Original Article
DOI: https://doi.org/10.70749/ijbr.v3i2.700

INDUS JOURNAL OF BIOSCIENCE RESEARCH
https://induspublishers.com/IJBR
ISSN: 2960-2793/ 2960-2807

Crossref

OPEN ACCESS

The Effectiveness of Nutrition, Life Style and Work Place Environment in Relation to Occupational Health and Productivity

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ARTICLE INFO

Keywords
Occupational health, workplace wellness, health and productivity, Dietary habits, Food and performance, Physical activity, Work-life balance, Health outcomes, Employee satisfaction, Lifestyle.

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Declaration
Authors' Contribution: All authors equally contributed to the study and approved the final manuscript.
Conflict of Interest: No conflict of interest.
Funding: No funding received by the authors.

Article History
Received: 15-01-2025
Revised: 16-02-2025
Accepted: 22-02-2025

ABSTRACT

Diet and nutrition is one of the integral components that affect the productivity of worker, their efficiency and attitude towards daily work chores. The energy levels and well-being of individuals is directly proportional to being mentally and physically present. In order to evaluate the intake of nutrients, the associated factors and their effect on workplace productivity, a across sectional study was conducted with 216 participants between age 18-55 years. In order to minimize biasness simple random sampling technique was implied. The sample population was selected from teaching and administrative staff of different private sector universities in Lahore. Time duration of the study was 6 months, from june 22, 2024 to December 22, 2024. Different aspects about their personal and workplace dynamics were questioned. A multi-dimensional questionnaire, that consisted of socio-demographic information, food frequency and workplace related queries, was used. The main questions asked included assessment of their physical activity, an overview of the food intake, challenges faced at work and how does food intake effect their workplace productivity, either they had an environment that promoted healthy lifestyle or not. Data was analyzed using SPSS version 2.O. Descriptive analysis, cross-tabs and chi-square test was used to find out the association between different factors from socio-demographics, physical activity, frequency of foods consumed and how they impact the workplace productivity, and either those associations are significant or not. Results showed significant association between breakfast venue and punctuality (p-value: 0.012), skipping breakfast and monthly leaves (p-value: 0.02), physical activity was associated with energy levels (p-value: 0.001), physical tiredness (p-value: 0.008) and hard to get work done (p-value: 0.013). BMI was significantly related to consuming one or more important meals at work (p-value: 0.001). Meanwhile tea and coffee consumption had no significant impact on energy levels at work (p-value: 0.339). Also, BMI was not related to recreational physical activity (p-value: 0.637). The overall results showed that overall health and lifestyle had an impact on productivity at work. In order to maximize the worker output, the workplace needs to be supportive of their employees maintaining personal health and well-being. Gender, living situation and breakfast related habits played a major role in food preferences and availability. Energy levels at work were also affected by a number of factors like incentives and physical activity. Either a person lived at home or hostels, also led to deteriorating eating habits which in turn affected the productivity at work.

INTRODUCTION

The relationship between health and work has undeniable importance. In every field, either its office work or field work the employees need to maintain an optimal health in order to achieve their targets and maintain efficiency in workplace. There are numerous factors that determine the overall well- being of an individual like physical activity, diet, genetics, age, gender, living conditions, sleep quality, stress levels, social support and access to healthcare (1).

Workplace productivity is defined as "the efficiency with which outputs are produced by a given set of input, often quantified as the ratio of output per unit of labor or capital." (1). The capacity of an individual to give maximum inputs in order to attain certain goals depend largely on their health and vice versa. Workplace greatly influence the soundness, functioning, the risks of communicable and non-communicable diseases and the quality of life by effecting a person's food intake and overall relationship with food. As per WHO two-third of an adult

individual's day is spent at work which makes it a primary focus around which the daily activities are scheduled therefore it has the greatest influence on a eating patterns and behaviors (1).

The significance of nutrition and occupational health emerge from the basic fact that working community consumes more or at least one important meal of the day at their work site be it office or field, this environment puts a great influence on the behaviors and patterns that a person adopts which eventually becomes habits that directly effects the occupational health. In this context "Total Worker Health (TWH)" program proposed by the National Institute of Occupational Safety and Health emphasizes on providing safe and healthy food for the betterment of worker's health and the provision of secure working space (2). The World Health Organization declares workplace as a site to improve diet and promote physical activity. A good diet helps prevent diseases and decrease absentees according to the International Labor Organization (2).

Calorie dense and nutrient deficient diets in low- and middle-income countries have a great impact on work productivity and economic development. On the other hand, the challenge faced by high income countries is the senior citizens being a major part of their workforce being more susceptible to non-communicable nutrition related diseases like diabetes, obesity etc. Sedentary lifestyles stress and anxiety are also contributing in declining workers 'health (3).

It is crucial to remember that nutrition disorders are illnesses that arise when a person's diet does not contain enough nutrients for optimal health or when they are unable to properly absorb nutrients from food (4). Generalized under nutrition, over nutrition that results in obesity, eating disorders, and illnesses where nutrition plays a part in the etiology are all considered nutritional disorders (5).

Numerous chronic diseases, such as diabetes, heart disease, hyperlipidemia, and arthritis, have been significantly influenced by nutritional deficiencies. Therefore, it is acknowledged that overnutrition-related illness results in indirect labor costs in the form of lost production from presenteeism and absenteeism. Therefore, it is crucial to comprehend the factors associated with obesity in the workplace in order to create an effective intervention (6).

Eating habits are characterized as behaviors that correspond to a certain degree of health, with diets high in fat, sugar, or salt being associated with bad health. Employee eating habits are influenced by a variety of personal factors, such as socioeconomic and psychological issues, prior involvement in nutrition promotion initiatives, and aspects of their jobs. The kinds of food offered in the office cafeteria, the overall attitude to nutrition in the workplace, and health promotion efforts that offer social support for better eating habits are all examples of how the workplace may affect an individual's eating habits (7).

