

AMERICAN UNIVERSITY OF BEIRUT

ANXIETY, DEPRESSION, DIET AND LIFESTYLE AMONG
LEBANESE ADULTS LIVING IN BEIRUT

by
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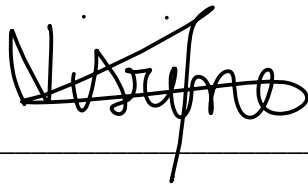
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ABSTRACT OF THE THESIS OF

Nisrine Naim Chidiac

for

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Major: Nutrition

Title: Anxiety, Depression, Diet And Lifestyle Among Lebanese Adults Living In Beirut

Scientific Background: Depression is the leading cause of disability worldwide and it's not uncommon for someone with an anxiety disorder to also suffer from depression or vice versa. Nearly one-half of those diagnosed with depression are also diagnosed with an anxiety disorder. Although dietary intake and nutritional status are suggested to affect mental health, few studies were carried out to examine the correlation between mental health and nutrition.

Objectives: In a sample of Lebanese adults, the main objectives of this study were 1) to determine the proportion of anxiety and depression in a sample of Lebanese adults 2) to assess the proportion of healthy lifestyle in a sample of Lebanese adults and 3) to Study the relationship between eating habits, exercise, smoking and Mediterranean diet with depression and anxiety in Lebanese adults.

Methods: Subjects for this study were selected from participants in a previous research conducted among adults working in various faculties and offices at the American University of Beirut (AUB). Individuals who provided a consent to be re-contacted for future research, were contacted and asked kindly to participate in the current study. After ensuring eligibility, subjects completed 3 questionnaires the Patient Health Questionnaire PHQ9, Generalized Anxiety Disorder and the History questionnaire. Data from these questionnaires were collected in a one to one interview on campus. Data for the nutrient intake were retrieved from the previous study and included: the Food Frequency questionnaire, Socio-Demographic questionnaire, Lifestyle questionnaire and Anthropometric assessment. The lifestyle score was computed based on the data collected from the previous study. Each participant received a score of one for each of the lifestyle factors if they were never smokers; were regularly active, i.e. performing 150 min/week of moderate intensity physical activity or 60 min/week of vigorous intensity physical activity; had a "normal" BMI of 25 kg/m²; and the Mediterranean diet pattern score = 1 (MDP scored of 3 and 4 is considered =1) otherwise participants received a score of zero for each of these factors. Lifestyle Factors score is generated by summing the score for each of the four components (smoking, MDP score, physical activity, and BMI). The Mediterranean score is based on the intake of olive oil, fibers,

fruits, vegetables, fish, meat and refined cereals whereby higher scores indicating better adherence to the Mediterranean dietary pattern. ANOVA and chi squared test were conducted to assess the associations between anxiety, depression and lifestyle score. Statistical Package for Social Sciences (SPSS) was used in the analysis and a $p < 0.05$ indicated significance.

Results: The majority of our sample were males (65%) while the age of the participants ranged between 23 to 45 years and above, among which 29.4% are below the age of 35 years. Of the participants, 72.9 % were either overweight or obese. Nearly 36.5% of the study sample had an elevated depression while 30.7% had an elevated anxiety score. Also, the majority of the participants had a moderately severe unhealthy to a moderately healthy lifestyle (Moderately severe unhealthy= score of 1; Moderately healthy lifestyle= score of 2) from which 80% of the participants have a moderate to high physical activity level, more than half of the participants (56.5 %) reported to be smokers and 72.9 % were either overweight or obese. Moreover, there's a low adherence to the Mediterranean diet in the Lebanese adults (51.8%). No significant association was found between lifestyle scores, depression and anxiety. Lower nonalcoholic beverages intake may be associated with depression and lower niacin intake is present among participants with anxiety . Furthermore, marital status, education level, higher income and an academic employment were significantly association with a better lifestyle ($P=0.028$, $P=0.002$, $P=0.008$).

Conclusion: The study's findings demonstrated that anxiety, depression, unhealthy lifestyle characteristics and a low adherence to the Mediterranean dietary pattern are considerably prevalent among Lebanese adults. In addition the results suggested some nutrients may be associated with depression and anxiety. Further studies are needed to set nutritional recommendations in order to maximize the mental health treatment effectiveness.

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ABBREVIATIONS

ANOVA: Analysis of Variance

AUB: American University Of Beirut

AUBMC: American University of Beirut Medical Center

BDNF: Brain-derived Neurotrophic Factor

BMI: Body Mass Index

CBT: Cognitive behavioral therapy

CNS: Central Nervous System

CRP: C-reactive protein

DA: Dopamine

DSM: Diagnostic and Statistical Manual of Mental Disorders

FFQ: Food Frequency Questionnaire

GABA: Gamma-aminobutyric Acid

GAD: Generalized Anxiety Disorder

IL-1: Interleukin 1

LMD: Lebanese Mediterranean Diet

MDP: Mediterranean Diet Pattern

NE: Norepinephrine

PHQ: Patient Health Questionnaire

PTSD: Post Traumatic Stress Disorder

CHAPTER I

INTRODUCTION

A. General Overview

Over the last decade, mental health diseases have represented the major contributors to years of life lost due to disability in developed countries, while alarming trends have also been registered in developing ones. Also, Diet per se has been estimated to be the most important risk factor for non-communicable diseases in the modern era. Remarkably, there is a growing interest in the so-called “nutritional psychiatry”, which aims to describe and understand the relationship between dietary factors and mental health disorders. (Whiteford *et al.*2013)

Some studied mechanism of the association of mental health and lifestyle factors may be through inflammation and oxidative stress, micro- and macro-nutrients, feeding time, circadian rhythm, hormonal homeostasis, and gut brain axis. Although the high prevalence of mental health and obesity in Lebanon accompanied by the westernization of Lebanese dietary pattern, few studies were done to study the correlation between mental health and nutrition. (Marx *et al.*2017)

B. Objectives

The aims of this study were to assess the prevalence of mental health and lifestyle factors in Lebanese working adults and to study there association. The objectives, therefore, were to:

- 1- Determine the prevalence of anxiety and depression in a sample of Lebanese adults.

2- Assess the prevalence of healthy lifestyle in a sample of Lebanese adults including BMI, physical activity, smoking and Mediterranean dietary pattern score.

3- Study the relationship between BMI, exercise, smoking and Mediterranean dietary pattern with depression and anxiety in Lebanese adults.

CHAPTER II

LITERATURE REVIEW

A. Mental health: definition, prevalence and burden.

Mental health is a state of well-being in which an individual realizes his or her own abilities, can cope with the normal stresses of life, can work productively and is able to make a contribution to his or her community. (WHO2018)

Studies estimates that 792 million people lived with a mental health disorder. This is slightly more than one in ten people globally (10.7%). (Ritchie & Roser2018)

Furthermore, it's estimated that 14.3% of deaths worldwide, or approximately 8 million deaths each year, are attributable to mental disorders (Walker2015). Also, due to the high prevalence of common mental disorders, the social, economic, and health burden associated with these disorders is substantial, with up to \$8.5 trillion in lost output attributed to mental, neurological, and substance use disorders.(Chisholm *et al.*2016)

Number of people with mental health disorders, 1990 to 2016

Number of people with mental health and neurodevelopmental disorders, not including alcohol and drug use disorders. Figures attempt to provide a true estimate (going beyond reported diagnosis) of prevalence based on medical, epidemiological data, surveys and meta-regression modelling.

