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FEMALES AND OCCUPATIONAL EXPOSURES: REVIEW ARTICLE

By

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Abstract

Introduction: Women and men may experience different outcomes when exposed to the same risks. It is common for people to mistakenly believe that work done by women is lighter, easier and safer than that taken by men and consequently obtained less attention. Men may have a higher rate of accidents and fatalities at work, and it is common for women to work in jobs that involve both physical challenge and repetitive tasks; examples include, social care, cleaning, agriculture, hotel work, food manufacturing, and domestic work, in addition to many other occupations. Realizing how gender differences can impact the risk of exposure to occupational hazards is a key aspect of developing effective injury as well as illness prevention strategies. **Aim of the review:** The aim of this review article was to study the occupational exposures in relation to female workers and the hazardous effects occurring due to these exposures, pointing to the risk factors related to these exposures for the female workers. **Result:** According to the review, there are differences in exposures to occupational hazards between men and women and the gender distribution of the labor force by occupation is not the sole cause of these differences. Male workers continue to face the enduring challenge of occupational exposure to dusts and chemicals, as well as engaging in specific physically demanding tasks. However, it should be noted that women workers had a significant prevalence for many of these occupational exposures. In contrast to their male counterparts, female workers exhibited a higher incidence of repetitive tasks, working at exceptionally high speeds , and exposure to specific agents such as disinfectants, hair dyes, and textile dust. Gender differences in exposure were in part explained by gender differences in occupational distribution, while for some exposures, differences in prevalence were even observed for men and women with the same occupation. **Conclusion:** Hence, gender significantly influences the prevalence of occupational exposure, emphasizing the importance of considering gender in occupational health research.

Key words: Gender difference, Occupational exposures, Occupational hazard and Female workers.

Introduction

The presence of an external substance or risk factor in the work environment that is not related to the worker can be defined as occupational exposure. The Encyclopedia of Public Health identifies five categories of occupational exposure: accidents, physical, chemical, biological, and psychosocial exposures, added to organizational factors (Kirch, 2008).

Women make up 48.5% of the global workforce and 27.6% of the agricultural workforce (rising to 66.5% in low income countries) (ILO, 2018).

Gender has a significant impact on the occupational health and safety of workers in various ways. The types of occupations and industries in which men and women work differ based on their roles and expectations, their role and responsibility within these occupations and industries, as well as their involvement in the labor force in general (Milner et al., 2021).

Women and men may experience different effects from exposure to the same risks. It is common for people to mistakenly believe that work done by women is lighter, easier and safer than that carried by men and consequently obtained less attention. While men may experience a higher rate of workplace accidents and fatalities, it is noteworthy that women commonly engage in occupations that combine physical challenges and repetitive tasks. These occupations span across various sectors, including agriculture, cleaning, hotel work, social care, domestic work, food manufacturing, and many others (ILO, 2020[a]).

Realizing how gender differences can impact the risk of exposure to occupational hazards is important for development of effective strategies for preventing injuries and illnesses that incorporate both individual and social contexts in their design, especially as over half of the workforce in many countries is occupied by women (Eng et al., 2011).

Aim of the review

To study the occupational exposures in relation to female workers and the hazardous effects occurring due to these exposures, pointing to the risk factors related to these exposures for the female workers.

1- Gender difference in occupational exposures

Differences in gender can influence

occupational health. A systematic review spanning from 1999 to 2010, which examined variations between women and men in their general exposure to work and employment conditions, revealed that, in comparison to women and men ; end more to indicate elevated job insecurity, face more challenging working conditions, which include the demand of psychosocial work environments, and account lower self-perceived physical and mental health. However, when we compare the work of men and women; men were more likely to be exposed to more physically demanding work, longer working hours, noise, and to experience greater effort-reward imbalance (Campos-Serna et al., 2013).