No poverty and zero hunger are the two important sustainable development goals provided by the United Nations, which significantly impacts global labor economics. Poverty cannot be eradicated without a healthy workforce and gainful employment is a social predictor of health (8).

There are different types of workplace inactivity. The US Social Security Act states that the incapacity to work is known as work disability. The second one being absenteeism, which is expressed in terms of days off, short or sick leave, it is a typical way to define work loss. Being physically present but working below par due to an acute or chronic illness, compromised physical or mental health is known as presenteeism, which is yet another type of occupational limitation (9).

Health behaviors can be influenced in the workplace in a number of ways, either directly through initiatives like health education, expanding access to nutritious food, and providing opportunities for physical activity, or indirectly through social support and social norms that encourage healthy behavior. It is also possible to connect workplace health promotion projects with more general workplace health support initiatives, like employee assistance programs, disability management programs, and occupational health and safety initiatives. Workplaces can prioritize needs based on their own assessment and/or create programs with worker engagement, focusing on behaviors linked to the biggest declines in mortality and morbidity, increases in disability, and declines in productivity (10).

RESEARCH OBJECTIVES

- To investigate common dietary patterns among workers and how these patterns co relate with nutrient intake and productivity levels.
- To identify most effective interventions at personal and institutional level in order to enhance productivity through lifestyle modifications.

LITERATURE REVIEW

Nutrition is a fundamental right and need for every nation that must be prioritized. Working a full-time job and taking care of one's nutritional health is crucial in this day and age where convenience foods are the preferred choice, with packaged and frozen foods being the primary component of major meals of the day. The main reason is the easy access to processed and unhealthy foods with high saturated fats and salts as compared to fresh fruits, vegetables, meats etc. Following is an overview of how nutrition directly impacts the health and productivity of individuals all over the world and the factors associated with it (2).

A cross-sectional study conducted in Queensland Australia in 2019, consisted of 231 truck drivers, since

truck drivers are at greater risk of nutrition and physical activity related diseases, they were made to take part in a survey that questioned about health awareness, frequency of fruits and vegetables consumed per day, detrimental foods and sugary drinks along with physical activity data. 75% of the respondents agreed that they needed to improve their health by making changes. 88% consumed lesser fruits and vegetables than the recommended amount. 65% of the individuals drank at least one can per day of sugary drinks. Physical activity levels were less than moderate for 80% drivers and 60% of the total sample population were obese (2).

Drivers have finite access to grocery stores and healthy options due to their work routines; most drivers have to work 12 hours per day with continuous driving, also they need to be limited to certain locations due to work policies and rules. Due to convenience, and time shortage they prefer foods which are on the go like junk and fast foods over healthier options which are more difficult to obtain in the locations where they work. They also declare their work locations unsuitable for physical activity and all these factors contribute to poor nutrition and obesity among the workers which in turn lead to a number of non-communicable diseases (2).

Another study that took place in California consisted of 394 nurses from California Board of Registered Nurses List. The motive of the study was to find out the link between occupational factors and obesity among the workers. More than half of the nurses population were obese or overweight. One of the most important factors was the job title and description, nurses on the managerial posts have higher obesity percentage than staff nurses because they are not linked with providing direct patient care and are subjected to a more sedentary routine at work. Working full time or longer shifts was also found out to be coherent with being obese and over-weight since longer shifts provided far less time to focus on ones well -being and healthier lifestyle. Only 41.3% nurses were engaged in one or another type of physical activity , which was also a leading cause of obesity and other associated diseases (11).

Food sources and nutrient intake analysis was done of Filipino working adults in a cross sectional study performed in 2020 revealed that the fat , protein and sodium intakes were extremely high and also the major source of energy from the total calories that were bring consumed . Fats were high in saturated fats that put them at the risk of developing cardiovascular diseases and obesity. Fruits and vegetable consumption was inadequate. Salt intake was 52% above the adequate intake. Food sources that dominated their diets included rice, pork, fats and oils, chicken and bread. Even the carbohydrate sources were furthermore nutrients that were deficient from diets included iron, folate, riboflavin, calcium, vitamin C and thiamine. WHO's global physical assessment questionnaire was used to determine the levels of physical activity which turned out to be sub optimal. The admin sector had the highest levels of sedentary lifestyle (65.81%). It was seen that being overweight or obese was the leading cause of 20% loss in productivity (12).

The increasing burden of non-communicable diseases like diabetes, HTN, obesity, cancer etc. is one of the major reasons for focus on nutrition and diet. A research took place in Thailand that discussed workplace and individual factors effecting the eating practices of factory workers. The survey consisted of two levels; individual and workplace. On individual level participants were asked about their nutrition knowledge, work shift, job type, perception of worksite environment and their attitude towards food whereas workplace level included inquiries about policies, manager's attitude, cafeteria food choices and the nutrition related environment at workplace.

This results of the study after analysis suggested that most of the sample population was indulged in poor eating practices. Only 17.6 % of the individuals participated in nutrition programs. Knowledge level about healthy eating habits was moderate. The low perception scores of workers regarding social and environmental support for nutrition at the worksite align with the low incidence of policies and plans for nutrition promotion. This suggests that without strong policies and plans in place to promote nutrition, workers may not feel supported in making healthy dietary choices at work. Effective strategies to improve these perceptions and outcomes could include developing and implementing comprehensive nutrition promotion policies, creating supportive environments, and increasing awareness and education about healthy eating practices (7).

Workplace productivity and performance is directly affected by the kind of diet the workers are consuming, their knowledge and awareness regarding nutrition and physical activity. Hydration is one of the key factors that influence the overall well -being of an individual and not only poses physiological risks but also has been found to have impact on mood, efficiency, working memory, reaction time and also increases tension and anxiety (13).