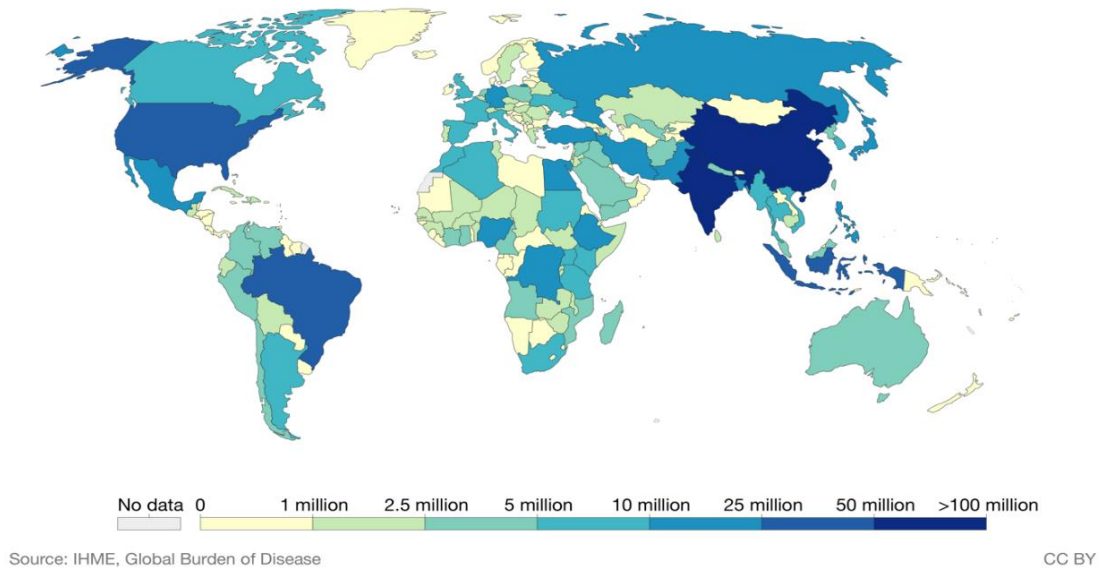


Figure 1. Number of People with Mental Health Disorders, 1990 to 2016

This graph represents the number of people with mental health disorders from 1990 till 2016. As shown mental health is a worldwide problem and not specific to a single country. The distribution of mental health around the world differ from a place to another, China has the highest levels.

Based on data from 2010, the global direct and indirect economic costs of mental disorders were estimated at US\$2.5 trillion. Importantly, the indirect costs (US\$1.7 trillion) are much higher than the direct costs (US\$0.8 trillion), which contrasts with other key disease groups, such as cardiovascular diseases and cancer as shown in figure 2. (Trautmann *et al.*2016)

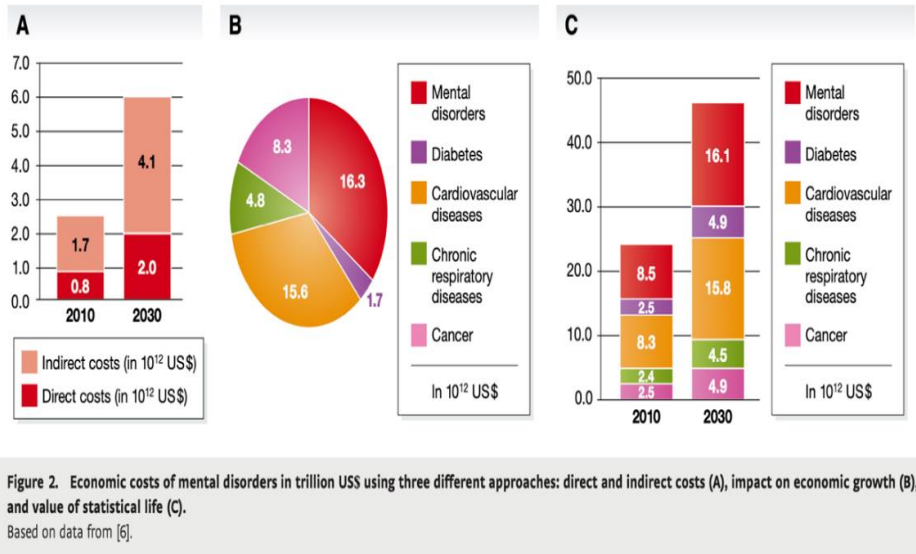


Figure 2. Economic Costs Of Mental Disorders.

Multiple social, psychological, and biological factors determine the level of mental health of a person at any point of time. Poor mental health is also associated with rapid social change, stressful work conditions, gender discrimination, social exclusion, unhealthy lifestyle, physical ill-health and human rights violations. (*Mental health: Strengthening our response.2018*)

There are specific psychological and personality factors that make people vulnerable to mental health problems. Also, biological risks include genetic factors. (*Mental health: Strengthening our response.2018*)

Genetic factors such as having a close family member with a mental illness can increase the risk. However, just because one family member has a mental illness doesn't mean that others will. Moreover, Drug and alcohol abuse may play a role. For example, illicit drug use can trigger a manic episode (bipolar disorder) or an episode of psychosis. Drugs such as cocaine, marijuana and amphetamines can cause paranoia. Other biological factors such as some medical conditions or hormonal changes affects

individuals mental health. Also, early life environment, negative childhood experiences such as abuse or neglect can increase the risk of some mental illnesses. Trauma and stress, in adulthood, traumatic life events or ongoing stress such as social isolation, domestic violence, relationship breakdown, financial or work problems can increase the risk of mental illness. Traumatic experiences such as living in a war zone can increase the risk of post-traumatic stress disorder (PTSD). In addition, personality factors, some traits such as perfectionism or low self-esteem can increase the risk of depression or anxiety. (*Causes of mental illness.2020*)

B. Anxiety and depression: definition and burden.

Depression is the leading cause of disability worldwide (*Mental health by the numbers.2020*). Also, it's not uncommon for someone with an anxiety disorder to also suffer from depression or vice versa. Nearly one-half of those diagnosed with depression are also diagnosed with an anxiety disorder. (*Fact sheets, 2020.2020*)

The essential feature of the Generalized Anxiety Disorder (GAD) is excessive anxiety and worry (apprehensive expectation), occurring on more days than not for a period of at least 6 months, about a number of events or activities. The person with GAD finds it difficult to control the anxiety and worry, which is often accompanied by restlessness, being easily fatigued, having difficulty concentrating, irritability, muscle tension and disturbed sleep. (Leicester (UK): British Psychological Society2011)

While Depression refers to a wide range of mental health problems characterized by the absence of a positive affect (a loss of interest and enjoyment in ordinary things and experiences), low mood and a range of associated emotional, cognitive, physical and behavioral symptoms. (Leicester (UK): British Psychological Society2011)

Behavioral and physical symptoms typically include tearfulness, irritability, social withdrawal, an exacerbation of pre-existing pains, and pains secondary to increased muscle tension. A lack of libido, fatigue and diminished activity are also common, although agitation and marked anxiety can frequently occur. Typically, there is reduced sleep and lowered appetite (sometimes leading to significant weight loss), but some people sleep more than usual and have an increase in appetite. A loss of interest and enjoyment in everyday life, and feelings of guilt, worthlessness and deserved punishment are common, as are lowered self-esteem, loss of confidence, feelings of helplessness, suicidal ideation and attempts at self-harm or suicide. Cognitive changes include poor concentration and reduced attention, pessimistic and recurrently negative thoughts about oneself, one's past and the future, mental slowing and rumination (Leicester (UK): British Psychological Society 2011).

