



Review

# The Intricate Web of Fatigue in Women

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**Abstract:** The modern woman has taken her rightful place in society as a worker, a caregiver, a mother, and a world citizen. However, along with the privileges of these roles comes the great cost of stress and resultant exhaustion and fatigue. Psychosocial, physical, cultural, and disease-related realms of stress act as strands of a web that serve to bind and hinder women with chronic stress. New areas of research, such as exercise intervention, improved social programs (e.g., childcare), and supplementation are constantly evaluated for effectiveness alongside traditional remedies such as exercise. This review will highlight some of the key issues regarding stress in women and explore reports of new treatment modalities in light of the specific requirements of the modern woman.

**Keywords:** women; stress; fatigue; psychosocial; sociocultural



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## 1. Introduction

The popular perception of fatigue as a normal part of society is a cultural phenomenon based on the necessities of modern life. Global commerce, communication across time zones, and the complexities of even entry-level jobs all serve to increase stress and reduce time for rest and recovery. However, as the complete retooling of society is impractical, most medical advice is oriented toward “fighting stress” instead of removing its root causes. This is the exact opposite of what medical science espouses (removing the cause of disease is far better than having to cure it) and offloads the burden of fatigue onto the victim. Women in particular, tend to suffer disproportionately from stress and, if women are unable to function while under the strain of education, career, childbirth, childcare, or social pressure (to be thin, happy, etc.), then the fault is placed on them and not the root causes [1]. This “combat” mentality is used in other chronic conditions, such as cancer, obesity, or other chronic diseases, to personify the affliction as an entity that can be conquered and any failures to do so are due to a lack of willpower on the part of the sufferer.

It is a romantic ideal of Western culture to fight a single foe in honorable combat but rarely is fatigue caused by a single source. Rather, fatigue, especially in women, is a dense web of interrelated and linked variables that shift, adapt, and overwhelm the individual's homeostatic capacity. In this view, fatigue is a disruption in neurophysiological homeostasis rather than a function of mere human willpower and thus can be more appropriately countered by balancing multiple strands of the web to achieve a more permanent resolution of stress symptoms. The realms of fatigue are as varied as the women who suffer from them and psychosocial, physical, cultural, and disease-related areas must be addressed in order to fully delineate the root causes of stress. This review will briefly survey each realm or area of fatigue, especially with regard to women in the modern age, and explore some reports on relief for each problem area. However, although many strands in the web are rooted in various sources, the final product, stress, is the main driver of fatigue (Figure 1) as the nervous system is truly capable of only two states: stressed or unstressed (sympathetic or parasympathetic mode) and any disruptions of its homeostasis due to imbalances in this system are manifested as fatigue. It is for this reason that, for the purpose of this review, fatigue and stress are interchangeable.



**Figure 1.** Sources of stress for the modern woman are multi-factorial and diverse.

## 2. Realms of Fatigue

### 2.1. Psychosocial

A large factor in modern stress that is linked to every other source is the psychosocial burden that relationships, finances, work, and society place upon women. As evidenced by the high divorce rate, increasing declarations of bankruptcy among women, the growing population of female prisoners (at least in the US), work demands in the COVID-19 pandemic, and ever-shifting cultural expectations of beauty, physique, and comportment, women are placed under tremendous strain in the face of a rapidly changing society [2,3]. These stresses are often chronic and difficult to counter because they involve forces outside of direct control and result in anxiety, hypersensitivity to pain, and compensation that can increase smoking, drinking, and calorie consumption [4–8]. Additionally, the compression of life choices and constantly shifting goalposts is evidenced in the pressure on teenagers to choose colleges, career paths, and family planning well before physical or intellectual maturity. Again, the battle metaphor is often used, as political and cultural leadership often prefers to offload the burden of short-sighted or poor choices onto individuals versus engineering society-wide fixes.

Divorce is a chief driver of stress among women, with 2.7 occurring per 1000 people versus a marriage rate of 6.1 per 1000 people (CDC.gov) [9]. A recent study of the effects of divorce on the well-being, economic, domestic, and housing situation of women subjected to divorce found that, unlike men who suffered transiently, women experienced chronic losses in financial security but, similarly to men, they suffered in all areas of health and well-being [10]. Another more recent study in older Australian adults found that smoking, anxiety, and depression were linked to divorce in both genders in variable ways depending on socioeconomic and educational statuses [11].