The effects of caffeine also need to be discussed here as it goes hand in hand with the working adults with hectic and demanding routines. Caffeine consumption comes in many forms the main source of it being coffee, tea and energy drinks. Caffeine is the main active element in coffee, which is a workplace staple in many areas. Due to its sociable and stimulating qualities, coffee is a daily beverage for two thirds of adult Canadians. But an increasing number of people are choosing to get their caffeine from other sources, such energy drinks, which are particularly well-liked by young adult employees. These beverages may be harmful to your health because

they frequently have significant amounts of sugar and caffeine.

It is well known that caffeine improves mood, alertness, and cognitive abilities—especially when sleep deprived—which is advantageous for people who work shifts or have high-pressure jobs. The ideal amount of caffeine, however, differs depending on the profession: lower dosages (1-2 mg/kg) increase alertness and reaction time, while higher doses (3–6 mg/kg) boost physical performance. Overconsumption of caffeine (>500 mg) can lead to adverse effects such as upset stomach, anxiety, vertigo, and slower reaction times. Excessive caffeine intake can also cause blood pressure to rise and poor sleep (14).

Shift work is an ergonomics problem that can have a negative impact on employees. Due to their numerous duties, Iranian medical center security staff members are frequently put in awkward situations include watching patients, arguing with patients' attendants, accepting unfavorable shift schedules, and spending extended amounts of time away from home. The aim of this research was to evaluate health issues among Iranian hospital security staff, often known as shift workers, by utilizing the Persian version of the Survey of Shift-workers (SOS) questionnaire. This cross-sectional investigation was carried out in seven healthcare facilities—three clinics and four hospitals. A total of 416 employees were polled: 209 shift workers (the exposed group) and 207 non-shift workers (the unexposed group). Compared to day workers, shift workers were more likely to experience negative health impacts. Compared to day workers, shift workers had a considerably higher mean Body Mass Index (BMI) and higher level of education. Compared to day workers, shift workers also had a significantly greater prevalence of cardiovascular, psychological, and gastrointestinal diseases. In general, medical center security staff members had a significant prevalence of health issues. Therefore, in the event that a disorder is identified, it is advised that staff members be subjected to routine monitoring and get medical counseling and treatment (15).

Over the past 25 years, Indonesian production has grown by 3.1% annually. Human resources are vital and need to be of the highest caliber. The aim of this investigation was to examine the impact of workers' sleep duration, breakfast habits, and nutritional health on productivity at PT. Sejahtera Buana Trada Sunter. Methods: This study was carried out in April–July 2022 with 39 workers as the subjects. Purposive sampling was used in the cross-sectional study design. The study's participants had to be employed at PT Sejahtera Buana Trada Sunter, be between the ages of 18 and 55, and have been there for at least a year. This study did not include subjects who fasted in order to measure their food consumption. This study did not include subjects who fasted in order to measure their food consumption. The chi-square test was used to examine the data. In this study, both primary and secondary data were employed. PT. Sejahtera Buana Trada Sunter's labor productivity (71.8%) is high and considered good. Worker productivity and breakfast habits (p-value = 0.003), sleep length (p-value = 0.004), and nutritional status (p-value = 0.002) are significantly correlated. The research revealed a connection between the breakfast habits, amount of sleep, and nutritional status of PT. Sejahtera Buana Trada Sunter personnel and their productivity (16).

Worksite wellness programs primarily aim to address unhealthy lifestyles, which have been linked to decreased office productivity. However, it's unclear how much job productivity rises over time in reaction to alterations in dietary preferences. This study looked at the relationship between changes in major lifestyle risk factors over a two-year period and decreased working productivity. A retrospective cohort from the Heart of New Ulm Project including 1273 working individuals from 2009 and 2011 was examined. The result was a decline in workplace productivity as a whole in 2011. Two-year variations in fruit and vegetable consumption, physical activity levels, alcohol usage, and smoking were among the predictors. An ideal lifestyle score derived from a combination of these four variables was also included. In comparison to those who did not smoke during the same period, the adjusted model showed that those who smoked for more than two years saw a considerably higher total loss in workplace productivity (9.8% vs.2.5%,p=0.031). In conclusion, compared to individuals whose lifestyle characteristics remained unchanged, employed adults in this cohort who stopped smoking, regulated their alcohol use, increased their intake of fruits and vegetables, or increased their physical activity did not experience a decrease in productivity loss over a two-year period. Additional lifestyle enhancements may not have a significant effect on employee productivity in workforces with high productivity already and/or generally healthy lifestyle characteristics. Employers' expenditures in lifestyle-oriented programs need to be guided by larger experimental investigations conducted in more diverse locales (17).

The impact of the work environment on employees' eating habits is becoming increasingly acknowledged, and this could lead to a rise in overweight and obesity. The consequences of being overweight or obese are severe in terms of decreased well-being, decreased productivity at work, and an elevated risk of non-communicable diseases. The workplace is a great setting for encouraging and intervening in healthy behaviors.

The purpose of this review was to determine what supports and hinders nurses' good eating habits at work.

Review participants were mostly enrolled, registered, and/or nurse assistants who worked in hospitals in middle-class or wealthy nations. The bulk of research found that unfavorable work schedules, personal obstacles, features of the actual workplace, and social eating customs at work all provide obstacles to eating healthily. Not many facilitators were mentioned. Overall, research indicates that nurses' nutritional consumption is significantly impacted negatively by their workplace. In conclusion, it is necessary to reorient the workplace to encourage nurses to eat healthily (18).

