Prevalence of Perceived Fatigue and its Impact on Quality of Life Among Saudi General Population

Terad Adnan Talmesany [1], Saeed Saleh Aziz Alghamdi [2], Muhannad Ahmed Mousa Alzahrani [2], Saad Saeed Hassan Alghamdi [3], Anas Abdullah Ghazi Alalyani [2], Alsaedi, Abdulaziz Ahmed J [4], Naif Mohammed M Alhamyani [5], Alamri, Hamzah Mohammed M [6], Abdullah Mohammed Ali Alghamdi [7], Feras Awadh Saeed Alamri M [4]

(1) Assistant Professor of Family Medicine and Geriatric, Faculty of medicine, Albaha university, Kingdom of Saudi Arabia
(2) GP, KFH-Albaha, MOH-SAU
(3) GP, PMH-ALbaha, MOH-SAU
(4) Intern, BU-SAU
(5) GP, Qia hospital -Taif, MOH-SAU
(6) GP, SQGH-ALQUNFUDAH, MOH-SAU
(7) GP, AL-Aqiq Genral Hospital -ALBaha, MOH-SAU

Corresponding author:
Dr. Terad Adnan Talmesany M.D.
Assistant Professor of Family Medicine and Geriatric, Faculty of medicine, Albaha university, Kingdom of Saudi Arabia
Email: t.talmesany@bu.edu.sa

Received: November 2022 Accepted: December 2022; Published: December 30, 2022.
Citation: Terad Adnan Talmesany et al. Prevalence of Perceived Fatigue and its Impact on Quality of Life Among Saudi General Population. World Family Medicine. December 2022 - January 2023 Part 2; 21(1):329-343
DOI: 10.5742/MEWFM.2023.95251606

Abstract

Background: Fatigue is a prevalent condition and the incidence of fatigue has been reported as a symptom of different health conditions among the population of Saudi Arabia. It is important to determine the impact of perceived fatigue in the general population as well as the factors that can explain its prevalence.

Aim: The aim of the study was to gauge the prevalence of perceived fatigue among the people of Saudi Arabia, its effect on their quality of life and the socio-demographic factors that could explain the prevalence and self-reported experience of fatigue among the people.

Methods: A descriptive cross-sectional study was conducted among the Saudi general population. A questionnaire was developed with various self-reported measures for estimating the prevalence of fatigue among the population. One-way ANOVA was used to examine the association between socio-demographic characteristics and fatigue experience.

Results: General fatigue is found to be more common among the people of Saudi Arabia than physical and mental fatigue which does not really interfere with their daily life activities and can be reduced with rest. Socio-demographic factors; particularly gender, anaemia and being widowed are found to be associated with the prevalence of perceived fatigue.

Conclusion: The experience of fatigue can differ for people depending on their socio-demographic factors.

Keywords: Perceived Fatigue, Fatigue Assessment Scale (FAS), Prevalence of Perceived Fatigue, Impact of Fatigue on Quality of Life, General Population, Saudi Arabia.

Introduction

Fatigue is a term used to define physical and mental exhaustion. However, the term has a broad and multidimensional concept such that it may vary in its duration and intensity to certain degrees (Engberg et al., 2017). The incidence of fatigue long gained the attention of research since its occurrence in 7.5 per cent of 1000 patients attending general practices. Not only this, but the symptom of fatigue often leads to physical morbidity and psychological distress (Cullen, Kearney and Bury, 2002). Fatigue symptoms cause persistent and prolonged exhaustion and are usually associated with cognitive impairment, physical distress, and sleep disturbances. In the extant literature, varying terms have been used to explain various aspects of fatigue such as physical fatigue, cognitive fatigue, performance fatigue etc. each demonstrating different dimensions of fatigue (Kluger, Krupp and Enoka, 2013). In this context, perceived fatigue can be understood as a subjective and self-reported experience of fatigue where the individual would report fatigue using self-report measures. These include experiencing subjective exhaustion, increased exertion, or perceived discrepancies between exertion and actual results or performance (Riegler et al., 2022). On the other hand, fatigability is a concept, characterized by the more objective experience of a lack of physical and mental strength or decline in performance; measured in relation to some control/reference value (Eldadah, 2010).

Studies of perceived fatigue in older adults show an age-associated incidence of fatigue (LaSorda et al., 2020). However, the research has also reported that both young and older adults may become susceptible to increased fatigability with their changing capacities of neuromuscular mechanisms (Paris et al., 2022). This is so because the comparison of fatigability between young adults and older people remains quite complex for the reason of differences in their neuromuscular functionality (Bigland-Ritchie et al., 1995). One aspect of comparison is studied as the performance of a dynamic task which is unrelatable to muscular capacity such that responses may vary to the task (Paris et al., 2020). In addition to the general population, people with psychiatric disorders are also prone to fatigue symptoms. In fact, it is found that the prevalence of fatigue among such people is 25 to 36 per cent (Zou et al., 2020). In addition, Hunter, (2018) studied the mechanism behind fatigability during activities which is associated with perceptions of fatigue and afferent input during the performance of tasks. It was stated that this fatigability increases the load on the neuromuscular mechanism and reduces the speed of voluntary contraction of muscles (Smith et al., 2007). This perceived fatigue can be developed regardless of the performance of submaximal tasks and if the task continues longer, the failure of performance may result from fatigability causing decreased maximal strength to perform the tasks (Hunter, Duchateau and Enoka, 2004). Hence, the assessment of fatigability can be a strategic approach to studying risks and symptoms.

Literature has studied the risk of fatigue in different health conditions. For example, Severijns et al., (2017) systematically studied the assessment of fatigability in patients with multiple sclerosis. There were found a variety of protocols to assess fatigability such as measuring the isometric and concentric contractions in healthcare settings. Kim et al., (2018) also highlighted that fatigability can be assessed through different measures of performance, and self-reported deterioration, however, there is still a lack of practice for assessing these measures to determine fatigability (Kim et al., 2018). Fatigue is found to be correlated with various negative health outcomes such as poor general health (Galland-Decker, Marques-Vidal and Vollenweider, 2019) and sleeping disorders (Veauthier, 2014) etc. As health appears to be a major dimension of "quality of life", the negative health outcomes of fatigue highlight an adverse effect of the condition on the quality of life of the people. To conceptualize, quality of life can be understood as the overall general well-being of people in terms of objective factors and subjective assessments of emotional, physical and social well-being as well as levels of personal development and goal-oriented activity (Kluger, Krupp and Enoka, 2013).

Moreover, studies in Saudi Arabia showed the prevalence of fatigue as a symptom in different health conditions such as multiple sclerosis, Sjögren's syndrome, and systemic lupus erythematosus (Al-Sobayel et al., 2016: AlEnzi et al., 2020). However, the problem is the lack of assessment of the risk of fatigue in patients and their health outcomes. On the other hand, literature has studied the fatigue assessment scale (FAS) as an imperative instrument to measure fatigue as a unidimensional concept with exclude other risk factors lead to perceived fatigability . It has defined the uni-dimensionality of fatigue which assesses the perceived risk of tiredness among the population for their level of experiencing poor outcomes (Michielsen et al., 2004). Not only this, but the prevalence of these perceptions may define the influence of quality of living. Based on uncertainty present in the literature in the context of the Saudi population and their susceptibility to perceived fatigue and poor quality of life, the present study aims to determine the impact of perceived fatigue in the general population of Saudi Arabia to determine how this perceived fatigue would impact their daily activities and quality of life.

From the aforementioned research purpose, we pursued our research objectives in this study, which aimed:

- To estimate the prevalence of perceived fatigue among the people of Saudi Arabia.
- To gauge the subjective and self-reported experience of fatigue among the people.
- To determine the effect of perceived fatigue on the quality of life of the people in Saudi Arabia.
- To determine the socio-demographic factors and risk factors that could explain the prevalence and self-reported experience of fatigue among the people of Saudi Arabia.