As technology progresses, new work patterns continue to emerge, automation, artificial intelligence, and other emerging technologies and the gendered distribution of the labor force, we are going to be capable to identify new or previously underreported occupational hazards that differ between men and women in different occupations (Biswas et al., 2021).

2- Females and physical occupational exposures:

Many female can experience physical hazards such as excessive heat, cold, noise, or radiation. In a comprehensive review article exploring gender disparities in occupational hazards, across various professions, it was observed that greater percentage of men faced exposure to occupational noise, vibration, ultraviolet radiation from sun exposure, radiation exposure from radioactive substances and diagnostic medical devices; no research work demonstrated that women have a higher exposure than men to these occupational hazards (Biswas et al., 2021).

Lund et al. (2019) reported that a greater percentage of women were subjected to wet work, with no study indicating a higher proportion of men exposed to this particular type of labor.

Exposure to noise, heat and radiofrequency radiation had a negative impact on both men and women reproductive functions (Ramezanifar et al., 2023).

3- Females and chemical occupational exposures:

There is potential exposure to chemicals in a wide variety of occupations. In a nationwide survey done in New Zealand by Eng et al.

(2011), men were more liable to be exposed to smoke/fume/gas, solvents and oils compared to women within the same occupation. Male working population has a higher prevalence of specific exposures by more than 10 times compared with the female working population included: hydraulic oil; welding fumes; paint thinner; paint dust; kerosene; diesel fuel; printing; insulation material; sulfuric acid; timber treatment; fibreglass; and cutting fluid, while textile dust, hair dye, disinfectant; bleach, environmental tobacco smoke; and household dust were common among women.

While women exposure to hazardous chemical substances like smoke, and gas fumes was mentioned in a limited number of studies like Guytingco et al. (2018) and Scarselli et al., 2018; who described similar exposures between men and women , also they discovered that both gender had similar prevalence of exposure to pesticides and herbicides.

a) Pesticides

Research proposed that being exposed to occupational pesticides could lead to a notable elevation in follicle-stimulating hormone (FSH) levels, without affecting the luteinizing hormone (LH) or testosterone, as observed in the investigated sprays (Abdallah et al., 2017)

b) Metals

Reproductive dysfunction is a health hazard to metals like Manganese, Zinc and Cadmium that have destructive effects on the reproductive system. Arsenic, Cadmium and Lead also has negative reproductive effects that impair female fertility causing abortion, abnormalities, and birth defects (Lin et al., 2023).

c) Solvents

Within the category of solvents, formaldehyde stands out as one of the extensively utilized substances that impact the reproductive system. Research indicated that formaldehyde had an impact on the quality of semen, particularly affecting its excitatory parameter (Wang et al., 2015). In addition to formaldehyde, polycyclic aromatic hydrocarbons (PAHs) also had detrimental effects on the reproductive system. Exposure to PAHs had a possible association with recurrent pregnancy loss in women (El-Sikaily et al., 2023).

d) Gases

Exposure to nitrogen dioxide,

carbon disulfide and sulpher dioxide gases can have a reproductive toxicity (Chen et al., 2020).

4- Females and biological occupational exposures:

Some research work detected that women were more expected to be exposed to biological materials and urban waste from garbage collection and biological dust (Skorge et al., 2009), while Merino-Salazar and his colleagues (2017) found no differences between men and women in their exposure to various biological agents. In a work examining biological exposure, it was found that men faced a risk of work disability related to respiratory issues when exposed to molds , other bio-aerosols, , and mixed agricultural work. Although both men and women shared a high risk for such exposures, the risk of respiratory work disability from animal-derived agents was greater among women compared to men (Fell et al., 2016).

5- Females and Mechanical hazards:

a) Ergonomics

Females are more inclined to engage in professional roles, especially within the fields of health and education. They are also more likely to work in service and sales occupations, as well as clerical positions, which are often characterized by fast-paced and repetitive tasks. Machine operators, typists, secretaries, telephone operators, assemblers, dressmakers ,sewers and stitches' women, and bus drivers are occupations with excessive sitting. Nurses, hairdressers, waitresses, retail clerks, and cosmetologists are examples of women who spend a significant portion of their workday standing (Eng et al., 2011).