Financial issues, especially during global economic shifts precipitated by the current COVID-19 pandemic, are also a primary source of stress for women. Studies have shown that financial concerns tend to affect women negatively regardless of social or familial support, different from men whose financial stress tends to inversely correlate with family support [12]. Women were found to provide half or more income globally (Europe: 59%, US: 55%), making working women a large population of active labor that could be adversely impacted by the economic disruptions of a global pandemic [13].

Crime and the results of criminal activity may entangle women either as perpetrators or victims. It is well-known that women are the chief victims of domestic violence (e.g., 31.3% of all Japanese women vs. 19.9% of all Japanese men) and also suffer from harassment or stalking at higher rates than men [14]. A 2011 national study of women

in Australia also found that women experiencing serious personal or financial stressors were also more likely to suffer violence (actual or threatened) [15]. This kind of stress is additive to the other causes and can result in constant engagement of the “fight or flight” response that subjects the central nervous system to chronic activation of the sympathetic nervous system and resultant high levels of cortisol (stress hormone) and adrenaline. This triggers circadian disruptions that perpetuate stress and fatigue in a vicious physiological cycle [16].

Work of all kinds has been moved, as much as possible, to online or teleworking arrangements in light of COVID-19 concerns in crowded offices. For female white collar workers, however, social stress remains a source of stress and fatigue as online meetings may trigger fatigue from overconcentration or oversaturation of interpersonal perception [17]. On the other hand, blue collar service professions, such as janitorial or maid services, are mostly women (up to 61%) and could keep women exposed to COVID-19 risk in addition to fatigue from extended standing or excessive physical effort [18,19]. Additionally, female health care workers of all levels and grades have been pressed into extended hours at the frontlines of the pandemic and may experience additional stress from this, in addition to the usual witnessing of death and stress in patients and co-workers, resulting in burnout syndrome that predominantly affects women [20,21].

## 2.2. Physical

Physical fatigue from long hours, exacerbated by staffing issues, shift work, and profit-driven corporate expectations, has been paired together with psychosocial pressure to trap women in a vicious cycle. As layoffs and unemployment continue to mainly affect men, the wives of such laid off workers may have to work to compensate for lost income (an effect that is also part of the cultural evolution) while swing shift or night shift work also contributes to fatigue in women that may affect fertility [22,23]. The ultimate result of this dreadful synergy between psychosocial and physical realms is complete exhaustion. Paradoxically, chronically high levels of stress hormone, while inducing fatigue, may disrupt sleep cycles (especially rapid eye movement) and reduce the restorative effects of sleep [24,25]. Fatigue in this sense is also usually accompanied by aching or stiff muscles, headaches, and heart palpitations that further reduce the ability to enter deep sleep [26].

Women may also suffer from physical ailments such as sleep apnea (up to 13–24% of apnea sufferers are women), chronic fatigue syndrome, postural orthostatic tachycardia syndrome (POTS; predominates in women), neuroimmune (e.g., systemic lupus erythematosus) diseases, and endocrine (hypothalamic-pituitary-adrenal axis) issues [27–31]. Estrogen has also been found to contribute to muscle weakness in women and premenstrual syndrome/menopause contribute to poor quality sleep [28,32]. Additionally, childbirth alters stress patterns in the body (e.g., cortisol fluctuation during bottle feeding versus lower stress from breastfeeding), requiring adequate maternity leave to recover and adapt to life with an infant [33]. While many national policies around the world follow the International Labour Organization-recommended 12 weeks, women may feel financial or employment pressure to return, especially if their leave is unpaid [13,34]. Along with the overlapping cultural expectation that women are primary caregivers for infants, this could create significant stress, especially in single mothers in the US for whom options are limited since national law does not mandate paid maternity leave (mothers must choose to either care for their child and endure mental/physical stress or pay for childcare and suffer financially) [35]. Indeed, women suffer from postpartum depression, with a Japanese study detailing the peak at 1 month post-delivery, and such depression could synergistically add to financial or other psychosocial strain to add to existing stress and fatigue [36,37].

## 2.3. Cultural

Cultural expectations of women vary by country but most countries expect women to care for their families as a top priority. Such cultural expectations of childcare have forced working women to either attempt to physically care for their children while working or

to pay for licensed childcare, imparting additional financial strain. Additionally, up to 57–81% of all caregivers for the elderly and aged in the world are women and caring for an ailing parent or family member in addition to other expected duties has been associated with higher psychological and caregiver burdens [38,39]. Thus, cultural forces that prevent women from shifting their expected burdens may result in somatization of stress as fatigue and this expression may vary by country due to cultural limitations on the expression of such stress [40].