Literature Review

1 Perceived Fatigue and Fatigue Experience

The concept of fatigue has been used in various contexts while referring to various conditions, causes, and in different situations or conceptions. (Landmark-Hoyvik et al., 2010). In general, it can be understood as a normal response of an individual's body or mind to physical activity and stress, but it can also be a sign of many disorders. In a general sense, people appear to be well familiar with this condition from their personal experience, regardless of age, gender, or health status (Davis and Walsh, 2010). Its subjective dimension is called perceived fatigue which entails an individual's perceptions of his subjective experience of fatigue (Landmark-Hoyvik et al., 2010). Furthermore, fatigue can be both pathological and physiological implying that it can be experienced by both diseased people and healthy individuals. In the case of generally healthy people (who don't have any comorbidity), fatigue can be a physiological response to prolonged strenuous activity. It can be a temporary condition that would decrease with rest over time. In such cases, the experience of fatigue does not interfere with the daily life activity of the people (Kluger, Krupp and Enoka, 2013).

On the other hand, the experience of fatigue among people with diseases varies. For people who have comorbidity or any disease, fatigue can be an overwhelming experience, related to lack of energy, lethargy, lack of endurance and loss of strength that interferes with their daily life activities (Davis and Walsh, 2010). Common underlying reasons for physiological fatigue entail tiredness after any exhausting physical activity, physical or mental disorders, jet lag etc. In contrast to this, pathological fatigue may result from some physical or mental diseases (Finsterer and Mahjoub, 2014). Nonetheless, regardless of any type of fatigue experienced by any individual, the experience of fatigue can have a negative effect on the social, physical, emotional and occupational functioning of the people which may cause significant impairment in the quality of life (Bower, 2012). Furthermore, Fatigue can be regarded as a signal to prevent any additional exertion on the body for the muscles to avoid any kind of injury or prolonged muscular condition (Al-Mulla, Sepulveda and Colley, 2011).

2 Quantification of Fatigue

The construct of perceived fatigue (individual perceptions of fatigue) can be measured with the incorporation of self-reported scales. The scale for measuring perceived fatigue in a quantitative manner needs to include self-reported measures (Finsterer and Mahjoub, 2014). In general, the incorporated scale can be unidimensional (evaluate a single characteristic) or multidimensional (evaluate multiple characteristics) (Falup-Pecurariu, 2013). The dimensions to be assessed in the perceived fatigue scale may include instantaneous (state) cognition, chronic cognition (trait cognition), effects of fatigue on functioning or performance, assessment of related factors such as physical or mental exhaustion, the severity of the fatigue experience and the dimensions of fatigue such as mental or physical fatigue. The various scales differ in their ability to exhibit sensitivity endpoints of moderate or severe fatigue (e.g., Fatigue Susceptibility Scale) as well as sensitivity to change over time for clinical intervention (e.g., Modified Fatigue Impact Scale), (Kluger, Krupp and Enoka, 2013). A scale containing self-reported measures is used for the present study to gauge the subjective experience of fatigue self-reported by the people.

3 Relation with Socio-demographic Factors

This research demonstrates the dependency of perceived fatigue on various socio-demographic factors such as age, gender, comorbidities, individual habits etc. Age and gender have been widely discussed as major socio-demographic factors explaining the prevalence of fatigue. It is found that certain aspects of perceived fatigue can be dependent on age (6). In contrast, age does not impair the capability of recruiting motor units or the central nervous system, but motor neuron firing rates vary significantly with age (Davis and Walsh, 2010). Older adults may have decreased muscle strength due to sarcopenia (Lanza, Larsen and Kent-Braun, 2007). Regarding gender differences, there are contrasting opinions. It is found that men, in general, report greater peripheral neuromuscular changes than females, manifested in a higher reduction in quadriceps peak strength; particularly during exercising. In contrast, women report decreases in quadriceps motor evoked potential (MEP) amplitude (Stern et al., 2012). Furthermore, it is also found that people with substance use disorders (SUDs) suffer from a variety of health problems that ultimately redound in their experience of fatigue (Votaw et al., 2019; Morris et al., 2018). Substance use or any dysfunction of organs (such as kidney disease), mental disorders, as well as diabetes, anaemia and other chronic conditions are associated with the experience of fatigue (Vold et al., 2020). In addition, females with a low level of education and patients with opioid use disorders receiving opioid agonist therapy are also found to be generally at risk of increased fatigability (Galland-Decker, Marques-Vidal and Vollenweider, 2019; Maglione et al., 2018).

Methods

A descriptive cross-sectional study was conducted among the Saudi general population. The questionnaire targeted all Saudi Arabia regions for participants aged above 18 years old between 2021 – 2022. Participants were recruited by sharing the questionnaire through social media. Consent was taken from all participants who agreed to complete the questionnaire.

The online questionnaire was made using Google form. The questionnaire was customized according to our aims. Questions wer taken from many research studies motioned in the references and some were compiled by the researchers to achieve the objectives of the research, then all questions were reviewed by an independent expert to assess the validity and applicability and their opinion was taken when creating the questionnaire.

After that, a pilot study was done on 15 persons who were excluded from the result. The aim from the pilot study was to assess the reliability of the questionnaire, however the reliability coefficient (Cronbach's Alpha) of the questionnaire was 0.97.

1 Participants

This cross-sectional observational study was conducted to assess the prevalence of fatigue and its subsequent impact on the quality of life of the Saudi general population. For this purpose, a close-ended survey questionnaire was designed comprising two sections; where the first section focused on socio-demographic information with risk factors/disease which may lead to fatigue, and the second section was the most important, where the national scale of fatigue (Fatigue Assessment Scale [FAS]) was used. The sample size for this study was 673 participants who were Saudi citizens and who provided a completely filledin survey, which was conducted online. All the participants were aged 18 and above to ensure informed decision-making.

2 Data Analysis

The collected data from the online survey were analyzed using Statistical Package for Social Sciences (SPSS) v20. The collected responses were entered into MS Excel for coding and systematically organizing the data. Descriptive statistics were used for assessing the socio-demographic characteristics and FAS questions, while ANOVA was used for determining the statistical relationship existing between the research variables. Additionally, logistic regression was used to recognize the data anomalies.

3 Research Ethics

To comply with the ethical considerations, formal ethical approval from the Scientific Research & Ethical Committee of Faculty of Medicine, Al Baha University was taken for conducting the research. After permission was granted, a consent form was designed comprising brief research objectives and implications to educate the participants about the significance of the study. The informed consent section also included the clause relating to the voluntary participation of the respondents and their free will to leave the research at any time without having to face any negative consequences. The data security and safety clause was also added, which ensured that the collected data would not be used for any other research purpose and neither would be shared with other researchers for future reference. Lastly, the confidentiality of the participants was also ensured by data coding, and no personal data was to be shared publicly.

Results

1 Demographic characteristics of the participants

The frequency descriptive of the participants is shown in Table 1. Most participants were male (51.3%) and 48.7% were female. Moreover, 30.5% of the respondents belonged to the age group from 26 to 35 years while only 2.7% are older than 55 years. More than half of the respondents are married and 42.8% of the participants are single. Similarly, 67% of the participants have a university education. Furthermore, most participants are nonsmokers only 18.7% are a smoker. Similarly, 95.5% have no diabetes and 82.6 per cent have no anemia.

Table 1: Socio-demographical characteristics of the participants

	Frequency	Per cent
- Gender		
female	328	48.7
male	345	51.3
- Age		
from 18 to 25 years	172	25.6
from 26 to 35 years	205	30.5
from 36 to 45 years	145	21.5
from 46 to 55 years	95	14.1
less than 18 years[i]	38	5.6
more than 55 years[i]	18	2.7
- Marital status		
Divorced	8	1.2
Married	363	53.9
Single	288	42.8
Widow/widower	14	2.1
- Educational level		
High School or less	183	27.2
Master's degree and above	37	5.5
Not educated	2	0.3
University	451	67.0
- Smoker		
No, but I am an ex-smoker	43	6.4
No, I am not a smoker	504	74.9
Yes, I am currently a smoker	126	18.7
- Diabetes		
No	643	95.5
Yes	30	4.5
- Anemia		
No	556	82.6
Yes	117	17.4

The regional demographical data of the participants is shown in the Figure 1 / Table 2. It shows that most of the participants (38%) are from Makkah, while 19.5% of the participants are from Riyadh.