B) Injuries

Back injuries are one of the major occupational injuries. Poorly designed jobs are the result of many back injuries. A representative example is the task of a nursing aide: lifting and turning patients. Most of hospital workers were complaining of back injuries. The latter may occur when a job involves carrying heavy objects or twisting the torso. Women in healthcare professions with repetitive tasks faced an increased risk of injuries across all causes (Fan et al., 2012).

Tenosynovitis was the major complain among carpenters ,typists, and other workers such as small machine assemblers, who are required

to make rapid finger and hand movements. To eliminate this potential injury, we suggest better job design, tool design, and worker training. Some research work detected that there is an association between exposures to repetitive physical work tasks and musculoskeletal diseases (MSDs), where Hanvold and his colleagues (2015) found that both men and women were susceptible of shoulder pain that was due to prolonged arm elevations, but women were at increased risk compared to men. Men and women were at risk of elbow-specific lateral epicondylitis from monotonous repetitive exertion but no difference in the risk for men and women as was noted by Herquelot et al. (2013). Prakash and his colleagues in (2017) found out no variation between men and women about the hazard of back or degenerative MSDS from extremely repetitive work tasks.

Physical work demands in occupations may cause men and women injury, Fan and his co workers (2012) found that men in professional and administrative occupations generally, or occupations in the primary or secondary industry sectors (natural resources, manufacturing, or construction), could be at higher injury risk from different monotonous repetitive work tasks than women in these occupations and industries, but in sales and service occupations ;that there were no differences in work injury risk between men and women.

In a research work done by Smith and Anderson in 2017 on janitorial workers, men were at higher danger of injuries from falls from height and from being struck by or against something, compared to women. The same study detected that there were no difference between men and women janitorial workers in their danger of MSDs and harm from falls from the same level.

Females and psychological occupational hazards

Examples of the main psychosocial occupational hazards were occupational stress, occupational violence, bullying or harassment and fatigue. Newman et al., 2011 detected that more women than men were exposed to sexual harassment, bullying ,discrimination, verbal aggression/abuse, and sexual assault. Dzurova and Drbohlav , 2014 from Finland reported that more women than men in administrative work tasks were complaining from bullying.

Health care workers were studied by Newman and his colleagues (2011) and detected a higher prevalence of bullying , verbal abuse and harassment in Rwanda women workers. Women nurses in Italy were facing work stress and lower social support than men registered nurses (D'Ettorre et al., 2019).

The vast majority of employed women encounter significant occupational stress as a major hazard. Potential sources of stress for women could be prolonged hours of work, shift work, overloaded work strain or call duty schedules and sometimes, monotony/boredom, in addition to the nature of traditional female-dominated occupations and the dual roles of work at home and in the workplace (Eng et al., 2011).

Most of chronic diseases could be due to the effect of stress. The physiological, psychological, and social ramifications of workload result in disruptions to the typical sleep-wake cycle, depression and burnout syndromes (Korneeva et al., 2013).

One of the potential sources of stress in women's work is job dissatisfaction from the underutilization of skills as well as the lack of recognition of accomplishments, excessive hours of work and demanding job requirements. Excessive loads at work and home for the large number of dually employed females is another source of work-related stress. According to studies, psychological demands and workplace stress are more prevalent indicators of high levels (e.g., elevated job strain, imbalance in effort-reward) among women than men. At work, women were exposed to more perceived stress and emotional demands than men, and there is a lack of support from colleagues or superiors (Biswas et al., 2021).