#### 2.4. Disease Progression/Recovery

Chemotherapy, surgeries, and even the common cold can cause fatigue as a main symptom. As women have been found to suffer exhaustion more when recovering from illness or injury, this realm, which ties into the physical cause above, may exacerbate stresses from other areas. Additionally, prescription medications may have side effects with regard to fatigue but studies related to female-specific adverse events are underreported in the literature. The fatigue-causing effect of diseases in women is diverse: the results of cancer therapy on the immune system with regard to body weight and chronic fatigue's links to the immune system have been reported [41,42]. Additionally, recovering from COVID/viruses causes T-cell depletion in both genders but the effect of menopause on the inflammation status in female COVID patients has not been adequately investigated [43,44]. Moreover, the enhancement of the immune system by estrogen could be causative for neuroimmune inflammation or other autoimmune diseases for which fatigue is a key symptom (the inflammation = fatigue theory) [29,30]. Of more recent concern is COVID-19 since an infection that remains mild tends to run its course over a 2-week period but, for around 10–30% of sufferers, their infections become “long-haul” COVID-19 in which symptoms (such as fatigue, brain fog, muscle aches) persist for weeks or months, even after multiple negative test results, and lower quality of life for up to 44% of long haulers [45]. Women, unfortunately, tend to suffer from this long haul syndrome more frequently than men as their estrogen-boosted immune response may leave immune sequelae after infections are cleared, an effect also thought to explain the excessive burden of vaccine (COVID-19) side effects women under 50 have suffered [46,47].

Of particular importance to women's health is the prevalence of chronic fatigue syndrome in women, who carry a 17–24% higher chance to suffer from myalgic encephalomyelitis (ME) or chronic fatigue syndrome (CFS) [48]. Classified as an idiopathic brain disorder with an estimated gender ratio of 3:1 (female:male), insomnia, dizziness, joint pain, muscle aches, headaches, sore throats, flu-like feelings, palpitations, and extreme fatigue that prevents even part-time work are common symptoms [49]. No causes have been currently confirmed although viral, hormonal, and immune etiologies have been explored, and treatments only provide minor relief from symptoms.

### 3. The Costs of Stress and Fatigue

#### 3.1. Financial

The financial cost of fatigue is enormous. Estimates of \$330 million USD per year in lost productivity, errors, and performance reduction have been reported in the US and treatment of CFS may, according to a UK study, cost \$20,000 USD per patient per year while an Australian study estimated 12 doctor's visits per year per patient at a total cost of \$14.5 billion USD [50,51]. Although these are aggregate numbers, research has reported the predominance of certain types of fatigue in women (e.g., ME/CFS) and thus estimates of the financial cost, even in women only, remain high.

Apnea costs roughly \$165 billion USD per year and accidents due to fatigue in every sector, from industrial to transportation, also kill or injure an estimated 1550 people per year in the US (NHTSC) and 1003 in China (2011) [52–54]. Additionally, burnout and fatigue in the health care fields may cause medical mistakes. In the US, estimates of deaths from medical errors reach as high as 251,000 annually and this is at least partly attributed to fatigue and overwork from ever-increasing caseloads [55–57]. Since women are key

participants in the medical field (as nurses and physicians), fatigue may contribute to the 50% burnout rate seen in a US study, with estimations of burnout in female physicians to be 20–60% higher than men [58].