Figure 1: Participants regional characteristics (The percentage of Participants demographical data)

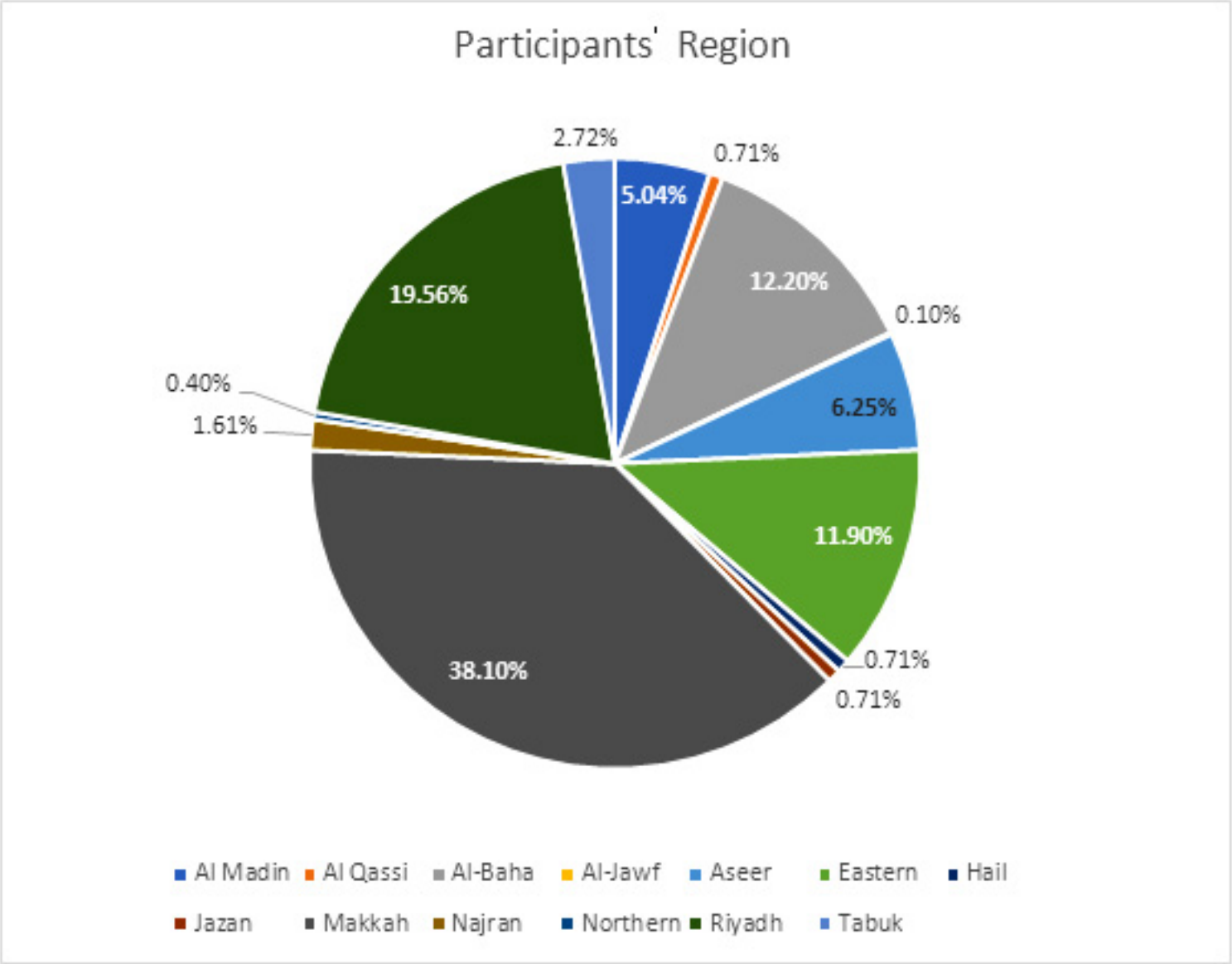


Table 2: Participants demographical data

Regions	Count of 5. Region:
Al Madinah	34
Al Qassim	5
Al-Baha	82
Al-Jawf	1
Aseer	42
Eastern Province	80
Hail	5
Jazan	5
Makkah	256
Najran	11
Northern Borders Province	3
Riyadh	131
Tabuk	18
Grand Total	673

The descriptive statistics below in Table 3 show the descriptive statistics of the length, weight, and BMI of the respondents. The overall results indicate greater variation in the weight and length as well as BMI values.

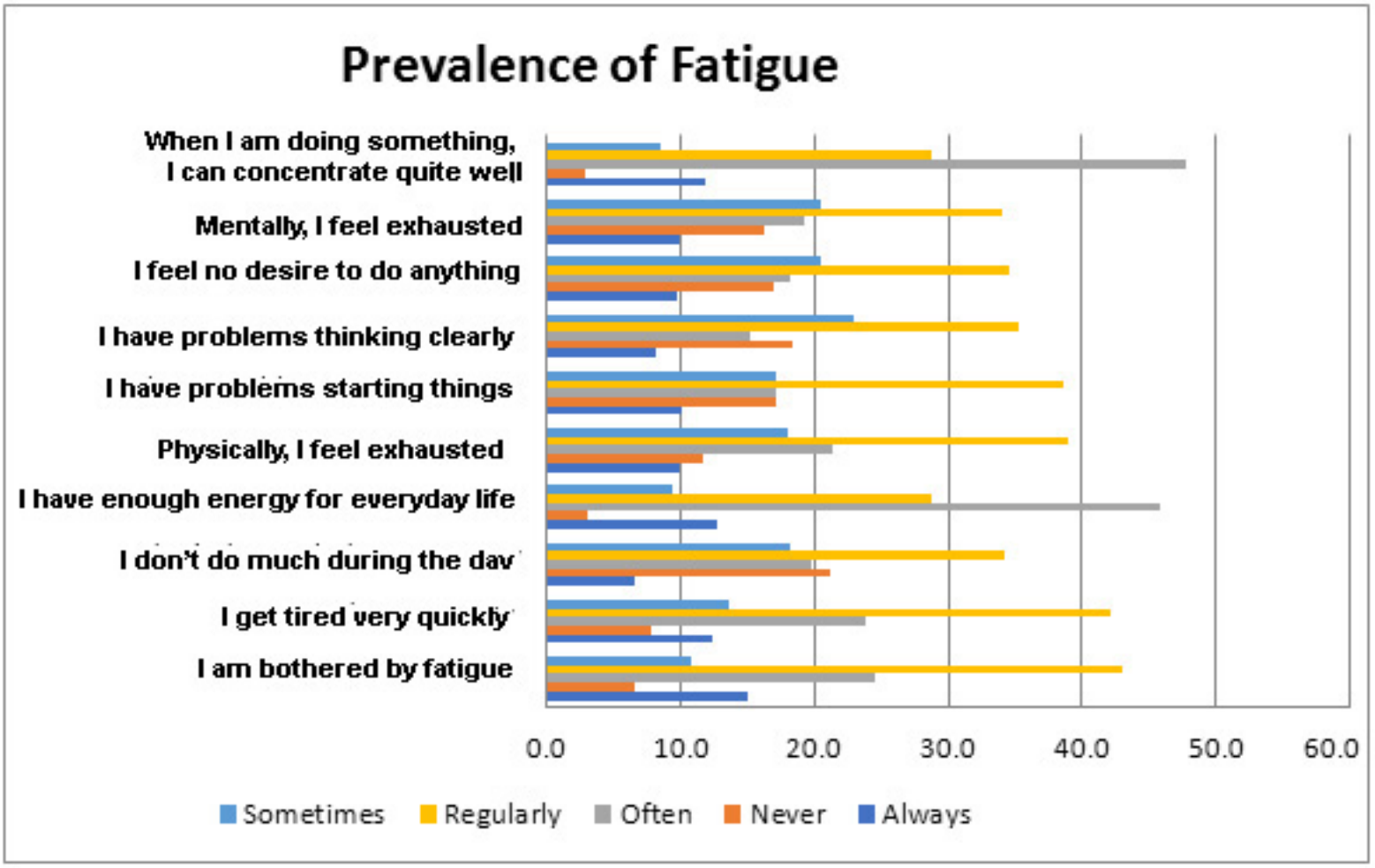
Table 3: Descriptive Statistic Results - length, weight, and BMI.