Clarke et al. found a strong association between physical illness and depression and anxiety in all the National Health Priority Area disease groups — that is, that having a physical illness is a risk factor for depression and/or anxiety. Depression, in particular, is also associated with worse functional outcomes for people with physical diseases.

The prevalence of depression was markedly and consistently higher in people with heart disease, diabetes mellitus, cancer, stroke, rheumatoid arthritis, and osteoporosis than in the general population. (David M Clarke & Kay C Currie 2009)

A high prevalence of panic disorder is found in patients with cardiac disorders (10%–50%). Evidence-based clinical practice guidelines report anxiety to be high in patients with cancer, with estimates ranging up to 69% as disease progressed. (David M Clarke & Kay C Currie 2009)

Data from the Netherlands Study of Depression and Anxiety (NESDA) showed an association between anxiety and components of the Metabolic syndrome (MetS) using a dimensional approach. In particular, waist circumference, triglycerides, and blood pressure were strongly associated with anxiety. (Van Reedt Dortland *et al.*2010)

C. Scales to measure anxiety and depression.

Different scales are available to measure anxiety and depression levels. Scales are partitioned based on the target population. For Depression in the General Adult Population, seven scales are used. The Beck Hopelessness Scale is a self-report measure for adults age 17 to 80. It assesses an individual's negative expectations about the future. The measure includes 20 items to which participants respond with "true" or "false." It takes five to 10 minutes to complete. (*Depression assessment instruments.*2019)

The Quick Inventory of Depressive Symptomatology-Self-Report (QIDS-SR) measures the severity of depressive symptoms in adults 18 and older. There are 16 measures, selected from the Inventory of Depressive Symptomatology (IDS, 2000). These symptoms correspond to the diagnostic criteria from the DSM-IV. Respondents use a 4-point Likert-type scale to assess their behaviors and mood over the course of the past week. It takes five to seven minutes to complete the report. (*Depression assessment instruments.*2019)

The Patient Health Questionnaire (PHQ) is a 3-page questionnaire that can be entirely self-administered by the patient. The clinician scans the completed questionnaire, verifies positive responses, and applies diagnostic algorithms that are abbreviated at the bottom of each page. The PHQ assesses 8 diagnoses, divided into

threshold disorders (disorders that correspond to specific DSM-IV diagnoses: major depressive disorder, panic disorder, other anxiety disorder, and bulimia nervosa), and subthreshold disorders (disorders whose criteria encompass fewer symptoms than are required for any specific DSM-IV diagnoses: other depressive disorder, probable alcohol abuse/dependence, somatoform, and binge eating disorder). (Kroenke *et al.*2001)

The PHQ-9 is the 9-item depression module from the full PHQ. Major depression is diagnosed if 5 or more of the 9 depressive symptom criteria have been present at least “more than half the days” in the past 2 weeks, and 1 of the symptoms is depressed mood or anhedonia. Other depression is diagnosed if 2, 3, or 4 depressive symptoms have been present at least “more than half the days” in the past 2 weeks, and 1 of the symptoms is depressed mood or anhedonia. (Kroenke *et al.*2001)

The Reminiscence Functions Scale (RFS) is a 43-item questionnaire that takes 15 to 25 minutes to complete. The RFS assesses the frequency with which adults, 18 years and older, engage in the act of recollecting past experiences or events. Respondents answer questions on a 6-point Likert-type scale, and responses are scored in eight different categories. (*Depression assessment instruments.*2019)

The Social Adjustment Scale (SAS-SR) is a self-report measure of social functioning. It contains 54 items rated on a 5-point scale. It takes about 20 minutes to complete and is intended for individuals 17 years and older. There are also Short and Screener versions available, which take five to 10 minutes to complete. (*Depression assessment instruments.*2019)

The Social Functioning Questionnaire (SFQ) is a self-report tool that measures social functioning in adults over the last two weeks. The questionnaire contains eight

questions which are rated on a 4-point scale. It takes less than four minutes to complete. (*Depression assessment instruments*.2019)

Several scales are validated to measure anxiety severity. The Generalized Anxiety Disorder Scale (GAD-7) It is a seven-item, self-report anxiety questionnaire designed to assess the patient's health status during the previous 2 weeks. The items enquire about the degree to which the patient has been bothered by feeling nervous, anxious or on edge, not being able to stop or control worrying, worrying too much about different things, having trouble relaxing, being so restless that it is hard to sit still, becoming easily annoyed or irritable and feeling afraid as if something might happen. (Williams2014)

The Short Health Anxiety Inventory (SHAI), in particular, has become a popular measure among both clinicians and researchers. Each item of the SHAI consists of a group of four statements in which an individual selects the statement that best reflects their feelings over the past 6 months (1 week in some studies). Item scores are weighted 0–3 and are summed to obtain a total score. To create the main scale of the SHAI, the authors selected 14 items from the HAI with the highest item-total correlations from a sample of patients with hypochondriasis. (Alberts *et al.*2012)

The GADSS is a six-item scale developed specifically to assess the severity of GAD symptoms. As GAD is centrally defined by difficult-to-control worry, the GADSS begins with a target worry list to identify situations that are the focus of the worry (health, family, finances, social relationships, intimate relationships, work, school, daily activities). It also identifies two target symptoms among the six associated DSM-IV-TR symptoms (restlessness/feeling keyed up, fatigue, difficulty Concentrating/mind going blank, irritability, muscle tension, sleep disturbance). After establishing the target worry

domain and the associated symptoms, the scale is scored by a clinician on the following six items: frequency of worry, distress due to worry, frequency of associated symptoms, severity and distress of associated symptoms, impairment in work and impairment in social function. Each of these items is scored on a 5-point severity scale, ranging from 0 = none to 4 = very severe. (Andreescu *et al.*2008)