### 3.2. Medical

Chronic stress and its endocrine effect, namely the release of persistent stress hormones at subclinical thresholds, is thought to be causative or add to the risk of developing a panoply of illnesses/conditions, including cardiovascular disease, neurological disorders (including dementia), diabetes, obesity, depression, and cancer. Women, particularly those suffering from gynecologic issues (such as menopause, excessive menstrual bleeding, or pelvic pain), are especially susceptible to ME/CFS while a study by Song and colleagues in 2017 examined 101,708 male and female Japanese participants (gender ratio 1:1.05) and found a 4–6% increased overall risk of cancer based on perceived stress levels [59,60]. Chronic diseases in women, especially immune-driven conditions such as fibromyalgia or lupus, may also be exacerbated by chronic stress or perceptions of it as a 2004 study of 56 Spanish women with SLE found that, while high-stress life events did not clinically worsen disease symptoms, women reported that their perceptions of exacerbations seemed to coincide with such events and, after 2 days of such stress, clinical biomarkers of SLE did increase [61]. In a study of 100 polycystic ovarian syndrome sufferers, aged 13 to 30 years of age, an Indian study found strong correlation between stress levels (reflected in a 6.64% increase in salivary cortisol in PCOS patients) and overweight status, increasing future risk of insulin resistance and PCOS-related metabolic disruptions [62]. Another Spanish study in 45 SLE patients (all female) found that cognitive behavioral therapy did alleviate somatic symptoms in sufferers compared to controls, highlighting the effect of stress on chronic disease exacerbation [63]. Additionally, immune competence and resistance to disease depends on low levels of stress hormones and sufferers of ME/CFS were found to have higher levels of inflammatory biomarkers while activity of NK cells and CD16+CD56+ lymphocytes were found to be compromised in 57 Japanese shift work nurses suffering from fatigue [20,64]. A similar effect was found in a controlled study of 58 first-year graduate students (47 female) in which CD19+ B lymphocytes decreased in response to perceived stress, along with a blunted cortisol awakening response from an increase in stress-induced glucocorticoids [65]. In women of childbearing age, this phenomenon of prenatal maternal stress is heightened, as a study in 89 women who experienced the Quebec ice storm of 1998 had children (37 participating) with up to a 10% decrease in CD4+ T cells and 0.5-log increase in pro-inflammatory TNF- $\alpha$  levels [66]. This drives home the idea that stress and strain can create a stress-mediated immunodeficient condition, a relevant concern in the age of COVID-19 and especially a concern in frontline nurses caring for infected patients. As fatigue and strain also affects pregnant mothers and those caring for infants and young children, reductions in immune competence from fatigue, coupled with the complex regulation of immunity during and immediately after pregnancy, could have serious healthcare implications [67,68].

### 3.3. Demographic/Social

Tired women, in general, are less willing to have children and this can send demographic shockwaves through an entire country as birthrates fall, yearly replacement of tax-paying workers drops, and governments suffer under the strain of lower revenues for social and infrastructure programs. Women were found, in a large South Korean study, to have significantly higher odds ratios for self-rated stress and depressive symptoms while a case study from Hong Kong found that women working 50+ hours per week were fatigued and this exhaustion was inversely correlated with the desire to have children [69,70]. Japan, as a technologically advanced nation, is well-reported to suffer from below-replacement birth rates and long work hours, exhaustion, depression, and corporate/legal frameworks to protect working mothers have all been blamed [71]. However, this effect is not homogeneous; more rural and less crowded areas of Japan (such as Okinawa with a fertility rate of

1.94) seem to be sustaining the birthrate in the place of large cities such as Tokyo (1.17) [72]. Therefore, urbanization (leading to long commutes), high living costs (necessitating the choice for work over children for young women), and scarce land availability (to create fertility rate-boosting childcare centers and parks) have all been examined; however, these choices indicate that women are forced to make an opportunity cost calculation of their financial stability versus having children with a limited energy budget [72].

Industrialized societies have also had to come to grips with higher divorce rates and single mothers bear the largest part of that burden, with a South Korean study of 195 single mothers finding higher rates of low income, housing uncertainty, stress, and alcohol problems resulting in a depression rate of 33% versus 8% for married mothers [73]. This effect was confirmed in a large American Time Use survey (2016) where responses of women aged 21–55 (19,264 total) with a child were selected and analyzed for stress, fatigue, happiness, sadness, and life meaning [74]. Single mothers with no employment suffered the most stress and fatigue while employment did not change fatigue but decreased stress and increased happiness [74]. This indicates that both unemployed and employed single mothers often suffer from high levels of fatigue (whether working or not) but stress from poverty is a predominant factor [74]. Taken together, results from these international studies reveal that the decision to have children is a complex and multifactorial issue that sees women calculating the stress and fatigue of childbirth and childrearing with respect to their perceived finances and availability of care.

#### 4. Potential Solutions

The industrialization and mass production capability of society was promoted as a time and labor saver for the home-bound mother but has created an entire world of problems for women caught up in shift work, working motherhood, or stressful changes in work culture. As the causes of fatigue and stress in women are multifactorial, methods to alleviate them are also diverse and run the gamut from supplementation to social engineering. A brief review of some of the most visible research in stress solutions follows.