A number of chronic diseases can be effectively prevented and treated by following a vegetarian or vegan diet. However, not much research has been done on their acceptance outside of a clinical trial context. The purpose of this study was to ascertain whether a vegan diet program at work is acceptable and how it affects both productivity and health-related quality of life. For 22 weeks, employees of a large insurance company who had a body mass index of ≥25 kg/m2 and/or a history of type 2 diabetes were either given weekly group education on a low-fat vegan diet (n = 68) or no diet education (n = 45). The vegan group saw improvements in vitality (p = 0.004), mental health (p = 0.03), physical functioning (p = 0.001), general health (p = 0.002), and overall diet satisfaction (p = 0.004) In comparison to the control group, the vegan group also reported lower food expenses (p = 0.003) and more trouble finding foods when dining out (p = 0.04). Health-related productivity impairments at work (p = 0.03) and in daily activities (p = 0.004) were found to have decreased 40–46% in the vegan group. This study concluded that vegan nutrition programs at work were widely accepted and could be implemented by companies to enhance workers' productivity, well-being, and quality of life (19).

The attitudes of Pakistani employees of multinational corporations (MNCs) regarding physical activity and its related benefits are the main emphasis of this research. Prior studies have demonstrated a positive correlation between physical activity and employees' life happiness and on-the-job productivity worldwide. This thesis attempts to focus on the same elements, but instead of using an intervention study, it uses employees' perspectives because no such research has been conducted in Pakistan before. The scope of this thesis also covered related advantages of physical activity, such as lower healthcare costs, decreased exposure to different health hazards, and decreased presenteeism. Recalled levels of physical activity were used in an effort to determine whether or not the target population could also benefit from physical activity. An electronic questionnaire was used to gather pertinent information and was distributed to the appropriate HR departments of the multinational corporations doing business in Pakistan. Following data collection and analysis, this study discovered that employees of multinational corporations (MNCs) with operations in Pakistan strongly correlated physical exercise with their life happiness and on-the-job productivity. However, it was observed that the quantity of health risks to which the employees were exposed and the presenteeism cost were unaffected by the length of the recalled degree of physical activity. Furthermore, it was found that obesity was the most commonly cited health concern by employees and that it was a greater problem among younger workers. Additionally, compared to employees who did not report being obese, presenteeism expenses were higher for those who did. Employers may be able to lower presenteeism expenses and, as a result, boost employee productivity by implementing the thesis's conclusions. Attempting to physically engage the workforce can enhance workers' job and personal satisfaction (20).

Positive, satisfying feelings about one's work are known as work engagement, and they are linked to increased morale and productivity. A cross-sectional study was conducted to find out if Japanese workers' healthier eating habits were correlated with their level of work engagement. The daily nutritional intake was assessed using a validated food frequency questionnaire. Dietary fat (saturated, monounsaturated, and polyunsaturated fatty acids), dietary fiber, folate, isoflavone, and salt intake were the seven nutrients taken into account. After controlling for psychological distress, work-related stress, and other variables, multivariable linear regression analysis was conducted. The baseline study asked 2,233 workers from 12 Japanese workplaces on their level of involvement at work. 89.7% of the participants were male, and the sample's mean age was 43.4 ± 9.7 years. The average work engagement score was 2.9 ± 1.0. In contrast to saturated fatty acid (β = 0.16, SE = 0.11, P =.13) and isoflavone (β = 0.64, SE = 0.36, P =.072), higher work engagement was significantly positively associated with higher consumption of salt (β = 0.17, SE = 0.06, P =.006), monounsaturated fatty acids (β = 0.29, SE = 0.13, P =.03), polyunsaturated fatty acids (β = 0.28, SE = 0.09, P =.001), dietary fiber (β = 0.23, SE = 0.09, P =.012), and folate (β = 10.2, SE = 2.9, P =.005). According to the study, employees who were more engaged at work also tend to eat in a healthier way. Enhancing work engagement could be a new focus for workplace health initiatives (21).

Improving employee productivity is essential for businesses to be competitive since it enables the creation of items in specified quantities in a shorter amount of time. A number of factors affect workers' productivity, most notably their health and nutritional status. The purpose of this study is to investigate the connection between the productivity of production

workers at Pt. Wijaya Karya Beton Tbk Ppb in North Sumatra and their nutritional health. Using a cross-sectional study design and a quantitative methodology, the research includes a sample of 63 employees out of the 410 in the production department. Scales for measuring height were among the instruments used to collect the data. The chi-square test was used to analyze the results at a 95% confidence level (α = 0.05). Of the 63 employees, 27 (42.9%) were considered productive, and 36 (57.1%) were considered unproductive, according to the survey. The findings of the chi-square test showed a strong correlation (P value = 0.049) between worker productivity and nutritional status. The study comes to the conclusion that labor productivity is greatly impacted by nutritional status, and that improving work performance is mostly dependent on appropriate nutritional status (22).

A person's regular diet can significantly impact a number of areas of their life. Therefore, a study with the primary goal, to look into the connection between general life satisfaction and work-related outcomes as well as health-related nutritional behavior, was conducted. The study's second goal was to figure out how they predict employee engagement, productivity, and absenteeism. The study included 230 workers (175 women and 55 males; M of age = 30.92, SD = 8.75). Following tools were employed: the Slovenian short version of the WHO Health and Work performance questionnaire (Sedlar, 2015; Kessler et al., 2003), the General Life Satisfaction Scale (SWLS) (Diener et al., 1985), a screening questionnaire of nutritional habits (Public Health Institute of the Republic of Slovenia, 2011), and the Utrecht Work Engagement Scale (Schaufeli et al., 2006).The initial phase was calculating the descriptive statistics, testing the normal distribution, and confirming each scale's dependability. The correlations between the variables that were measured were then computed.