The HAM-A is a clinician-based questionnaire; however, being available in the public domain, it has been employed as a self-scored survey. It consists of 14 symptom-defined elements, and caters for both psychological and somatic symptoms, comprising anxious mood; tension (including startle response, fatigability, restlessness); fears (including of the dark/strangers/crowds); insomnia; 'intellectual' (poor memory/difficulty concentrating); depressed mood (including anhedonia); somatic symptoms (including aches and pains, stiffness, bruxism); sensory (including tinnitus, blurred vision); cardiovascular (including tachycardia and palpitations); respiratory (chest tightness, choking); gastrointestinal (including irritable bowel syndrome-type symptoms); genitourinary (including urinary frequency, loss of libido); autonomic (including dry mouth, tension headache) and observed behavior at interview (restless, fidgety, etc.). Each item is scored on a basic numeric scoring of 0 (not present) to 4 (severe): >17/56 is taken to indicate mild anxiety; 25–30 is considered moderate–severe. (Thompson2015)

The Beck Anxiety Inventory (BAI) consists of 21 items with a Likert scale ranging from 0 to 3 and raw scores ranging from 0 to 63. It was developed in 1988 and a revised manual was published in 1993 with some changes in scoring. The BAI scores are classified as minimal anxiety (0 to 7), mild anxiety (8 to 15), moderate anxiety (16 to 25), and severe anxiety (30 to 63). (Halfaker *et al.*2011)

In this study, The Generalized Anxiety Disorder Scale (GAD-7) and The Patient Health Questionnaire (PHQ9) were used to measure anxiety and depression respectively. Both tests are validated in an Arabic speaking Lebanese psychiatric outpatient sample and translated to Arabic. The items on the PHQ-9 correspond to the 9 DSM-IV criteria used to diagnose a major depressive episode. The scale is shown to have high internal consistency and high test-retest reliability. The GAD-7 is a 7-item self-report scale, also based on DSM-IV criteria, used to measure the severity of generalized anxiety disorders, and was also shown to be a reliable screening tool for panic, social anxiety and post-traumatic stress disorder. The GAD-7 exhibits excellent internal consistency, good convergent validity when compared to the Beck Anxiety Inventory, Symptom Checklist 90 (SCI-90) anxiety subscale, Penn-State Worry Questionnaire (PSWQA- worry), Depression Anxiety Stress Scale (DASS-anxiety and DASS-stress. Studies also provide evidence for good sensitivity (83–89%) but questionable specificity (46–82%). (Sawaya *et al.*2016a)

Table 1. Validated tests to measure depression.

Name	Advantages	Disadvantages
The Beck Hopelessness Scale	<p>The Beck Hopelessness Scale (BHS) has been the most frequently used instrument for the measurement of hopelessness in the past 40 years</p> <p>The BHS is a valid measure of hopelessness in various subgroups of the general population.</p>	The scale has low predictive values for suicide, with sensitivity of 29 to 54% and specificity of 60 to 84%.
The Quick Inventory of Depressive Symptomatology-Self-Report (QIDS-SR)	Brief, Studies in patients with MDD and bipolar disorder have shown good psychometric properties, including strong internal consistency, concurrent validity, sensitivity to symptom change, and ability to distinguish response and remission.	The QIDS-SR ₁₆ rates symptom domains during the prior 7 days.
The PHQ-9	Brief; includes the key content areas for the formal diagnostic criteria Includes a question on suicidality supporting concurrent screening for depression and suicide risk	Some overlap with symptoms of inflammatory disorders (lacking energy, sleep, and appetite difficulties)

<p>The Reminiscence Functions Scale (RFS)</p>	<p>The RFS is a valid, reliable, and relatively comprehensive measure of many fundamental uses of reminiscence in adulthood. The RFS has several advantages over the latter typology, including ease of administration and scoring, greater comprehensiveness in terms of identified factors, and clearer differentiation between factors.</p>	<p>It's use in diagnosis of clinical depression is still not explored.</p>
<p>The Social Adjustment Scale (SAS-SR)</p>	<p>The SAS-SR has been translated into 17 languages and has a fourth-grade reading level. The questions were designed to measure expressive and instrumental performance over the past two weeks in six role areas: work, either as a paid worker, unpaid homemaker, or student, social and leisure activities, relationships with extended family, role as a marital partner, parental role, and role within the family unit, including perceptions about economic functioning.</p>	<p>It's initially a 54 items scale but Two shortened versions were recently developed: the 24-item SAS-SR: Short and the 14-item SAS-SR: Screener.</p> <p>Take up to 20 minutes to complete and are unsuitable when a brief measure of social functioning is required.</p>

The Social Functioning Questionnaire (SFQ)	The SFQ takes less than 4 minutes. SFQ is a useful short robust instrument to assess social functioning in a wide range of situations. It could be suitable for research in epidemiological investigations and for evaluating the effects of interventions that may alter social function.	SFQ may be a concern in those with severe mental illness may under-rate their dysfunction when a self-rating is relied upon alone.
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Table 2. Validated tests to measure anxiety.

Name	Advantages	Disadvantages
The Generalized Anxiety Disorder Scale (GAD-7)	Brief Focuses on a common anxiety disorder, generalized anxiety disorder	May not capture anxiety related to anxiety disorders other than generalized anxiety disorder Possibly only moderate test-retest reliability
The Short Health Anxiety Inventory (SHAI)	The SHAI demonstrated satisfactory reliability and a clearly interpretable factor structure including lower-order factors assessing the perceived likelihood of illnesses, anticipated negative consequences of having an illness, and attentional	incremental validity, cut-off scores, and use among diverse samples needs to be examined.

	deployment toward bodily sensations	
The The Generalized anxiety disorder severity scale GADSS	The Generalized Anxiety Disorder Severity Scale (GADSS) is the only published scale that specifically measures symptom severity in GAD.	Further studies are needed to confirm test–retest and inter-rater reliability of the GADSS and to determine its usefulness as an in-person instrument.
The HAM-A	reasonable inter-rater reliability and good one-week retest reliability.	limited usage in the evaluation of anxiolytics.
The Beck Anxiety Inventory (BAI)	The BAI is a relatively brief, easily administered, and easily scored measure of anxiety	The primary limitations for the BAI are the relatively limited scope of symptoms evaluated. It does not assess other primary symptoms of anxiety, most notably worry and other cognitive aspects of anxiety.

D. Etiology of anxiety and depression: pathophysiology, genetics, environment.

Anxiety disorders appear to be caused by an interaction of biopsychosocial factors. Genetic vulnerability interacts with situations that are stressful or traumatic to produce clinically significant syndromes. Furthermore, Childhood maltreatment (eg, childhood sexual abuse), physical punishment in childhood, parental history of mental disorders, low socioeconomic status, and an overprotective or overly harsh parenting style are all associated with increased risk of anxiety disorders. These risk factors are non-specific—they increased risk for many mental disorders. Women are at an increased risk of each anxiety disorder for reasons that remain unclear.(Craske & Stein2016)

Individuals with anxiety disorders are excessively fearful, anxious, or avoidant of perceived threats in the environment (eg, social situations or unfamiliar locations) or internal to oneself (eg, unusual bodily sensations). The response is out of proportion to the actual risk or danger posed. Fear occurs as a result of perceived imminent threat whereas anxiety is a state of anticipation about perceived future threats. Panic attacks feature prominently as a particular type of fear response. (Craske & Stein2016)