##### 4.1. Supplementation

The supplement industry is a multi-billion-dollar machine that markets thousands of products purported to solve every known illness and prevent every disease. In particular, adaptogenic supplements, which are thought to support stress-relieving homeostasis by providing whatever the body needs, are currently a \$9.78 billion USD market all by themselves with a growth rate of 6.5% [75]. Adaptogens, or extracts derived from plants, such as ashwaganda, rhodiola, licorice, maca, and the venerable ginseng, have been extensively studied in the traditional Chinese medicine (TCM) literature and are thought to both inhibit production of stress enzymes, protecting the central nervous system and glands associated with the hypothalamus-pituitary-adrenal axis, as well as providing antioxidant protection against stress/inflammation-induced free radicals [76–78]. However, paradoxical effects have been noted, especially with ginseng and *Elutherococcus senticosus*, where the stress response may be exacerbated through feedback mechanisms, and such adaptogens may also carry cardiovascular and hepatic risks [79].

The B vitamins, particularly B12, B6, and folate, are implicated in depression and fatigue as they are crucial for conversion of carbohydrates to ATP and also the synthesis of neurotransmitters such as dopamine and serotonin [80]. However, a metastudy of 6276 total participants in 16 clinical trials found no significant association of B12, B6, or folate with a reduction in depressive symptoms while data on fatigue was insufficient for statistical analysis [81]. However, a smaller pilot study of B12 nasal drops in CE/MFS patients found significant improvements in energy levels after therapy, suggesting that the effectiveness of B vitamin supplements may be related to both administration method (aiming for high, stable serum levels) and target population (nerve inflammation-mediated diseases like CE/MFS may benefit more) [82].

#### 4.2. Exercise

Exercise is the most often recommended therapy for any fatigue or stress-related complaint as the correct amount of age-appropriate exercise is at least as effective as medication for depression and alleviating fatigue mediated by anxiety, depression, stress, and other nervous dysregulation syndromes [83]. That exercise is effective is no longer debated heavily in the literature; however, consensus on the proper types, amounts, and intensities to treat various stress- and depression/anxiety-related fatigue, especially in women, remains elusive. For example, while multiple studies on yoga (hatha, online, etc.) have reported improvements in depression and stress, one study found that 150 min of yoga per week was considered too much [84,85]. Clearly, there is some ideal middle ground for exercise as overtraining, especially in aerobic exercise, can raise cortisol and induce strong fatigue from parasympathetic effects [86].

#### 4.3. Hormone Replacement Therapy

In post-menopausal women, hormone replacement therapy (HRT; either as bioidentical estrogen or a triphasic oral contraceptive) is often performed with the hope of restoring muscle mass (which reduces fatigue) and improving insomnia and fatigue symptoms [87,88]. However, side effects, such as a fear of estrogen-mediated cancers, cardiovascular risk (based mostly on age), inconvenience, and a lack of significant effect on cognitive fatigue levels in some international studies has kept HRT from becoming the cure-all treatment for both post-menopausal and post-hysterectomy women [89–91]. In particular, women receiving HRT after breast cancer treatment were vulnerable to more severe fatigue, according to a metastudy of 27 studies totaling 12,327 survivors, while HRT was found to have no significant effect on muscle mass in a study of 60–72-year-old women [92,93]. In contrast, “younger” post-menopausal women (50–59 years of age) may receive benefits in skeletal muscle increases in line with early findings by the Women’s Health Initiative study where increased cardiovascular risk (stroke) was found to be negligible for the first 6 years of post-menopausal HRT [94].

#### 4.4. Psychological Support

The first line of psychological support for most women is family, followed by a family physician who may refer patients to psychiatric care and subsequent prescription medications. Women received such antidepressant prescriptions almost twice as often in a Brazilian study and psychotropics twice as often in a pan-European study of 34,204 women [95,96]. While medication may act to suppress symptoms, restore circadian rhythms disrupted by insomnia, boost energy, and improve mood, psychiatry has embraced a dual model of therapy and medication to synergize beneficial effects over the long term (more than 1 year) [97]. Two families of therapies currently exist: “talk” therapies (cognitive behavioral therapy, meditation, and psychodynamic therapy) and “social” therapy (alleviating poverty, childcare, domestic interventions, and family support structures).