	N	Minimum	Maximum	Mean	Std. Deviation
Length	673	133	191	163.06	13.581
Weight	673	38	170	71.10	19.743
BMI	673	15.95	43.78	28.05	18.166

2 Prevalence of Perceived Fatigue and its Impact on Quality of Life among the Saudi General Population

The prevalence of Perceived Fatigue by the ten questions from Fatigue Assessment Scale of the questionnaire and the percentages of their responses are shown in Figure 2. From the figure, most of the participants believe that they usually can concentrate well. Moreover, most participants have enough energy for everyday work. In contrast, general fatigue such as being bothered by fatigue, and getting tired quickly seem to be more common compared to mental fatigue such as having no desire to do anything and having a problem thinking, etc.

Figure 2: Prevalence of Perceived Fatigue among Saudi General Population



3 Association between Demographic characteristics and fatigue subgroups

Fatigue among the Saudi General Population is divided into three subgroups General fatigue, mental fatigue, and physical fatigue. To examine the association between demographic characteristics and sub-group fatigue, one-way ANOVA was utilized. The results of the one-way ANOVA are shown in Table 4. Regarding gender, the p-value is significant for all three subgroups (less than 0.05). Moreover, the mean value of fatigue of all three subgroups is higher in females compared to males, so, it can be concluded that females are more likely to suffer from general, physical as well as mental fatigue compared to males. For the second demographic which is age, the p-value is found to be insignificant, indicating that age has no significant impact on general, physical as well as mental fatigue. However, the mean value of fatigue is higher for participants of the age group from 18 to 25 years.

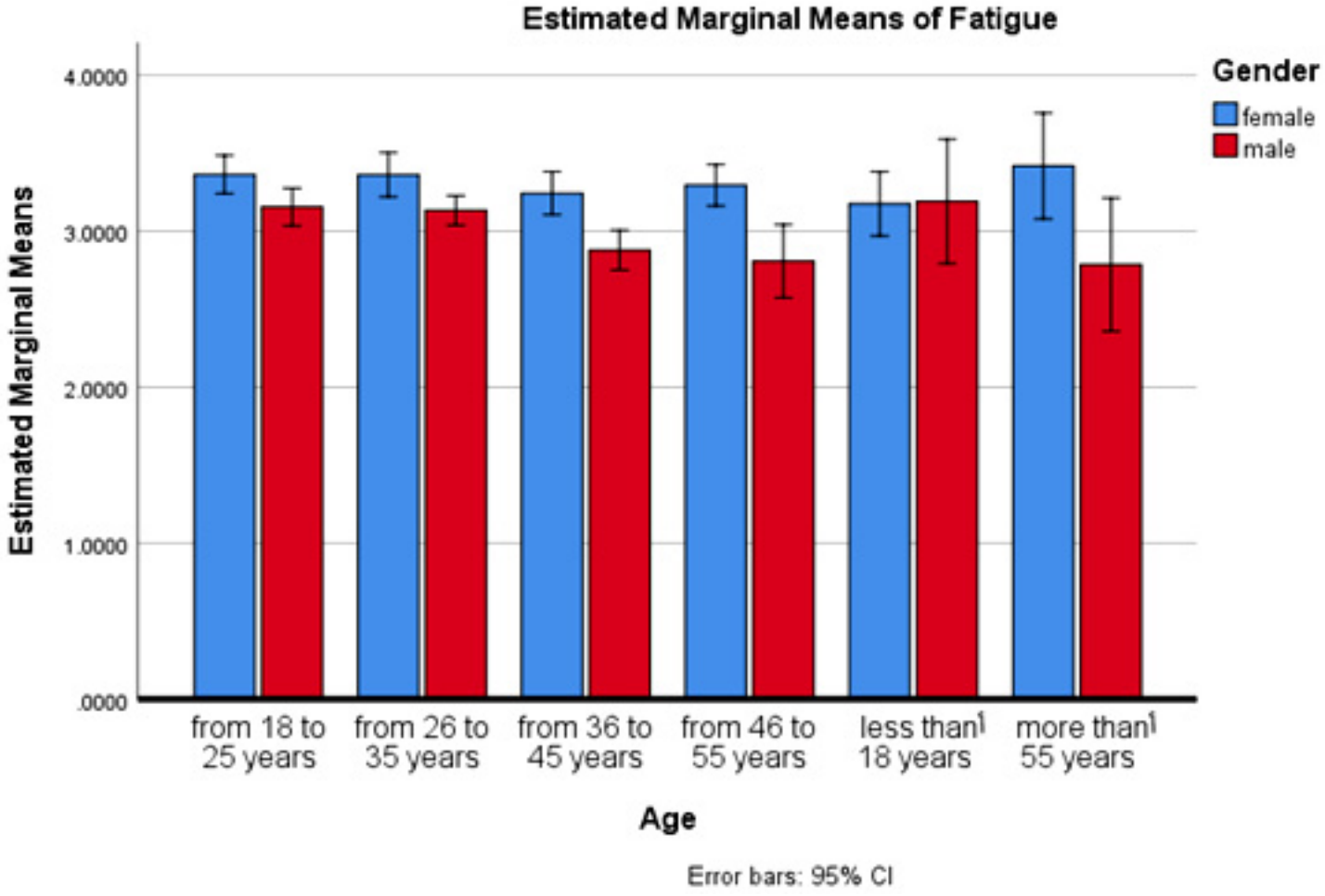
Similarly, no significant impact of marital status of the participants is found in the three subcategories of fatigue. However mean value of General fatigue is found higher for widows. Similarly mean value of physical fatigue and mental fatigue is also found to be higher widows, indicating that widows are more likely to suffer from fatigue.

Table 4: One-way ANOVA result of multidimensional fatigue among the Saudi General Population in association with demographic characteristics (Mean ± SE)