In the central nervous system (CNS), the major mediators of the symptoms of anxiety disorders appear to be norepinephrine, serotonin, dopamine, and gamma-aminobutyric acid (GABA). Other neurotransmitters and peptides, such as corticotropin-releasing factor, may be involved. Peripherally, the autonomic nervous system, especially the sympathetic nervous system, mediates many of the symptoms. (Bhatt2020)

Anxiety disorders have very high morbidity including substance abuse, alcoholism and major depression. In others, anxiety impairs the ability to develop social

relationships and worsens the quality of life. Severe anxiety has also been linked to high rates of suicides. (Chand & Marwaha2020)

Cognitive behavioral therapy (CBT) is the most empirically supported psychological treatment for youth and adult anxiety disorders. CBT is a short-term (eg, 10–20 weeks), goal-oriented, skills-based treatment that reduces anxiety-driven biases to interpret ambiguous stimuli as threatening, replaces avoidant and safety-seeking behaviors with approach and coping behaviors, and reduces excessive autonomic arousal through strategies such as relaxation or breathing retraining. In addition, Drug therapies are available for all of the anxiety disorders. (Craske & Stein2016)

Anxiety disorder may be related to depression. The specific cause of major depressive disorder is not known. As with most psychiatric disorders, major depressive disorder appears to be a multifactorial and heterogeneous group of disorders involving both genetic and environmental factors. (*Depression: Practice essentials, background, pathophysiology.*2020a)

Genetic factors play an important role in the development of major depression. Evidence from twin studies suggests that major depression has a concordance of 40–50%. First-degree relatives of individuals with depression are about 3 times as likely to develop depression as the general population; however, depression can occur in people without family histories of depression, as well. Although major depressive disorder can arise without any precipitating stressors, stress and interpersonal losses certainly increase risk. For example, loss of a parent before the age of 10 years increases the risk of later depression. Chronic pain, medical illness, and psychosocial stress can also play a role in major depressive disorder. The parent-child relation model conceptualizes

depression as the result of poor parent-child interaction. Adults with depression report low paternal involvement and high maternal overprotection during early childhood. Troubled relationships with parents, siblings, and peers are common in children and adolescents with affective illness. (Tsuang & Faraone 1990)

Clinical and preclinical trials suggest a disturbance in central nervous system serotonin (5-HT) activity as an important factor for developing depression. Other neurotransmitters implicated include norepinephrine (NE), dopamine (DA), glutamate, and brain-derived neurotrophic factor (BDNF). The role of CNS 5-HT activity in the pathophysiology of major depressive disorder is suggested by the therapeutic efficacy of selective serotonin reuptake inhibitors (SSRIs). In addition, studies have shown that an acute, transient relapse of depressive symptoms can be produced in research subjects in remission using tryptophan depletion, which causes a temporary reduction in CNS 5-HT levels. Functional neuroimaging studies support the hypothesis that the depressed state is associated with decreased metabolic activity in neocortical structures and increased metabolic activity in limbic structures.

An integrative model of late-onset depression posits that age-related brain changes and disease-related changes (eg, cerebrovascular disease), coupled with physiologic vulnerabilities (eg, genetic risk factors, personal history of depression) and psychosocial adversity, lead to disruptions in the functional circuitry of emotion regulation—namely, hypometabolism of cortical structures and hypermetabolism of limbic structures. (Chand & Hasan 2020)

Major depressive disorder has significant potential morbidity and mortality, contributing as it does to suicide, incidence and adverse outcomes of medical illness, disruption in interpersonal relationships, substance abuse, and lost work time. With

appropriate treatment, 70-80% of individuals with major depressive disorder can achieve a significant reduction in symptoms, although as many as 50% of patients may not respond to the initial treatment trial. (*Depression: Practice essentials, background, pathophysiology*.2020b)

E. Diet and lifestyle are modifiable risk factors.

Despite the steadily escalating psychological and economic burden of depression, there is a lack of evidence for the effectiveness of available interventions on functioning areas beyond symptomatology (Kamenov *et al.*2017).

Pharmacotherapy, such as antidepressants, and psychotherapy, such as cognitive-behavioral therapy, are cornerstones of treatment. However, they avert less than half of the disease burden, suggesting that additional strategies to prevent and treat mental disorders are needed (Marx *et al.*2017)

It's not only a problem for psychotherapist but will affect nutritionist and physician work because the deterioration of mental health has become a serious phenomenon, as various research evidence indicates that it leads to an increased risk for multiple diseases, including cardiovascular disease and diabetes (Pan *et al.*2012).

On the other hand, eating a healthy diet was significantly associated with better emotional health, and eating an unhealthy diet was significantly associated with more significant emotional distress (Kulkarni *et al.*2014) Irregular diets, including high salt intake, breakfast omission, and inadequate fruits, vegetables, and eggs, were positively associated with poor mental health (Yang *et al.*2017) Research investigating the potential biological processes involved in the diet and mental health relationship has primarily implicated inflammation, oxidative stress, and neuroplasticity, with the gut

microbiome as a critical mediating pathway for each of these processes (Marx *et al.*2017)

Subjects with depression have a higher level of oxidative stress markers observed, as well as lower levels of antioxidants, such as vitamin E, vitamin C, coenzyme Q10, and glutathione when compared with healthy controls.(Moylan *et al.*2014) The causes of inflammation include several lifestyle factors, such as psychological stress, smoking, obesity, lack of sleep and, of particular relevance to the present discussion, poor diet. (Marx *et al.*2017)

It's known that the Mediterranean dietary patterns significantly improve markers of inflammation in intervention studies'(Schwingshackl & Hoffmann2014). Moreover, the adherence to a Mediterranean Dietary Pattern ensures an adequate intake of fruits, nuts, vegetables, cereals, legumes or fish, essential sources of nutrients linked to depression prevention.(Sánchez-Villegas *et al.*2006)

While studies results reveal an unfavorable trend towards a Westernized diet in the Middle East and, to a certain extent, in North Africa. (Golzarand *et al.*2012) Accordingly, with an increase in mental health and a westernized lifestyle, this may suggest a relationship between individual lifestyle patterns with depression and anxiety.

Compelling evidence, predominantly from animal studies, indicate the gut microbiota can affect mental health-related behaviors via multiple pathways(Fung *et al.*2017). including the modulation of serotonin neurotransmission (Moylan *et al.*, 2014) immune function, and the hypothalamic–pituitary–adrenal axis-mediated stress response (Lora V. Hooper, Dan R. Littman, & Andrew J. Macpherson, 2012) . Clinically, differences in patterns of faecal microbiota, reflecting decreased gut

microbiota richness and diversity, have been reported in patients with depression compared with healthy controls (Kelly et al., 2016)

Furthermore, participation in sports activities have significant effects on mental health.(Motallebi M S & Noorbakhsh2010) The relationship between physical activity and depression has been widely investigated, with the results indicating that an increase in physical activity could be used as an alternative treatment in comparison to medication to improve mental health (Takahashi *et al.*2019)