The next step involved determining whether dietary behavior might predict work-related outcomes and overall life satisfaction using a regression analysis for statistically significant relationships. There was a strong relationship between dietary habits and worker productivity (r =.22) and engagement (r =.22). As predicted, dietary habits related to health are a powerful predictor of overall life satisfaction (β =.26), and they also significantly predict employee engagement (β =.22) and efficiency (β =.20). The findings were crucial for workers because they demonstrated that eating a healthy diet improved both work-related and life satisfaction and that nutrition played a significant role in producing positive work outcomes. These results were also very significant for employers since they validated the benefits of workplace health promotion, which benefited both employers and employees (23).

MATERIALS AND METHODS

Study Design: Cross sectional study was used that assisted in gathering data at a single point in time providing an insight of the relationship between different independent variables like age, gender, eating habits, physical activity with dependent variables like workplace productivity and occupational health.

Compared to longitudinal investigations, which necessitate recurring data collection over time, this cross-sectional study design was simpler and faster to carry out. The design provided insightful information on correlations and trends while requiring the least amount of time, money, and logistical resources possible. It was cost effective.

The results could be used right away by organizations and stakeholders to make evidence-based decisions on enhancing workplace regulations, employee health initiatives, or productivity-boosting tactics.

The study only collected data once, it did not prove causation but it offered useful connections. Nonetheless, its advantages in spotting trends and formulating theories made it a suitable option for this study's subject.

Settings: The study was carried out at several private universities in Lahore, Pakistan. These establishments were chosen because of their varied administrative and academic settings, which offered a representative sample of staff members in both administration and teaching positions.

The universities included in the study were:

- Superior University
- University of Lahore (UOL)
- University of Management and Technology (UMT)
- University of South Asia (USA)
- Green International University
- Other Private Universities in Lahore

This range of universities allowed the inclusion of both teaching and administrative staff, ensuring a comprehensive understanding of how workplace factors influence occupational health and productivity in academic settings.

Duration of Study: 6 months, from june 22, 2024 to December 22, 2024.

Sample Size: 250 questionnaires were filled keeping in mind the sample size. After data collection 34 questionnaires were discarded due to some errors (inclusion criteria was not met) so a remaining of 216 individuals from teaching and administrative staff participated in the study.

Sampling Technique: Random sampling technique was used . Every member of the teaching and administrative staff at the chosen universities had an equal chance of being included in the study because of random sampling.

This raised the possibility that the sample fairly

represented the range of backgrounds, positions, and experiences found in Lahore's private university workforce. The random sample method removed biases that could distort the results by avoiding systematic participant selection (e.g., selecting only senior professors or administrative heads). It offered a more objective perspective on the connections among occupational health, lifestyle, diet, and work environment.

Sample Selection

Inclusion Criteria: Private sector employees, age 18-55years, Teaching staff, Administrative staff, and apparently healthy individuals with no life threatening condition.

Exclusion Criteria: Individuals that do not fall under the given age and job description.

Data Collection: A multi-dimensional questionnaire was used for survey. The various dimensions included an enquiry of the socio-demographic information, assessment of the physical activity using precise questions from the physical activity assessment questionnaire by WHO. The next part of the questionnaire was an insight of different food intake and their frequencies with the help of food frequency questionnaire and at last the work place productivity and performance was assessed using a set of questions regarding habits, environment and opportunities at work.

Data Analysis: Data analysis was done using SPSS 2.0. Descriptive statistics were applied in order to analyze the socio demographic variables. Cross tabs were used to find out various trends. Chi-square analysis was used to find out significant or non-significant associations between various categorical variables.

Ethical Consideration: A critical component of any study involving human subjects is maintaining ethical integrity. The following ethical issues were taken into account for this study:

Clear and thorough information regarding the study's goals, methods and advantages was given to participants.

Participants' personal information was kept completely private and never shared with any parties. Only the research team had secure access to the data, which was kept in locked cabinets for physical copies and password-protected digital files.

The goal of the study was to reduce participant risk of physical, psychological, or emotional

The study complied with ethical standards set forth by the appropriate authorities, and participants were not subjected to any kind of pressure or coercion. Participants were told they could skip questions if they were uncomfortable answering them, and sensitive questions were carefully worded to prevent discomfort.

RESULTS

This section of the research presents the findings and results with their interpretations. Table 1 summarizes the socio demographic information collected from the population by applying descriptive statistics using SPSS 2.0. Out of the 216 individuals who became a part of this study 37% were females with males making up remaining of the 81%. Marries population was 19.4% where as 80.6% individuals were single. 74.2% of the sample attended their workplace from home while the rest of 25.3 % were hostilities. 55.8% belonged to a big cities like Lahore, Islamabad, Karachi etc.28.1% belonged to small cities whereas only 15.7% belonged to villages. The education level was divided into three categories intermediate (6.9%), bachelors (57.9%) and Post-graduation (35.2%).Since the data was collected from different private sector universities of Lahore including Superior University (41.5%), University of Lahore (16.1%), Green International University (12%), University of South Asia (11.1%), University of Management and Technology (10.1%) and a few other universities like Riphah International, University of Home Economics etc. there were two categories of job description in which teaching staff contributes to 45.6% of the population and administrative staff was the rest of the 53.9%.

Table 1

Demographic Characteristics of the Study Population

S. No		Frequency	Percentage
1	Gender		
	Males	81	37.3%
	Females	135	62.2%
2	Marital status		
	Married	42	19.4%
	Single	174	80.6%
3	Living situation		
	Home	161	74.2%
	Hostel	55	25.3%
4	Job description		
	Teaching staff	99	45.6%
	Administrative staff	117	53.9%
5	Education level		
	Intermediate	15	6.9%
	Bachelors	125	57.9%
	Post-Graduation	76	35.2%
6	Background		
	Big City	121	55.8%
	Small City	61	28.1%
	Village	34	15.7%
7	University		

	SU	90	41.5%
	GI	26	12%
	UMT	22	10.1%
	USA	25	11.5%
	UOL	35	16.1%
	Others	18	8.3%

Figure 1 is the graphical representation of the body mass index of the individuals who participated in the study. BMI is divided into four categories: underweight(less than 18.5kg/m2), normal(18.5kg/m2-24.9kg/m2), overweight(25kg/m2-29.9kg/m2) and obese(greater than 30kg/m2).. Out of the 216 participants 16.6% had BMI that was underweight, 53% were normal, 18.9%, were overweight and 11.1%were obese.

