health issues in the occupational environment. Sangroula et al., (2020) found that more than twenty-five percent of Nepalese factory workers were overweight or obese. Similar trends were observed among Brazilian bank employees (Sanchi & Borges, 2019) and night shift nurses (Ulacia et al., 2021), where disrupted circadian rhythms and sedentary work led to metabolic risks and weight increase. These results mirror the global nutrition transition, whereby even in underdeveloped areas processed food consumption and physical inactivity are rising.

Workplace and Occupational Determinants

Several studies have noted the contribution of working conditions and food availability on the nutrition of workers. For instance, Mei et al., (2020) and Kim et al., (2023)noted that migrant workers are usually food insecure, leading to poor nutrient intake despite the presence of a normal BMI. Although the balance of macronutrient and micronutrient content in the given meals should be noted, Torres et al., (2020) and Makurat et al., (2019) showed that meal programs can significantly affect crucial nutritional indicators such as of folate and ferritin.

Hence, the workplace is both a risk potential and an intervention setting. Strategies that are cost-effective in improving nutritional status can involve the provision of healthy food that is culturally acceptable, organizing work shift patterns, and incorporating health education at the workplace.

Nutritional Status and Worker Productivity

Nutritional status and worker productivity have a clearly established, economically important link. With p-value = 0.049 in a production worker study, research shows a statistically significant link between worker productivity and nutritional status (Bara et al., 2024). Efficiency of task completion, work quality, absence rates, and general output are just a few of the various quantifiable ways this relationship shows itself .

Normal nutritional status workers often show more productivity than those with poor nutritional status. On the other hand, workers with aberrant nutritional status—that is, either undernourished or overnourished—experience lower productivity because of more tiredness, less physical capacity, or health problems. According to a research of production workers, those with normal nutritional status and productive work output accounted for 62.5% of the sample; those with excess nutritional status showed noticeably reduced productivity rates, with just 23.5% attaining productive status.es, with only 23.5% achieving productive status (Bara et al., 2024).

The financial fallout from inadequate nutrition among employees is significant. The International Labour Office (ILO) claims that poor nutrition can lower production in many different sectors and nations by up to 20% (International Labour Organization, 2015). Increased absenteeism, presenteeism (lower on-the-job effectiveness), greater healthcare costs, and shortened working lives resulting from early disability or death are a few of the several causes of this productivity loss.

Nutrition Affects Work Performance

Many physiological and psychological processes help to explain how nutritional state affects performance at work. Those who consume insufficient nutrients generally suffer with energy deficits that show themselves as weakness, tiredness, and lower physical capacity (Sharma & Bajrcharya, 2024). These employees struggle to keep constant work output during their shifts even if they show attendance at somewhat low efficiency.

Lack of enough calories and nutrients causes undernourished workers to have poor physical condition, low energy levels, and higher sensitivity to tiredness. Research results clearly show that "workers with atypical or inadequate diets represent poor physical condition. This negative condition takes worker productivity into account such that it makes workers more prone to become fatigued or feel extreme weariness". Likewise, workers with excess nutritional status have other but equally important difficulties with productivity, usually connected to lower physical mobility, more health complications, and greater rates of chronic diseases compromising work performance (Rachmah et al., 2022).

Worker's eating habits expose significant trends that affect their nutritional condition and, hence, their performance at work. Studies show that working adults—who usually have more than eight hours a day—often have bad eating habits because the limitation of time and choices. Often resulting in meal-skipping, reliance on

convenience foods, and poor consumption of vital nutrients is this time strain (Dhillon & Ortenzi, 2023).

Research on the dietary makeup of working individuals reveal that cereals predominate in their diets; fruits and vegetables follow, milk and meat products, pulses and legumes, and lastly sweets and jaggeries. This hierarchy of food intake exposes possible nutritional imbalances; too much reliance on cereals high in carbohydrates could replace more nutrient-dense food categories necessary for best health and performance at work.

Workplace Nutrition Interventions and Solutions

Nutrition interventions in workplace present interesting ways to raise worker nutritional level and thereby increase production. Comprehensive work force nutrition programs have shown in studies to improve nutrition, health, and business results (Dhillon & Ortenzi, 2023). When these interventions incorporate several components and target high-risk categories of workers—such as those who are overweight or obese or pre-diabetic—they are very successful.

Research indicates that interventions in workplace nutrition and health help to improve workers' health condition and thus their balanced nutrition behavior. Studies on several intervention forms have shown favourable results including "increase in nutrition knowledge, self-efficacy, reduce risky behavior, and also improved body mass index and blood biomarkers". These results highlight the possibilities of office environments as effective intervention sites for treating malnutrition in its several forms (Bor, 2020).

At the workplace, a number of intervention strategies have shown to be effective (Rachmah et al., 2022). One important strategy is environmental modifications to the food environment; five studies in a systematic review target in particular interventions that changed the workplace food environment. These changes can involve simplifying healthier options more readily available in cafeterias, enhancing the nutritional value of foods at vending machines, or subsidizing healthier choices to help with affordability.

With four research in the same evaluation concentrating on nutrition education through several channels, including workplace visits and emails, nutrition education offers still another successful strategy. Particularly when catered to workers' personal needs and circumstances, educational programs including individualised counselling frequently exhibit the best outcomes. Furthermore, encouraging outcomes have come from thorough health risk reduction programs including nutrition into more general workplace health campaigns.

Limitations

Although findings are concordant, some limitations have to be stated. First, the studies varied in terms of design, sample size, and setting, thus limiting comparability. Second, the majority of the studies were cross-sectional in design, thus making it challenging to establish causal relationships between occupational outcomes and nutritional status. Third, upcoming studies need to concentrate on psychosocial and cultural determinants influencing employees' nutritional behavior because these areas have been less investigated.

Implications and Future Research

Findings of this research affirm the pressing need for multisectoral approaches to working population nutrition issues. Employers, policy makers, and occupational health professionals can, through collaboration, implement nutrition-sensitive interventions in diverse workplace environments. Research in the future must explore gender disparities in dietary behavior, determine long-term impacts of workplace nutrition interventions, and address other sectors of work, such as informal and agricultural workers.

CONCLUSION

The results of this systematic study show that occupational health and productivity of working individuals are mostly determined by their nutrition, therefore stressing a worldwide double burden of malnutrition. The high prevalence of anemia among women and manual laborers as well as rising overweight and obesity among sedentary and night shift workers show the complex nature of dietary problems in the working population. Food insecurity, limited dietary diversity, and work-related stressors further compound these risks. In spite of these challenges, organizational interventions like balanced meal programs, nutrition education, and shift regulation are promising. Worker nutrition is important not just for individual well-being but also for enhanced productivity, elimination of health inequalities, and attainment of general public health objectives.

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