Serotonin, dopamine, noradrenaline, and glutamate imbalances are often noted in the central nervous systems of people suffering from depression (Maletic *et al.*2007) acute exercise has been shown to increase peripheral levels of monoamines including dopamine, epinephrine, and norepinephrine (Basso & Suzuki2017) There were significant improvements in mental well-being among participants directly after the lifestyle intervention, which was sustained at the three-month follow-up. (Johnson *et al.*2017)

Moreover, studies have shown an association between mental health, especially anxiety and depression, with lifestyle factors such as diet, physical activity, and smoking. Depression, anxiety, sleeping disorders, and low quality of life were positively associated with self-evaluation of nutrition as “poor,” moderate consumption of food, and low-paid professional status. Depression and sleeping disorders were associated with smoking, a hazardous level of alcohol drinking, and alcohol dependence. Anxiety and low quality of life were associated with alcohol dependence. (Averina et al.2005)

A number of lifestyle factors have been recognized to play an important role in positively modifying medical and psychiatric diseases and their associated morbidity and mortality. These include, eating healthy food, greater physical activity, cessation of smoking, avoidance of alcohol and illicit substances. Additional lifestyle factors for healthy living include, safe and peaceful environment, optimal sleep, de-stressing and enjoyable activities, social connections/support and healthy mental activities. (Zaman *et al.*2019)

In summary, every aspect of the lifestyle can affect depression and anxiety through different pathways. While mental illnesses affect lifestyle patterns and may cause an increase in unhealthy practices. So, the association of mental illnesses and lifestyle factors is a vicious cycle where a change in one may impact the other.

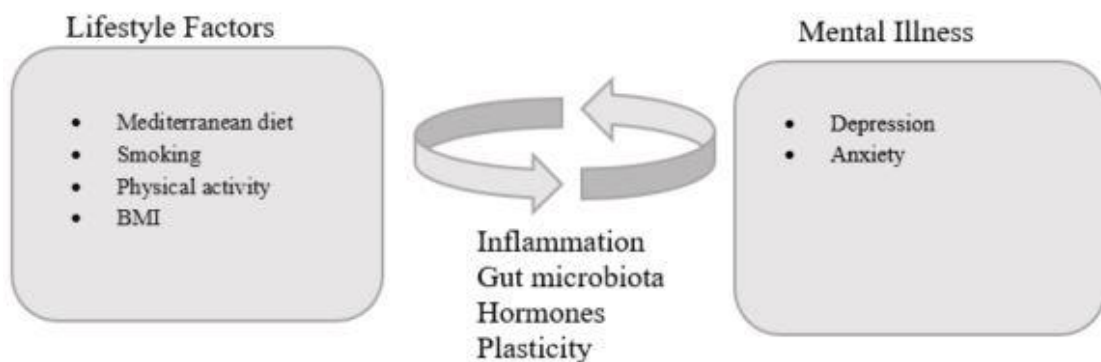


Figure 3. Association of lifestyle factors and Mental Illness

F. Anxiety and depression in Middle east and the region.

Depression and anxiety disorders are by far the most common mental illnesses in the Middle East. Among the individuals who seek treatment, many face misdiagnoses

at the hands of primary care physicians who are often overworked and who have little training in mental health. (*Hidden afflictions: Mental illness in the middle east*.2010)

The rates of depression (PHQ-9 \geq 12), generalized anxiety (GAD-7 \geq 10) and eating disorders (SCOFF \geq 3) at the combined Arab universities (Education City (EC) and Qatar University (QU) in Doha-Qatar, the American University of Beirut (AUB) in Lebanon) were 34.6, 36.1 and 20.4% respectively compared to the corresponding rates in the USA were: 12.8, 15.9 and 6.8%. Also, the impact of psychiatric problems on functioning in general and academic performance, in particular, was more severe in the Arab countries compared to the USA(Kronfol *et al.*2018).

Takriti and Ahmad (1992) had shown in a sample of 150 Jordanian out-patients with panic disorder that 26% suffered from DSM-III-R depression as well. 21% of 96 UAE patients and 7% of 100 Saudi patients had “any anxiety disorder” comorbid with depression. Another study in UAE had shown that among 644 psychiatric patients, 20% of the psychiatric sample who had “Psychologized mental disorders” and 33.8% of those who had “Somatized mental disorders” had mixed anxiety and depression disorder. In Algeria 7.6% and in Palestine 1.5% from a community sample had any anxiety disorder (excluding PTSD) co-morbid with depressive mood disorder in a post-conflict setting. (Tanios *et al.*2008)

G. Anxiety and depression in Lebanon.

In Lebanon, data suggests that an estimated 17% of Lebanon’s population suffers from mental health problems, yet almost 90% have no access to treatment (*Addressing mental health needs in lebanon*.2010)

As mentioned in the graph below, the number of people with depression in Lebanon has increased from 1990 to 2017. More than 285,723.30 of the Lebanese suffer from depression. (Ritchie & Roser2018)

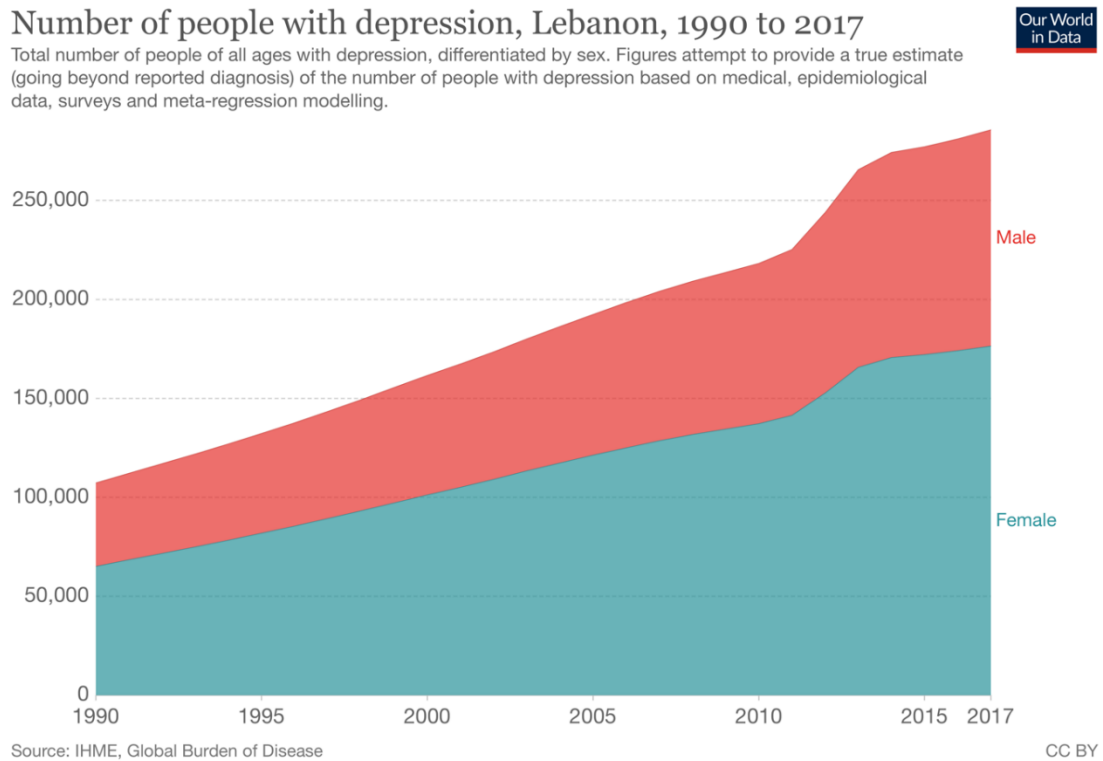


Figure 4. Number of People with Depression, Lebanon, 1990 to 2017.