Variable	Subgroup	General fatigue	Physical fatigue	Mental fatigue
Gender	Female	3.39±0.744	3.29±0.658	3.23±0.736
	Male	3.09±0.806	3.13±0.720	2.93±0.779
	P-value	0	0.002	0
Age	from 18 to 25 years	3.17 ±0.719	3.27 ±0.69	3.18±0.719
	from 26 to 35 years	3.12 ±0.778	3.24 ±0.746	3.13±0.778
	from 36 to 45 years	2.91 ±0.795	3.1 ±0.642	2.92±0.795
	from 46 to 55 years	3.06 ±0.739	3.18 ±0.633	3.06±0.739
	Less than 18 years	3.08 ±0.872	3.19 ±0.7	3.08±0.872
	More than 55 years	2.91 ±0.833	3.35 ±0.828	2.91±0.833
	P-value	0.054	0.323	0.054
Marital Status	Single	3.24 ±0.841	3.23 ±0.696	3.13 ±0.744
	Married	3.22 ±0.753	3.18 ±0.7	3.02 ±0.797
	widow	3.76 ±0.646	3.57 ±0.513	3.28 ±0.726
	Divorced	3.29 ±0.517	3.08 ±0.556	3.03 ±0.489
	P-value	0.1	0.198	0.325
Education	Not educated	4.5 ±0.707	4 ±0.471	3.87 ±0.176
	High School or less	3.29 ±0.842	3.16 ±0.718	3.06 ±0.766
	University	3.22 ±0.771	3.21 ±0.694	3.09 ±0.771
	Master's degree and above	3.15 ±0.709	3.35 ±0.555	2.89 ±0.802
	P-value	0.082	0.181	0.228
Smoking Status	No, I am not a smoker	3.24 ±0.8	3.22 ±0.689	3.08 ±0.784
	I am an ex-smoker	3.24 ±0.749	3.11 ±0.741	3.04 ±0.841
	Yes, I am currently a smoker	3.23 ±0.77	3.19 ±0.703	3.04 ±0.7
	P-value	0.955	0.565	0.833
Diabetes	No	3.24 ±0.788	3.21 ±0.699	3.08 ±0.768
	Yes	3.27 ±0.853	3.15 ±0.611	2.95 ±0.858
	P-value	0.815	0.647	0.39
Anemia	No	3.18 ±0.787	3.19 ±0.681	3.02 ±0.758
	Yes	3.53 ±0.741	3.31 ±0.752	3.31 ±0.795
	P-value	0	0.084	0

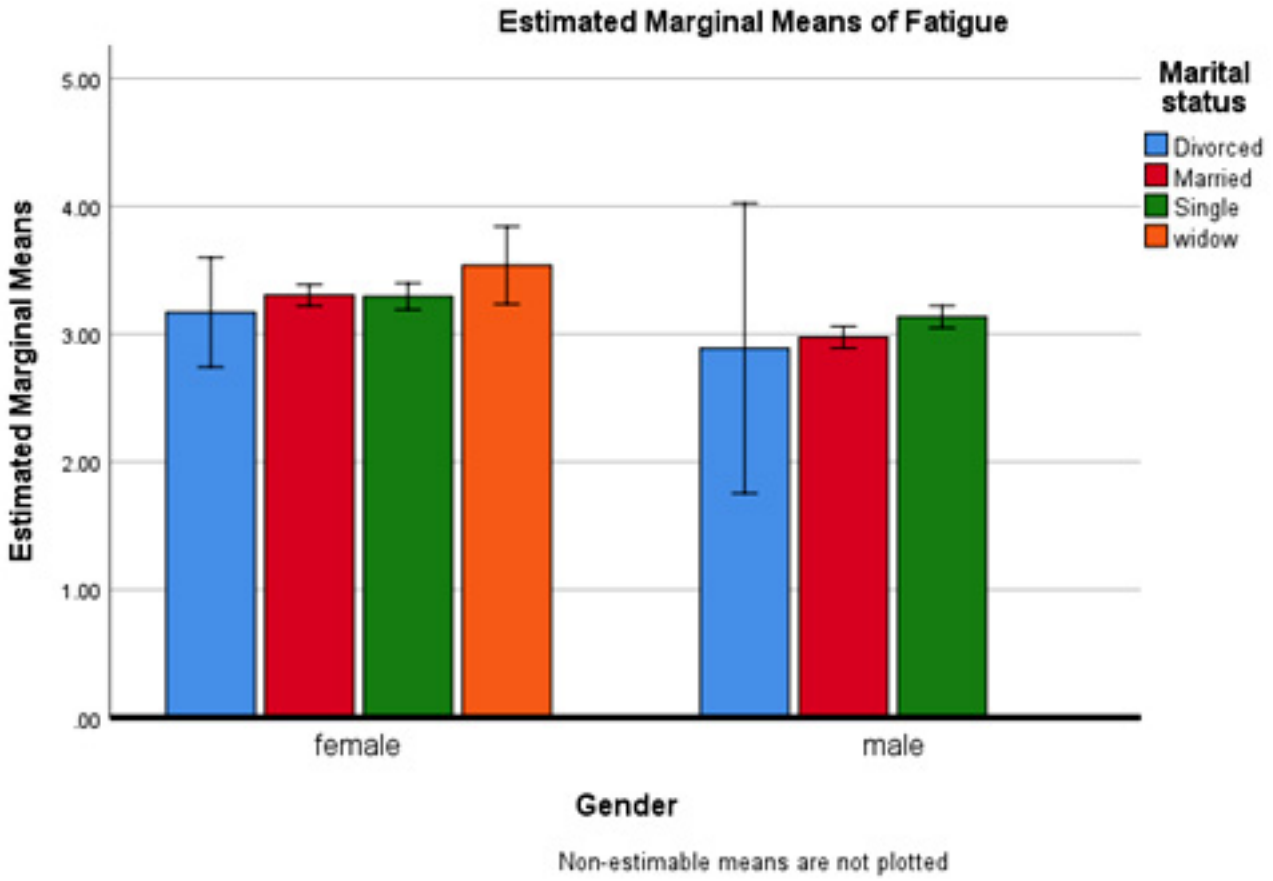
Moreover, no significant impact of education on general, physical as well as mental fatigue is found. Additionally mean value for the not educated participant is higher for general, physical as well as mental fatigue. Similarly, no impact of smoking habit is found on general, physical as well as mental fatigue And no association of diabetes was found with any of the three fatigue subgroups. However, the mean value of general fatigue is higher for the participants with diabetes, while mental and physical fatigue is higher for the participants who are not diagnosed with diabetes. In contrast to the result of diabetes, anemia has a significant impact on general and mental fatigue. Anemic participants are more likely to suffer from general fatigue, as well as mental fatigue. The overall results of the ANOVA table show that female gender and anemic are the only significant factors for fatigue among the Saudi general population.
The further assessment of the fatigue score among the Saudi general population was done by a univariate General Linear Model (GLM). The results of the GLM are documented by figures. Figure 3 indicates the mental fatigue group by gender of the participants. It indicates that women had higher mean overall fatigue scores than men. Moreover, a female who is more than 55 years has higher fatigue compared to other age groups. However, men who are less than 18 years are more likely to suffer from mental fatigue