Figure 1

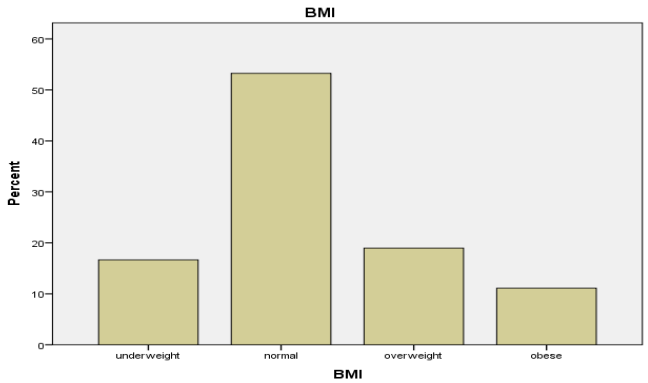

Table 2

Association Between BMI and Breakfast Skipping Frequency

BMI	Breakfast Skipping				Total
	Never	Twice a week	Thrice a week	Always	
Underweight	9	6	6	15	36
Normal	42	32	11	30	115
Overweight	16	10	7	8	41
Obese	10	7	1	6	24
Total	77	55	25	59	216

Table 2 was created using cross tabs. It shows that out of the 216 individuals who participated in the study 73 from teaching staff and 80 from administrative staff reported being irritable at work while 26 from teaching staff and 37 among administrative staff reported that they were not irritable at work. 70.8% of the total population felt irritated when haven't eaten at work where as 29.2% did not. Similarly, 67.6% of the population felt they had enough time for having lunch and snacks at work while the remaining 32.4% disagreed with the same.

Table 3

Impact of Job Description on Irritability and Meal Timing at Work

Job Description	Irritable at work when haven't eaten		Enough time for lunch and snacks	
	Yes	No	Yes	No
Teaching staff	73	26	65	34
Administrative staff	80	37	81	36
Total	153	63	146	70
%	70.8%	29.2%	67.6%	32.4%

In order to find out the association between different variables chi-square test was used. Table 4 shows all the significant associations. Breakfast venue preference was tested against a number of variables out of which it showed significant association between arriving late (p-value: 0.0012) and consumption of soft drinks (p-value: 0.038). Skipping of breakfast was associated with living situation (0.006), monthly leaves (0.02) and the consumption of fruits (0.05) and soft drinks (0.021). The association between gender from the socio demographic part and food frequency questionnaire showed significant association with red meat (0.010) and milk/dairy (0.030). Marital status was tested against the food frequency part and showed association with processed foods (0.004), tea (0.005) and milk/dairy (0.015). Either the sample population lived in hostel or homes strongly influenced the consumption of certain foods including milk/dairy (0.004), fruits (0.02) and vegetables (0.005). The intensity of physical activity demanded at work was associated with a number of variables like finding it hard to get work done (0.013), physical tiredness (0.008), energy levels during working hours (0.001) and work place prioritizing workers 'health (0.018). A significant association was found between workplace prioritizing workers 'health and physical activity done for recreational purposes (0.000). Incentives and bonuses were associated with energy levels during working hours (0.001) and workplace support (0.000). Physical tiredness during work (0.003), workplace prioritizing health (0.000) , access to fruits and vegetables (0.001), opportunity to be physically active during work (0.005) and energy levels during work were all found to have significant association with workplace support.

Table 4

Statistical Associations Between Dietary Habits, Workplace Factors, and Health Outcomes

S. No	Variable 1	Variable 2	p-value	Interpreta-tion
1	Breakfast venue	Arriving late	0.012	Significant
		Soft drinks	0.038	Significant
2	Skipping breakfast	Living situation	0.006	Significant
		Fruits	0.05	Significant

		Soft drinks	0.021	Significant
		Monthly leaves	0.02	Significant
3	Gender	Red meat	0.010	Significant
		Milk and dairy	0.030	Significant
4	Marital status	Processed foods	0.004	Significant
		Tea	0.005	Significant
		Milk and dairy	0.015	Significant
5	Living situation	Milk and dairy	0.004	Significant
		Fruits	0.02	Significant
		Vegetables	0.005	Significant
6	Physical activity at work	Hard to get work done	0.013	Significant
		Physical tiredness	0.008	Significant
		Energy levels at work	0.001	Significant
		Work place prioritizing health	0.018	Significant
		Physically active during working hours	0.000	
7	Recreational physical activity	Workplace prioritize personal health	0.000	Significant
8	Incentives	Energy levels	0.001	Significant
		Work place support	0.000	Significant
		Physical tiredness during work	0.003	Significant
		Work place prioritize health	0.000	Significant
		Access to fruits and vegetables	0.001	Significant
		Physically active during work	0.005	Significant
		Energy levels during work	0.002	Significant
10	BMI	Important meal consumption at work	0.001	Significant

Chi-square test also showed a number of variables with non-significant association. Energy levels during work had no significant association with the individuals feeling rushed to get work done (0.634). Consumption of one or more important meals of the day at work had no significant association with having enough time for lunch and snacks (0.741) and energy levels (0.443). Coffee/ tea consumption (0.339) and breakfast venue (0.093) did not have a significant association with energy levels. Individuals involved in recreational physical activity had no significant association with meeting deadlines (0.528) and being irritable at work (0.506).