The same pattern is present in the generalized anxiety disorder. According to the graph below, the number of people with depression in Lebanon has increased tremendously from 1990 to 2017. More than 311,581.70 of the Lebanese population suffer from anxiety. (Ritchie & Roser2018)

Number of people with anxiety disorders, Lebanon, 1990 to 2017

Number of people with an anxiety disorder, differentiated by sex. This is measured across all ages. Figures attempt to provide a true estimate (going beyond reported diagnosis) of the number of people with anxiety disorders based on medical, epidemiological data, surveys and meta-regression modelling.

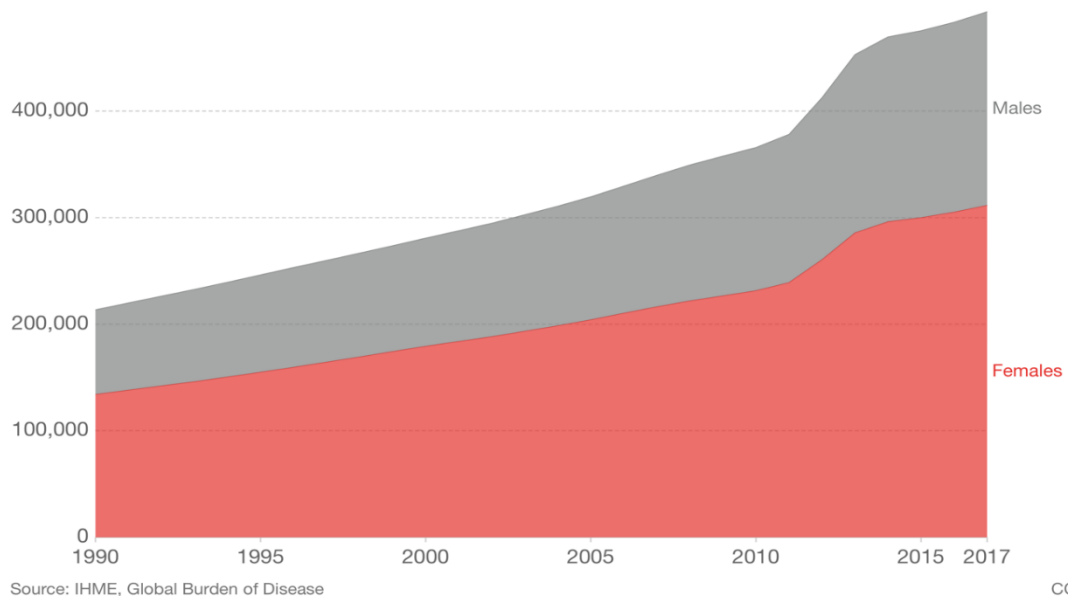


Figure 5. Number of People with Anxiety Disorders, Lebanon, 1990 to 2017.

H. Diet and lifestyle in Lebanon.

Lebanon, like other countries of the Middle-East and North Africa Region (MENA), is currently witnessing a fast rate of development and modernization with concurrent shifts in diet, physical activity and body composition. (Sibai *et al.*2010) This westernization of Lebanese adults diet and lifestyle may suggest an effect on mental health. At present, the traditional diet is eroding and is being replaced by high-fat foods. (Nasreddine *et al.*2006)

A diet comprised of vegetables, fruits, whole grains, fish, and legumes may protect against the development of depressive symptoms in older age. (Skarupski *et al.*2013) While low adherence to the Mediterranean Diet among Lebanese adults was observed. (Naja *et al.*2019). Modernization and adoption of the Western lifestyle for countries in transition are key factors affecting nutritional habits and obesity levels. (Sibai *et al.*2003) The Tremendous increase in mental health go along with a westernization in the Lebanese lifestyle. It seems that the Lebanese Mediterranean diet is converging with a pattern high in saturated fat, sugar, and refined foods and is low in fiber. Such a Westernized dietary pattern is associated with the increased risk of non-communicable diseases such as obesity, cardiovascular disease, diabetes, and hypertension. A dietary pattern comprising processed and “unhealthy” foods (western) was associated with a higher likelihood of psychological symptoms and disorders. Better diet quality, as measured by the diet quality score, was associated with a lower level of psychological symptoms. (Felice N Jacka *et al.*2010)

For adult Lebanese men and women (age ≥ 20 years), the prevalence of overweight was 57.7% and 49.4%, respectively. In contrast, obesity (BMI ≥ 30 kg/m²) was higher overall among women (18.8%) than men (14.3%), a trend that became more evident with increasing obesity class. These results show a high prevalence rates of overweight and obesity comparable with those observed in developed countries such as the United States. (Sibai *et al.*2003)

Approximately 1.1 million people ages 18 and older currently smoke in Lebanon. Also, Lebanon is ranked third in the world for highest cigarette consumption per capita and approximately 3500 people die every year in Lebanon because of tobacco- related diseases. (*State of smoking in lebanon.*2019)

Although obesity rate is high in Lebanese adults, the prevalence of physical activity among Lebanese adults was 55.5%. (Al-tannir *et al.*2009)

As suggested, an unhealthy lifestyle may increase the risk of mental illnesses. Lebanese lifestyle is shifting from a traditional Mediterranean diet, high activity level, low obesity and a low smoking rate to a more westernized unhealthy lifestyle. This may suggest a relationship between the rise of mental illnesses in Lebanon and the unhealthy lifestyle patterns. Few studies done in Lebanon were conducted on mental health and diet so the aim of this project is to study the prevalence of mental illnesses, assess the lifestyle patterns and determine the Association of diet and lifestyle with anxiety and depression among Lebanese adults living in Beirut.

CHAPTER III

METHODS

A. Materials and Methods

This descriptive cross-sectional study examines the prevalence of lifestyle factors, mental health such as depression and anxiety and determine their association. Data for the lifestyle (BMI, smoking, physical activity and Mediterranean dietary pattern) were collected from a previous done 2 years ago (Validity and reproducibility of a food frequency questionnaire among Lebanese adults for the assessment of energy and nutrient intake). A model of the cross-sectional study is included in Figure 5. The research questions for this study are as follows: RQ1. What is the prevalence of depression and anxiety in Lebanese adults? RQ2. What is the prevalence of healthy lifestyle in Lebanese adults? RQ3. Is there a relationship between BMI, exercise, smoking and Mediterranean diet with depression and anxiety in Lebanese adults?

Figure 6. Model of Cross-sectional Study.