Figure 3: Marginal mean of the overall by gender and age group



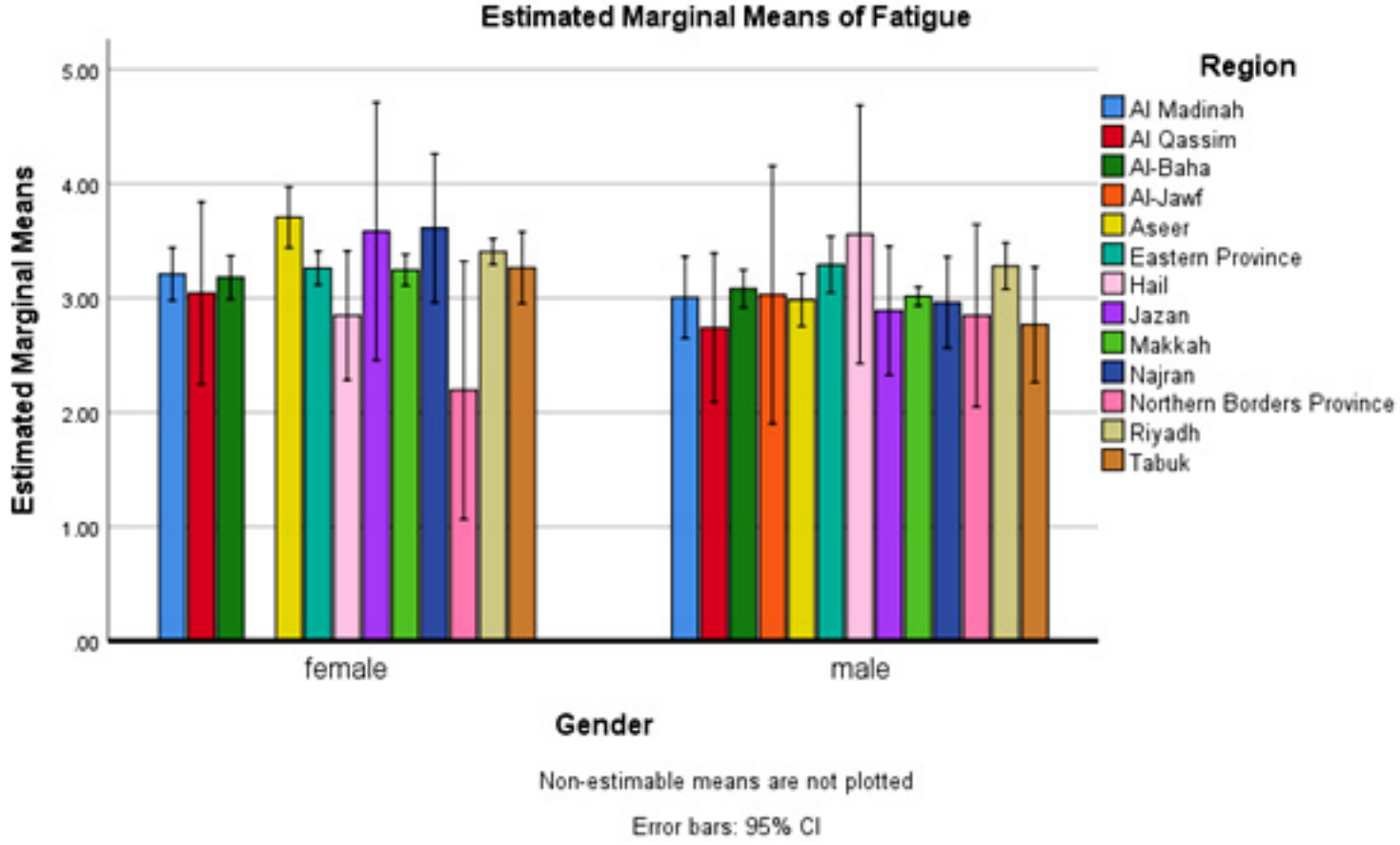
Similarly, Figure 4 shows that widowed females are more likely to suffer from fatigue, than single, married and divorced. However, single men are more likely to suffer from fatigue.

Figure 4: Marginal mean of the overall fatigue by gender and marital status



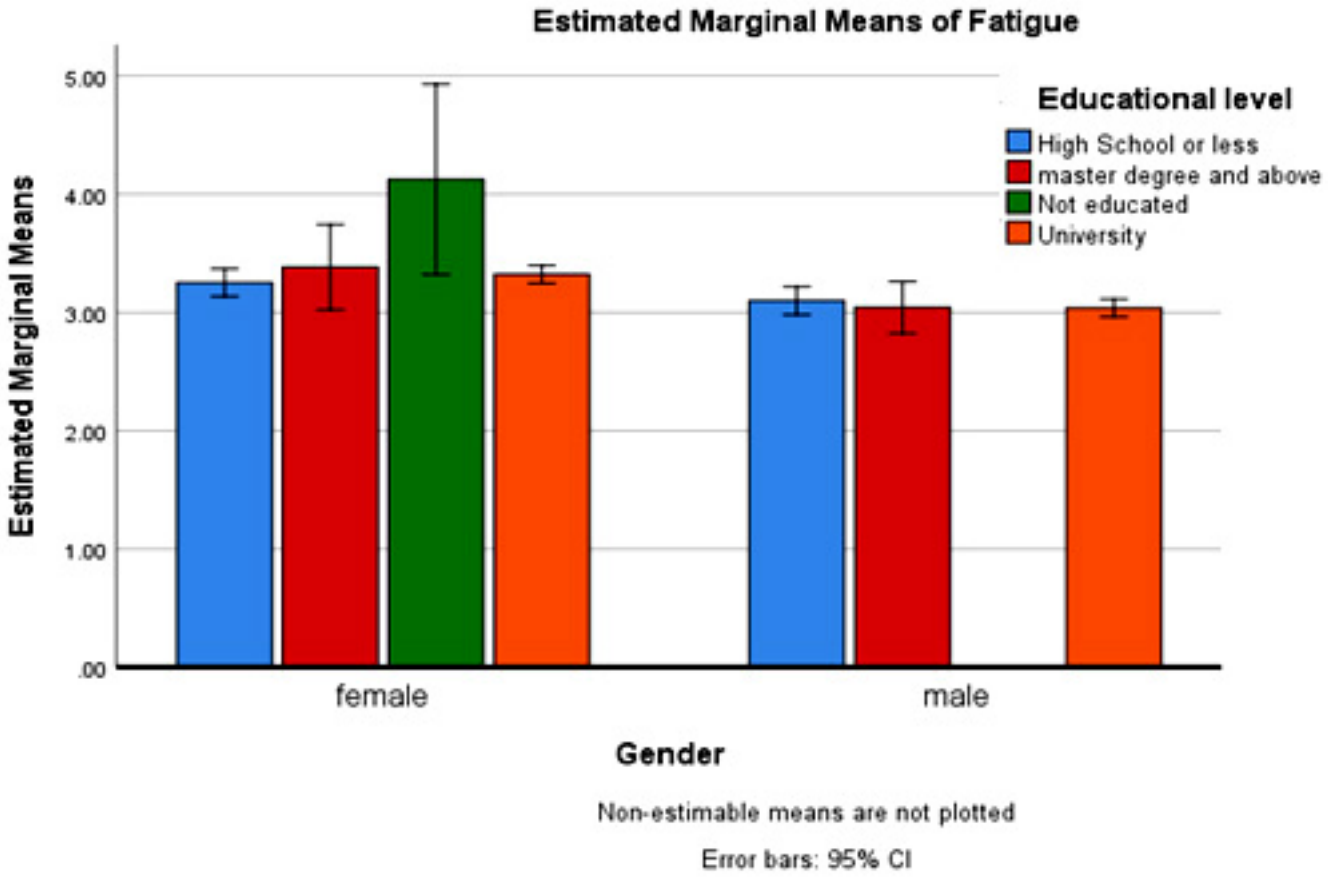
A higher value of fatigue is found for the Aseer Region for females, then Jazan, and then for Najran. However, the minimum value of overall fatigue is found for the Hail. Meanwhile, for the male, the maximum value of fatigue is found for Hail, then for Riyadh and Eastern provinces.

Figure 5: Marginal mean of the overall fatigue by gender and regions



For the education level, the highest value of mean fatigue is found for the females with no education and consequently for the females with a university education and master's degree. However, for males mean fatigue is the same for all education levels.

Figure 6: Marginal mean of the overall fatigue by gender and education level



Discussion

To restate, the aim of the current cross-sectional study was to determine the prevalence of perceived fatigue among the people in Saudi Arabia, and its effect on the quality of life of the people and its association with different socio-demographic factors. In terms of the prevalence of fatigue, it was found from the survey that the people appear to have good energy levels and the ability to concentrate well demonstrating satisfactory mental and physical strength. Previous studies have shown a correlation between the improvement of energy and physical functioning and reduction in fatigue which ultimately contributes to overall well-being and quality of life of people (Mock et al., 2004; Hazes et al., 2010; Gielissen et al., 2012). This demonstrates that the population, in general, do not report high levels of fatigue due to their sufficient energy levels and ability to concentrate well. Nonetheless, it was also found from the survey that the experience of general fatigue such as getting tired appears to be more common as compared to the experience of mental fatigue demonstrating no impact on the cognitive ability of the people such as thinking, problem-solving etc. This directs attention towards the prevalence of physiological fatigue that may result from prolonged strenuous activity that can be relieved with rest and avoidance of physical activity for some time. Also, this kind of fatigue does not have a severe impact on the daily life activity of the people (Kluger, Krupp and Enoka, 2013) so the population in general, do not report severe impacts of perceived fatigue.