With regard to talk therapy, cognitive behavioral therapy (CBT) and meditation are two recommended mental support activities to reduce stress, lessen fatigue, and improve quality of life. CBT has been reported as effective for ME/CFS treatment in diverse studies, including Canada (236 participants), the USA (in 120 early-stage breast cancer patients), Iran (in 74 polycystic ovary syndrome sufferers), and Francophone Quebec (30 participants) [98–101]. Non-religious meditation, usually termed “mindfulness” meditation, is a calming thought exercise that focuses on gratitude and is usually paired with progressive muscle relaxation exercises that tense and relax muscles for somatic activation of the parasympathetic nervous system. Studies of such techniques in early breast cancer patients (in-person) and in 124 adults (75% female) using a mobile app found significant reductions in fatigue [102,103]. As CBT and meditation are low-cost, simple methodologies, they are recommended as a compliment to exercise and evidence supports their usage as a primary therapy to counter fatigue stemming from stress.

Other psychological strategies (such as talk therapy, systemic therapy, or psychodynamic therapy) should take into account the differences seen between men versus women, especially with regard to counselor choice (women prefer women) and the expectations of counseling in general [104]. Whereas CBT defines its treatment paradigm around the perception and reaction of the individual to the world around her, psychodynamic therapy (individually or in groups) focuses on the relationships of the mind to both internal and external worlds [105]. Although recent results are mixed, most studies on psychodynamic therapy find it a good fit for women experiencing post-partum depression, anxiety, or eating disorders [106]. A study of 68 women (mean age 34.3 years) for whom 5-year follow-up data were available found no significant differences between psychodynamic and systemic group therapy with regard to depression but that psychodynamic therapy may bolster coping mechanisms to prevent symptoms from reappearing [107]. As a meta-study of 92 randomized, controlled trials on psychotherapy found significantly better control over symptoms when combined with medication in the long term, it is clear that giving women tools to change and shape their own mental health, be it through meditation, CBT, or psychodynamic therapy, offers clear benefits to women [108].

For “social” therapy, sociocultural adjustments, or the construction of legal protections, cultural and occupational expectations, and obligations of people within a culture, is a way for governments and nations to reduce stress on a societal scale. Mandating extended and paid maternity leave, increasing shift worker protection against unpaid overtime, and providing low-cost childcare are all ways to reduce stress for working mothers [34,37,71]. Especially during the disruptions of the COVID-19 pandemic, work-from-home situations have merged with home childcare for many working mothers and an international survey of 722 single, working mothers in 2020 found a critical need for childcare solutions and social networks to absorb the strain encountered from the synergistic stressors of finance, motherhood, and single status [109].

Multiple studies have explored the concept of social support in large groups of women, with an Iranian study of 1359 women (mostly housewives) revealing that social support, especially with regard to perceived roles and duties of women/mothers, was coupled to sufficient income [110]. Within working women, a study of 433 management-level employees (201 women) found gender equity to be a crucial social factor in boosting the well-being of female employees while availability of childcare, especially during the COVID-19 pandemic, was found to impact working mothers in a study of 3980 working Americans, with over 33% of mothers being the sole care provider and 49% of surveyed mothers having mild psychological distress [111,112]. Legally, protection for mothers engaged in primary childcare, payments to defray costs of raising children, and family-centered equity policies to protect seniority and income during pregnancy/childbirth may ameliorate some of the stress working women feel [113]. Mediation modeling that reduces family stress perceived by women engaged in work-family conflicts also alleviates mental health burdens [114]. However, while disruption of the family network by work or lower income may lower the quality of parenting, interventional government services for children are not a solution, as a recent review found that 38% of reports received by the US Child Protective Services System result in no formal replies and provided care is inadequate [115]. On the other hand, European-style, family-centric child care and early education policies through mandatory pre-school have been shown in several studies to boost cognitive scores of young children as well as relieving mothers of young children (aged 1–6 years) of some of the burden of care [116]. Thus, early programs that favor of supporting child-rearing women seem to be more effective than the US-based intervention after parental failure.

## 5. Conclusions

Just as there is no single source of stress for all women, there is no single solution for the fatigue and stress that women encounter. The web of fatigue and stress for women is comprised of psychosocial, financial, cultural, physical, and medical strands that serve to impart stress through complex and multi-factorial mechanisms. However, developments in



the field of supplementation, mental health support, and sociocultural modifications may give women relief from fatigue, adverse mental health conditions, and ailments resulting from chronic stress. Although definitive solutions are not yet confirmed by clinical studies, attention to diet, moderate exercise, connection to family, and high-quality sleep may be protective for women against stress while social programs that improve childcare, reduce poverty, and create equitable workplaces could provide broad support to working women, especially single mothers.

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