Occupational exposure and female health regarding some diseases

a) Reproductive toxicity due to occupational exposure:

Various occupational exposures previously mentioned can lead to adverse pregnancy outcome. The risk of low birth weight (LBW) child; increased for women who were exposed to endocrine-disrupting chemicals at work. Also children with brain tumors were seen following maternal occupational exposures to chlorinated solvents. A significant relationship observed in shift work and spontaneous abortion. Stillbirth and autism spectrum disorder was higher due to exposure

to ambient air pollution (Rahimi et al., 2020).

b) Respiratory diseases:

Occupational asthma had consistently greater odds for asthma diagnosis among women exposed to flour, paper, textile dust, cleaning agents and engine exhaust (Ahmed et al., 2022).

c) Skin diseases and allergy:

Women are engaged with occupations that involves continuous and prolonged contact to water, detergents and organic materials with risk of allergic and infectious skin diseases. Women engaged in outdoor activities as agricultural farm are susceptible to numerous factors in the environment that may lead to work related hazards including occupational skin diseases. The latter also could happen due to chemical substances exposure (Bhavani et al., 2019).

d) Cancer:

There is a lot of carcinogenic substances that women could be exposed at the workplace.

- **Breast cancer**

Ionizing and non-ionizing radiation exposure, night-shift work, pesticides, polycyclic aromatic hydrocarbons and metals are defined epidemiologically and experimentally as environmental factors for breast cancer, particularly at young ages (Pedersen et al., 2021).

International Agency for Research into Cancer (IARC) (WHO, 2007) concluded that disruption of the circadian rhythms due to shift work ; may cause breast cancer. Following additional deliberations in 2019, IARC affirmed that engaging in night shifts could potentially lead to cancer in humans. Once again, in 2019 the IARC highlighted the conceivable connection between night shifts and breast cancer (IARC, 2019).

- **Ovarian cancer**

Leung and his co workers (2021) suggest that occupations like accountants; hairdressers, barbers, and beauticians; sewers and embroiderers; saleswomen, shop assistants, and demonstrators; and occupations in retail trade, with specific exposures for hydrogen peroxide ,cosmetic talc ,hair dust, ammonia, propellant gases, ethanol, fluorocarbons, polyester fibers, cellulose, and may be associated with increased ovarian cancer risks, but it is not easy to conclude specific exposures that may lead to the increased risks.

- **Uterine cancers**

Cancer cervix could develop due to some occupational exposure of chemical nature. This occurs with certain dry-cleaning agents like tetrachloroethylene or diverse solvents. These substances pose a potential risk in professional sectors such as domestic and commercial cleaning, where an elevated prevalence of cervical cancer has been observed compared to the general population. Also women who work at rubber factories are at higher risk due to exposure to styrene-butadine, which may be the cause of several types of cancer, such as breast cancer and ovarian cancer, but mortality rates is quite inconclusive and could not be expected (Vicente-Herrero et al., 2021).

Occupational exposure to hormonal drugs can increase risk of both cervical and breast cancer as IARC concluded that combined hormonal estrogen and progesterone pills are group 1 carcinogenic with risk of cervical cancer and breast cancer (Williams et al., 2018).

Females in different industries:

By far female dominated occupations include variety of sectors. One of the most female-important occupations is personal care workers, such as home-based personal workers and health care assistants. As per the most recent statistics from the International Labour Organization (ILOSTAT), 88% of care giving personnel are female, while males make up only 12%. About three-quarters of health associate professionals, including those in pharmacy, pathology, imaging, are women, and 69% of health professionals, such as general medical doctors and nurses, are also women. Teaching , cleaning roles, food preparation and clerical support are also dominated by female workers for at least 60% (ILO, 2020[b]).

Statistics among the Egyptian population

In 2020, Egypt recorded a WBL score "Women, Business and the Law score" of 45 out of 100 points. That is, an average woman in Egypt has less than one half of the legal rights of an average man. Compared to a global average of 75 points, Egypt is one of the bottom 15 countries on the list. Female labor force participation rates (FLFPR) in Egypt have been declined since 2016 (Figure 1). The public sector remains the preferred sector of employment for women. In 2018, close to two thirds of

the female labor force were attached to the public sector, whereas the private sector is dismissing working women en masse. Between 2016 and 2018, private businesses lost 35% of the female labor force (ILO, 2020[c]). In addition, highly educated women in particular are attracted to the public sector. Working women are polarized at both ends of the occupational ladder. They represent at least one third each of the following occupations: professionals, associate professionals at one end and elementary occupations at the other. Egalitarian by nature, university educated women working in the public sector earn 86% of their male counterparts, compared to 74% in the private sector (ILO, 2018).