Furthermore, the study attempted to determine the impacts of socio-demographic factors on the perceived experience of fatigue among the study population. The results of the survey validated the gender dependency of perceived fatigue as the result indicated that females are more likely to experience general, physical and mental fatigue as compared to males. This is found to be in line with the findings of the previous studies that have proposed an association between gender and perceived fatigue. It is found that in the case of video conferencing and meetings, women tend to experience greater fatigue compared to men (Fauville et al., 2021). In a similar vein, Vold et al., (2020) proposed that women tend to be more fatigued as compared to men while the association between substance use and fatigue was stronger for females as compared to males. In this regard, it is worth noting that the gender difference in household responsibilities as well as financial stability can explain the differences between the experience of fatigue between females and males with females being more disadvantaged than males. Thus, due to such differences, females suffer from perceived fatigue greater than males.

When it comes to age, the current study found no association between the age of the individuals and perceived fatigue. Thus, age cannot explain the prevalence of general, physical and mental fatigue among the population. This finding of the study is found to be contrasting with many previous studies that have worked on the association between age and experience of fatigue. LaSorda et al., (2020) proposed that older people are more subject to fatigue than younger people. However, the findings of the current study appear to be in line with the findings of Paris et al., (2022) that have proposed that regardless of age, people can become susceptible to increased fatigability due to their changing capacities of neuromuscular mechanisms. Generally, it concludes that age has no impact on the perceived fatigue of the people in Saudi Arabia. In terms of marital status, no difference was found between the people who were unmarried and married demonstrating that people may experience fatigue regardless of their marital status. However, being a widow was associated with experiencing higher levels of stress. This is again found to be in line with the findings of many previous studies and has contrasted with many others. For instance, the findings are in line with the findings of Karakurt and Ünsal (2013) that have asserted that widowed people tend to report greater levels of fatigue compared to people who are either married or unmarried. In this context, both physical fatigue and mental fatigue were found to be greater for widowed people.

The findings of the current study did not find any substantial effect of education on the experience of any type of fatigue. Similarly, no association between smoking habit as well as diabetes was found in any of the fatigue subcategories. However, a strong association was found between anemia and perceived fatigue. In particular, people suffering from anemia are found to be more likely to report general and mental fatigue as compared to people not having anemia. In this regard, it is worth noting that in the relevant extant literature, anemia was found to be significantly associated with fatigue; in fact, fatigue has been found to be a major symptom of anemia. This is because, the abnormalities in energy metabolism notable by the anemic individual causes them to experience greater levels of fatigue (Sobrero et al., 2001). Also, as anemia is a common condition among cancer patients, the association between anemia and fatigue is exacerbated by rising metabolic needs of the patients due to the growing tumor. Thus, the fluctuations in the hemoglobin levels have significant impacts on mental and physical fatigue ultimately having a negative effect on both the quality of life and well-being of the people (Tardy et al., 2020; Lanser et al., 2020; Ebede Jang and Escalante, 2017; Sobrero et al., 2001). So, fatigue and anemia are found to be strongly associated. Therefore, gender and anemia are found to be the major factors that can explain the prevalence of perceived fatigue among the Saudi general population from the socio-demographic characteristic and other risk factors.

The association and the combined effect of multiple socio-demographic factors on fatigue were also investigated in the study. It was found that females who were aged over 55 years reported greater levels of fatigue compared to males or younger females. This may explain the age-associated incidence of fatigue among females (LaSorda et al., 2020). As it has already been established that household responsibilities, as well as lack of financial independence, can contribute to fatigue among females (Vold et al., 2020), it can be deduced that these two mediating factors are more relevant for older females as compared to younger females. As females age, their household responsibilities may increase while their financial independence is likely to decline over time (Li, Chen and Peng, 2022). Thus, this explains the greater levels of fatigue experienced by older females. In a similar vein, widowed women are also found to be more likely to be characterised by fatigue. This can again be associated with the lack of financial independence. Lastly, it was also found that females with no education reported a greater incidence of fatigue as compared to educated females with females having a university education and master's degree reporting the lowest incidence of fatigue. This is found to be supportive of the findings of both Galland-Decker, Marques-Vidal and Vollenweider, (2019); and Maglione et al., (2018) as they have suggested that females with lower levels of education are found to be more likely to experience fatigue demonstrating that fatigue may reduce with rising of the educational attainment.

Conclusion

The paper attempted to gauge the prevalence of perceived fatigue among the people of Saudi Arabia and attempted to determine the socio-demographic factors that could explain the prevalence and the subjective experience of fatigue that differs among the people. Generally, the paper found a significant impact of gender and anemia on the perception of fatigue. Also, despite the absence of any substantial impact of marital status (married or unmarried) on fatigue, the people who were widowed reported a greater incidence of fatigue. In general, the prevalence of general fatigue that may result from any strenuous activity is found to be commonly prevalent among the population as compared to mental or physical fatigue, demonstrating good physical and mental strength of the people and no severe impact on their quality of life. Lastly, the study also reported that females with higher ages and lower levels of education tend to report greater fatigue incidence.

Funding
There was no funding for this article.

Conflicts of Interest
The authors declare no conflicts of interest regarding the publication of this paper.

Acknowledgments
We would like to thank all the participated in this study, either the authors or who is participate in the survey

References

AlEnzi F, Alqahtani B, Alhamad EH, Daghestani M, Tashkandy Y, Othman N, Alshahrani K, Paramasivam MP, Halwani R, Omair MA. Fatigue in Saudi Patients with Primary Sjögren's Syndrome and Its Correlation with Disease Characteristics and Outcome Measures: A Cross-Sectional Study. Open access rheumatology: research and reviews. 2020; 12:303. https://doi.org/10.2147/OARRR.S284985

Al-Mulla MR, Sepulveda F, Colley M. A review of non-invasive techniques to detect and predict localised muscle fatigue. Sensors. 2011 Mar 24;11(4):3545-94.

Al-Sobayel HI, Al-Hugail HA, AlSaif RM, Albawardi NM, Alnahdi AH, Daif AM, Al-Arfaj HF. Validation of an Arabic version of the fatigue severity scale. Saudi medical journal. 2016 Jan;37(1):73. https://doi.org/10.15537/smj.2016.1.13055

Bigland-Ritchie B, Rice CL, Garland SJ, Walsh ML. Task-dependent factors in fatigue of human voluntary contractions. Fatigue 1995 (pp. 361-380). Springer, Boston, MA. https://doi.org/10.1007/978-1-4899-1016-5_29

Bower JE. Fatigue, brain, behavior, and immunity: summary of the 2012 Named Series on fatigue. Brain, behavior, and immunity. 2012 Nov 1;26(8):1220-3.

Cullen W, Kearney Y, Bury G. Prevalence of fatigue in general practice. Irish journal of medical science. 2002 Jan;171(1):10-2. https://doi.org/10.1007/BF03168931

Davis MP, Walsh D. Mechanisms of fatigue. J Support Oncol. 2010 Jul 1;8(4):164-74.

Ebede CC, Jang Y, Escalante CP. Cancer-related fatigue in cancer survivorship. Medical Clinics. 2017 Nov 1;101(6):1085-97.

Eldadah BA. Fatigue and fatigability in older adults. PM&R. 2010 May 1;2(5):406-13. https://doi.org/10.1016/j.pmrj.2010.03.022

Engberg I, Segerstedt J, Waller G, Wennberg P, Eliasson M. Fatigue in the general population-associations to age, sex, socioeconomic status, physical activity, sitting time and self-rated health: the northern Sweden MONICA study 2014. BMC public health. 2017 Dec;17(1):1-9. https://doi.org/10.1186/s12889-017-4623-y

Falup-Pecurariu C. Fatigue assessment of Parkinson's disease patient in clinic: specific versus holistic. Journal of Neural Transmission. 2013 Apr;120(4):577-81.

Fauville G, Luo M, Muller Queiroz AC, Bailenson JN, Hancock J. Nonverbal mechanisms predict zoom fatigue and explain why women experience higher levels than men. Available at SSRN 3820035. 2021 Apr 5.