Table 5

Non-Significant Associations Between Workplace Factors, Dietary Habits, and Energy Levels

S No.	Variable 1	Variable 2	p-value	Interpretation
1	Rushed to get work done	Energy levels during work	0.634	Non-significant
2	Important meal consumption at work	Enough time for lunch and snacks at work	0.741	Non-significant
		Energy levels at work	0.443	Non-significant
3	Energy levels during work	Breakfast venue preference	0.093	Non-significant
		Coffee/tea consumption	0.339	Non-significant
4	Recreational physical activity	Meet deadlines	0.528	Non-significant
		Irritable at work	0.506	Non-significant

DISCUSSION

This study took place in different private sector universities of Lahore, Pakistan. The main aim of this was to evaluate the effectiveness of nutrition, lifestyle and workplace environment on occupational health and productivity. After collecting and analyzing data a number of factors came forward that had an impact on workers' health and lifestyle choices.

According to the research done, one of the most important factors was the consumption of breakfast, the breakfast venue and skipping played a major role in determining various other factors. Breakfast was either consumed at home or cafeteria and this had an association with punctuality and the consumption of unhealthy options like soft drinks. Skipping breakfast is one of the eating habits `that shows significant association with either the individuals lived at homes or hostels, monthly leaves and the consumption of fruits and vegetables.

An insight into the existing literature revealed a survey done in Australia suggested that work hours and commute had an impact on food practices and overall workers' health. It was a longitudinal study, with sample size of 14807 individuals; data was collected in different waves throughout different years. The frequency of buying food from outside the home for breakfast, lunch and the consumption of fruits and vegetables, were among the results. Findings showed that people were more likely to buy foods from outside home the longer they worked and commuted (frequency of total out-of-home food purchasing: incidence rate ratio (IRR)=1.007 (95% CI 1.007 to 1.008)) and to eat fewer servings of fruits and vegetables, though these decreases were only slight (fruit: β=−0.002 (95% CI −0.003 to –0.001), vegetables: β=−0.002 (95% CI −0.003 to –0.001)). Examining within-individual variations revealed similar findings about relationships with food purchases made outside the home (IRR=1.006 (95% CI 1.005 to 1.007)) (24).

A random sample of 2665 undergraduate students participated in an analytical cross-sectional study at a public institution in Kuala Lumpur. The goal was to investigate the frequency of skipping breakfast and the factors that contribute to it. A self-administered, pre-tested questionnaire was used to collect data. The bulk of responders (58.3%) were Malays, with 43.5% being men. The percentage of people who skipped breakfast was 29.2 (95% CI: 27.3-30.3). Age, race, housing, faculty, and skipping dinner were the factors that were substantially linked to skipping breakfast ($p<0.05$). In addition, respondents who stayed at home were less likely to forgo breakfast than those who stayed in rented homes (OR: 2.08; 1.25 - 3.46), hostels with cafeterias (OR: 2.92; 1.74 - 4.91), or hostels with meals supplied (OR: 2.32; 1.39 - 3.84) (25).

Another study that took place in Lahore, studied the impact of breakfast skipping on the nutrient intake and BMI. The purpose of this long-term study was to look into the dietary preferences of college residence hall residents and the connections between BMI, nutritional consumption, food preferences, and skipping breakfast. Monthly assessments were used to gather data from students living in university residence halls over a three-month period. 306 students participated in the study; 153 students each were assigned to the breakfast-eaters (control group) and breakfast-skippers groups. The breakfast eaters underwent additional classification. Social demographics, anthropometric measurements, lifestyle evaluation, dietary evaluation using 24-hour dietary recall, and food composition table analysis were all included in the valid assessment questionnaire. Compared to other categories, breakfast skippers were more likely to be overweight (13.7%) and obese (15%) (26).

This aligned with the results of our study showing that skipping breakfast leads to consumption of unhealthier options like soft drinks and lesser intake of healthier options like fruits.

The next significant association was observed in gender and the consumption of red meat and milk/dairy. A study took place in Switzerland suggested that men consume more red meat than women. The emergence of a gender bias in the consumption of red meat and total meat across life stages, however, was a previously missing piece of the puzzle. Multiple-group regression across seven age classes to determine the gender bias across human life stages was used. The US National Health and Nutrition Examination Survey provided the data for the empirical analysis. The findings of the regression showed that the variations in meat consumption between the sexes began only after the age of four and subsequently progressed somewhat in tandem with the emergence of biological differences, peaking between the ages 51 and 65 (27).

A study assessing gender differences in food preferences highlighted notable eating patterns that differed by gender among the 2198 individuals (average age 41.1 ± 12.7 years, with 1314 females and 884 males). Significant disparities in dietary preferences and eating behaviors between genders were revealed by the investigation. Men consumed far more red and processed meat, milk, and dairy products than women did. Contrarily, women exhibited a stronger preference for vegetables, whole grains, tofu, and dark chocolate with a higher cocoa content, all of which were associated with healthy eating habits. Women tend to eat more often and reported feeling more hungry in the morning, but males tend to skip snacks, according to the study, which also showed disparities in eating behaviors, such as meal frequency, snacking habits, and hunger patterns (28).

Marital status was found to have an impact on dietary preferences and had a significant association with the consumption of processed foods. A study that took data from three Swiss Food Panel survey supports the significant results. A cross-sectional comparison between household types was undertaken by utilizing a one-way independent ANOVA.

The final sample included 3559 individuals, with a mean age of 56 (range: 22–94 years; 46% male. Women who lived with a spouse reported higher consumption frequencies of meat and processed meats than women who lived alone, according to cross-sectional data. The consumption of vegetables was higher among men who lived together. However, both sexes consumed more processed meats as a result of the transitional effect of living with a partner, whereas males consumed more pork and savory foods (29).