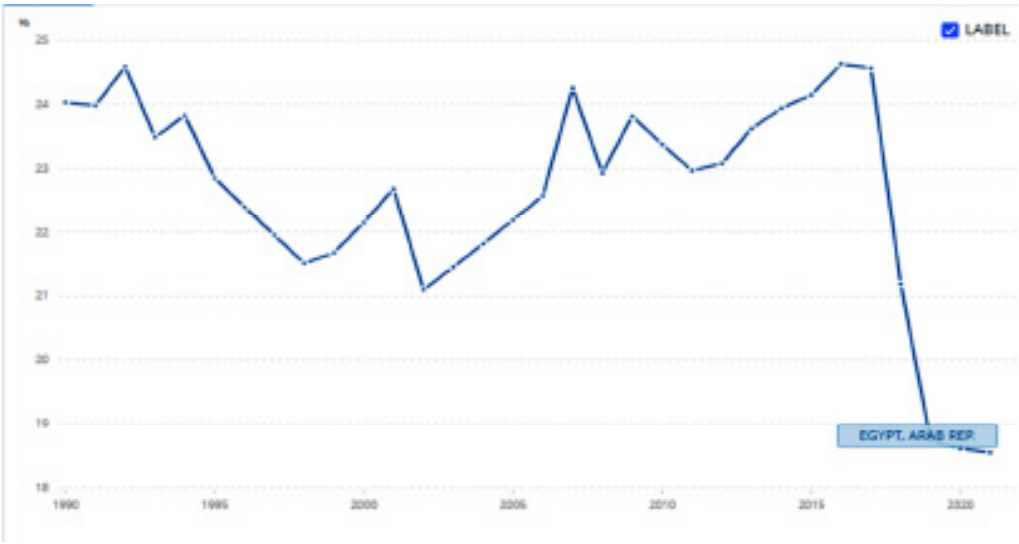

Figure 1: Female labor force (% of total labor force) - Egypt, Arab Rep.

Source: World Bank, World Development Indicators database. Estimates are based on data obtained from International Labour Organization and United Nations Population Division.

Conclusion

Men and women have different exposures to occupational hazards as the current review indicated and these differences are not solely due to a gendered distribution of the labor force .

Despite gender inequality in employment opportunities, occupational risk factors were not the same when we compared men and women. The burden of occupational exposure is increasing for male workers especially to certain physically demanding tasks and a large amount of dusts and chemicals. However, the prevalence in women workers was not negligible for many of these occupational exposures. Women workers had a higher prevalence of working at very high speed, repetitive tasks, and certain exposures such as hair dyes disinfectants, and textile dust compared with men. Gender variations in exposure were partially clarified by variations in occupational distribution between genders. Additionally, certain exposures displayed differences in prevalence even among individuals of the same occupation, irrespective of gender.

Occupational exposure prevalence was affected by gender, and that the effect of gender should not be overlooked in occupational health research.

Recommendations

The results could direct a prevention program which aims to lessen gender disparities in occupational health. Further research is necessary to clarify the factors which contribute to gender-based differences in exposures within identical occupations.

In these cases where differences are not obvious, generalized gender-neutral primary prevention strategies are necessary. For occupational hazards, targeted primary prevention will be necessary as prevention strategies that recognize sex and gender differences. Other prevention strategies and policies should be studied in which men and women can be exposed to occupational hazards based on gendered differences in labor force and within the same occupations, differences in work tasks should be directed.

Conflict of Interest

None

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