Finsterer J, Mahjoub SZ. Fatigue in healthy and diseased individuals. American Journal of Hospice and Palliative Medicine®. 2014 Aug;31(5):562-75.

Galland-Decker C, Marques-Vidal P, Vollenweider P. Prevalence and factors associated with fatigue in the Lausanne middle-aged population: a population-based, cross-sectional survey. BMJ open. 2019 Aug 1;9(8):e027070.

Galland-Decker C, Marques-Vidal P, Vollenweider P. Prevalence and factors associated with fatigue in the Lausanne middle-aged population: a population-based, cross-sectional survey. BMJ open. 2019 Aug 1;9(8):e027070.

Gielissen MF, Wiborg JF, Verhagen CA, Knoop H, Bleijenberg G. Examining the role of physical activity in reducing postcancer fatigue. Supportive Care in Cancer. 2012 Jul;20(7):1441-7.

Hazes JM, Taylor P, Strand V, Purcaru O, Coteur G, Mease P. Physical function improvements and relief from fatigue and pain are associated with increased productivity at work and at home in rheumatoid arthritis patients treated with certolizumab pegol. Rheumatology. 2010 Oct 1;49(10):1900-10.

Hunter SK, Duchateau J, Enoka RM. Muscle fatigue and the mechanisms of task failure. Exercise and sport sciences reviews. 2004 Apr 1;32(2):44-9. URL: https://journals.lww.com/acsm-essr/fulltext/2004/04000/muscle_fatigue_and_the_mechanisms_of_task_failure.2.aspx

Hunter SK. Performance fatigability: mechanisms and task specificity. Cold spring harbor perspectives in medicine. 2018 Jul 1;8(7):a029728. URL: http://perspectivesinmedicine.cshlp.org/content/8/7/a029728.full.pdf

Karakurt P, Ünsal A. Fatigue, anxiety and depression levels, activities of daily living of patients with chronic obstructive pulmonary disease. International journal of nursing practice. 2013 Apr;19(2):221-31.

Kim I, Hacker E, Ferrans CE, Horswill C, Park C, Kapella M. Evaluation of fatigability measurement: an integrative review. Geriatric Nursing. 2018 Jan 1;39(1):39-47. https://doi.org/10.1016 per cent2Fj.gerinurse.2017.05.014

Kluger BM, Krupp LB, Enoka RM. Fatigue and fatigability in neurologic illnesses: proposal for a unified taxonomy. Neurology. 2013 Jan 22;80(4):409-16.

Landmark-Hoyvik H, Reinertsen KV, Loge JH, Kristensen VN, Dumeaux V, Fossa SD, Borresen-Dale AL, Edvardsen H. The genetics and epigenetics of fatigue. 2010 PM R 2 (5): 456–465.

Lanser L, Kink P, Egger EM, Willenbacher W, Fuchs D, Weiss G, Kurz K. Inflammation-induced tryptophan breakdown is related with anemia, fatigue, and depression in cancer. Frontiers in immunology. 2020 Feb 21;11:249.

Lanza IR, Larsen RG, Kent-Braun JA. Effects of old age on human skeletal muscle energetics during fatiguing contractions with and without blood flow. The Journal of physiology. 2007 Sep;583(3):1093-105.

LaSorda KR, Gmelin T, Kuipers AL, Boudreau RM, Santanasto AJ, Christensen K, Renner SW, Wojczynski MK, Andersen SL, Cosentino S, Glynn NW. Epidemiology of perceived physical fatigability in older adults: the Long Life Family Study. The Journals of Gerontology: Series A. 2020 Sep;75(9):e81-8. https://doi.org/10.1093 per cent2Fgerona per cent2Fglz288

Li Y, Chen H, Peng X. Effect of physical frailty on elder mistreatment in a national survey: examining psychological vulnerability, housework involvement, and financial independence as mediators. International Psychogeriatrics. 2022 Aug;34(8):743-53.

Maglione MA, Raaen L, Chen C, Azhar G, Shahidinia N, Shen M, Maksabedian E, Shanman RM, Newberry S, Hempel S. Effects of medication assisted treatment (MAT) for opioid use disorder on functional outcomes: a systematic review. Journal of substance abuse treatment. 2018 Jun 1;89:28-51.

Michielsen HJ, De Vries J, Van Heck GL, Van de Vijver FJ, Sijtsma K. Examination of the Dimensionality of Fatigue: The Construction of the Fatigue Assessment Scale (FAS). European Journal of Psychological Assessment. 2004;20(1):39.

Mock V. Evidence-based treatment for cancer-related fatigue. JNCI Monographs. 2004 Jul 1;2004(32):112-8.

Morris L, Stander J, Ebrahim W, Eksteen S, Meaden OA, Ras A, Wessels A. Effect of exercise versus cognitive behavioural therapy or no intervention on anxiety, depression, fitness and quality of life in adults with previous methamphetamine dependency: a systematic review. Addiction science & clinical practice. 2018 Dec;13(1):1-2.

Paris MT, McNeil CJ, Power GA, Rice CL, Dalton BH. Age-related performance fatigability: a comprehensive review of dynamic tasks. Journal of Applied Physiology. 2022 Oct 1;133(4):850-66. https://doi.org/10.1152/japplphysiol.00319.2022

Riegler KE, Cadden M, Guty ET, Bruce JM, Arnett PA. Perceived fatigue impact and cognitive variability in multiple sclerosis. Journal of the International Neuropsychological Society. 2022 Mar;28(3):281-91.

Severijns D, Zijdewind I, Dalgas U, Lamers I, Lismont C, Feys P. The assessment of motor fatigability in persons with multiple sclerosis: a systematic review. Neurorehabilitation and neural repair. 2017 May;31(5):413-31. https://doi.org/10.1177/1545968317690831

Smith JL, Martin PG, Gandevia SC, Taylor JL. Sustained contraction at very low forces produces prominent supraspinal fatigue in human elbow flexor muscles. Journal of Applied Physiology. 2007 Aug;103(2):560-8. https://doi.org/10.1152/japplphysiol.00220.2007

Sobrero A, Puglisi F, Guglielmi A, Belvedere O, Aprile G, Ramello M, Grossi F. Fatigue: a main component of anemia symptomatology. InSeminars in oncology 2001 Apr 1 (Vol. 28, pp. 15-18). WB Saunders.

Stern A, Kuenze C, Herman D, Sauer LD, Hart JM. A gender comparison of central and peripheral neuromuscular function after exercise. Journal of sport rehabilitation. 2012 Aug 1;21(3):209-17.

Tardy AL, Pouteau E, Marquez D, Yilmaz C, Scholey A. Vitamins and minerals for energy, fatigue and cognition: a narrative review of the biochemical and clinical evidence. Nutrients. 2020 Jan 16;12(1):228.

Veauthier C, Paul F. Sleep disorders in multiple sclerosis and their relationship to fatigue. Sleep medicine. 2014 Jan 1;15(1):5-14.

Vold JH, Gjestad R, Aas CF, Chalabianloo F, Skurtveit S, Løberg EM, Johansson KA, Fadnes LT. Impact of clinical and sociodemographic factors on fatigue among patients with substance use disorder: a cohort study from Norway for the period 2016–2020. Substance abuse treatment, prevention, and policy. 2020 Dec;15(1):1-1.

Votaw VR, Geyer R, Rieselbach MM, McHugh RK. The epidemiology of benzodiazepine misuse: a systematic review. Drug and alcohol dependence. 2019 Jul 1;200:95-114.

Zou S, Liu ZH, Yan X, Wang H, Li Y, Xu X, Du X, Zhang L, Zhang Q, Jackson T, Ungvari GS. Prevalence and correlates of fatigue and its association with quality of life among clinically stable older psychiatric patients during the COVID-19 outbreak: a cross-sectional study. Globalization and Health. 2020 Dec;16(1):1-7.