Physical activity is one of the most important factors that affect overall health of workers. In the results mentioned above being physically active at work had significant relationship with a lot of different factors one of them is the energy levels. Being physically active determines what the employee feels active or drained during work which has a direct impact on work output A study that evaluated effect of frequent interruptions of prolonged sitting on self-perceived levels of energy, mood, food cravings and cognitive function , suggested that six hours of continuous sitting (SIT), SIT + thirty minutes of moderate-intensity treadmill walking in the morning (ONE), and SIT plus six hourly five-minute microbouts of moderate-intensity treadmill walking (MICRO) were the three conditions that thirty inactive persons underwent in a randomized crossover trial. Using visual analog scales, self-perceived energy, mood, and appetite were evaluated. The Profile of Mood State questionnaire was used to measure vigor and weariness. The Comprehensive Trail Making Test and a flanker task were used to assess cognitive function. Linear mixed models were used to examine the impact of the

intervention. When compared to SIT, ONE and MICRO both raised self-perceived energy and vigor ($p < 0.05$ for all). Compared to SIT, MICRO, but not ONE, enhanced mood, reduced fatigue, and decreased food cravings at the end of the day ($p < 0.05$ for all). The condition had no discernible effect on cognitive function.

Apart from the positive effects of physical activity on vitality and energy levels, distributing physical activity throughout the day enhanced mood, reduced feelings of exhaustion, and influenced hunger. One possible strategy to enhance general well-being at work without impairing cognitive function is to introduce brief bursts of movement into the workday for sedentary office workers (29).

Workplace support is crucial in maintaining maximum employee output and through research its importance was elaborated by multiple significant associations with various variables. A workplace that supported nutritional health and well-being of its workers ideally provided more opportunities to access healthier food choices like fruits and vegetables. A study was carried out to assess the long-term impact of a group randomized trial of workplaces on fruit and vegetable intake.

The Seattle metropolitan area's medium-sized blue-collar companies were sought after. Serial cross-sectional samples of the current workforce were used to measure intake at three different points in time. The companies were partnered with during the 18-month multilevel intervention. A 4.4-year follow-up was conducted after the baseline. In order to account for workplace random effects, statistical analysis employed general linear models. 29 of the 45 randomly selected worksites agreed to take part in a new study. A long-term differential change of 0.25 servings per day, 95% CI (0.09 to 0.40), was observed at the intervention worksites as fruit and vegetable intake rose with bigger sustained increases. At four years, the intervention had minor effects, including two years without contact. Despite the lack of significant results, this low-intensity intervention strategy may offer a valuable public health model. This study depicted that a workplace trying to be more supportive of employee's health will incorporate easy access to fruits and vegetables as a strategic intervention at workplace (30).

Another intervention by any supportive workplace to promote health and wellness would be the promotion of physical activity due to its numerous health benefits. The same association was observed in the above mentioned research. To support this result already existing literature led to a research based on The 15 Minute Challenge which was a mHealth workplace wellness program that used gamification to encourage physical activity with the goal of improving general well-being and health outcomes. This retrospective cohort study assessed the program's efficacy among workers at different workplaces in Australia, New Zealand, and the UK. 11,575 individuals from 73 firms provided real-world data for analysis. Over the course of six weeks, the program promoted daily 15-minute physical activity sessions. At baseline and six weeks, participants self-reported their energy, mood, general health, sleep quality, and level of physical activity and fitness. Additionally evaluated were program adherence, engagement rates, and program satisfaction. Multi-level mixed-effects linear regression analysis were used to assess effectiveness. Compared to 57% at baseline, 95% of participants met or exceeded international physical activity criteria after the intervention, indicating significant improvements in physical activity ($p < 0.05$). Self-reported energy, mood, sleep quality, exercise, and general health all showed substantial improvements (all $p < 0.05$, with improvements ranging from 7.1 to 14.0%). 92% of participants expressed high satisfaction and recommended the program. Among participating employees, the 15 Minute Challenge successfully raised levels of physical activity and enhanced self-reported health outcomes. The substantial health gains and high satisfaction rates demonstrate how workplace wellness initiatives can encourage a more active, healthy lifestyle and fight sedentary behavior (31).

CONCLUSION

In conclusion, the main purpose of this study was to investigate common dietary patterns among workers and how these patterns co relate with nutrient intake and productivity levels. It was observed that breakfast which is the most important meal of the day, skipping it and the breakfast venue, directly affected the parameters related to productivity so by designing an intervention around breakfast like providing enough time at work and giving healthier options can lead to a good impact on workers 'overall health and productivity.

Physical activity during work or for recreational purposes was a lifestyle factor that affected a number of variables like physical tiredness, energy levels at work and finding it hard to get work done. Recreational physical activity also had an association with body mass index, so by promoting personal well-being, by providing enough time and opportunity to work out during working hours and facilitate the employees with gyms and training centers at workplace can have a huge impact.

The support provided by the workplace was also one of the major contributors to maintaining workplace productivity. This support can be made evident by organizing nutrition related seminars at the workplace highlighting the importance of well-balanced diet and physical activity.

Limitations

This study provided valuable insights but certain limitations needed to be acknowledged. The duration of the study which was four months, limited the ability to track long-term implications of nutrition and lifestyle on productivity. Future research should have more time span in order to cover the broad topic.

Data was only collected from teaching and administrative staff of various private sector universities in Lahore. Government sector was not included due to difference in job description and facilities. The provided data is only a representation of working sector of educational institutions. Population that belonged to any other category like industries, factories, businesses etc. was not included. Government sector and other working fields should also be included in future research.

The study relied on self-reported survey data which may have introduced response bias.

The study employed a cross-sectional design, it only provided a snapshot of participants' experiences at a certain point in time. Future researches can use longitudinal study design in order to view the long-term effects.

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