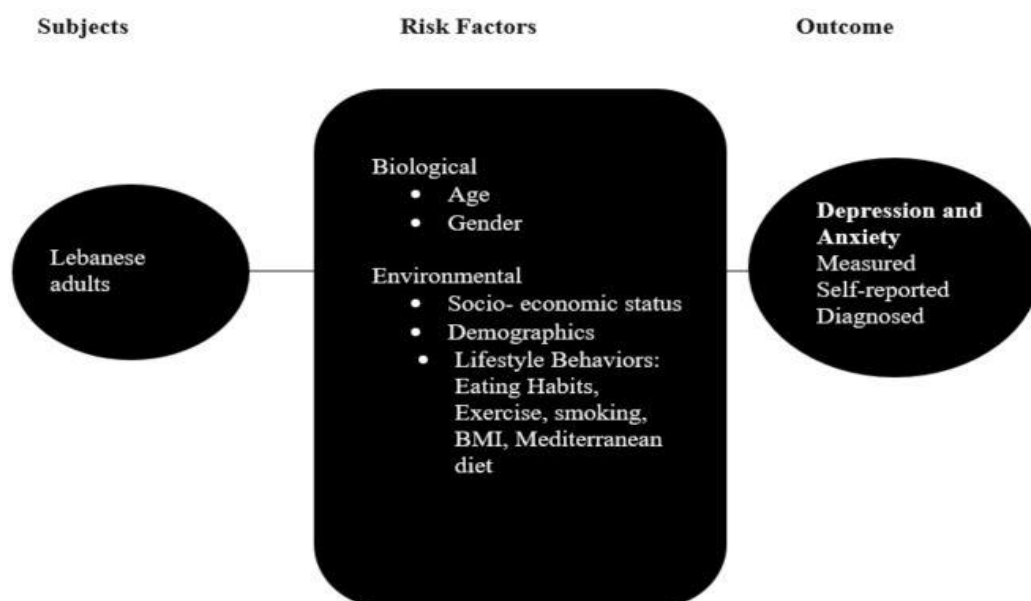


Table 3. Research Questions & Instrumentation.

Research Questions	Instrumentation	Measures
What is the prevalence of mental health in Lebanese adults?	GAD-7 (generalized anxiety disorder 7)	Anxiety severity
	PHQ9 (Patient health questionnaire 9)	Depression severity
What is the prevalence of healthy lifestyle in Lebanese adults?	FFQ (Food Frequency Questionnaire) Socio-Demographic Questionnaire Lifestyle Questionnaire Anthropometric Assessment Lifestyle Score Mediterranean Diet Pattern Score	Energy, macronutrients, micronutrients and Mediterranean diet
Is there a relationship between BMI, exercise, smoking and Mediterranean diet with depression and anxiety in Lebanese adults?	Survey Instruments indicated above	Anova Chi-squared test

B. Sample and Settings

1. Sample

The American University of Beirut (AUB) has 4660 employees from which 1214 are faculties instructors, making it the single largest employer in the Lebanese private sector. Given that AUB is a culturally diverse institution with employees from across the country and from various socioeconomic statuses, this renders it as a suitable site for participant recruitment. (*Facts and figures.2020*)

This study population is based on the participants of the previous study done at AUB (validity and reproducibility of a food frequency questionnaire among Lebanese adults for the assessment of energy and Nutrient intake). Participants were invited to the study via several methods from verbal announcements during departmental or office general meetings to using flyers distributed everywhere on campus. In addition, flyers were posted in the entrance of all academic faculties and departments at AUB, student and staff cafeteria, post office and physical plant. The posting of flyers took place in coordination with the administration of each of these academic/administrative units. Serious efforts were made to recruit a study population from across all departments and offices at AUB. A trained research assistant certified by the Collaborative Institutional Training Initiative (CITI) for ethical research conduct contacted interested faculty and staff members for briefing them about the purpose of the study, assuring their qualification, and finally recruiting them in the study. (El Sayed Ahmad, Raeda Ibrahim2019)

From the 120 individuals who participated in the previous study, N=110 individuals provided a consent to be re-contacted, they were contacted again and asked kindly to meet at the university campus. (figure 6)

A convenience sample of N=85 AUB adults working in various faculties and offices at the American University of Beirut (AUB) were recruited. Eligible individuals who met the inclusion and exclusion criteria and who agree to take part in this study signed a written consent form. The inclusion criteria were as follows: Holding the Lebanese nationality or residing in Lebanon for more than 10 years, able to speak the Arabic language, between the ages of 18 and 65 years. Individuals with chronic health conditions that require dietary modifications such as those diagnosed with eating disorders, diabetes, renal diseases, liver diseases, etc. were excluded.

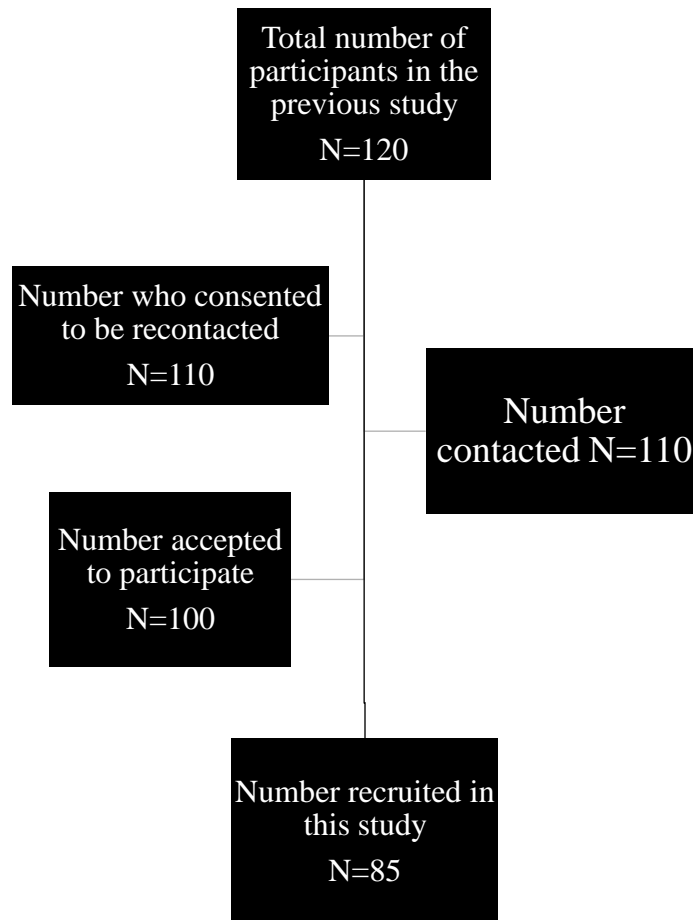


Figure 7. Total number of participants in the original study, number who consented to be recontacted and the number recruited in this study.

In the previous study FFQ, Socio-Demographic Questionnaire, Lifestyle Questionnaire and Anthropometric Assessment were taken. In this study two tests are conducted Generalized anxiety disorder (GAD7) and patient health questionnaire (PHQ9) plus the history questionnaire. A trained research assistant certified by the Collaborative Institutional Training Initiative (CITI) for ethical research contacted interested faculty and staff members who provided a consent to be re-contacted, for the purpose of briefing them about the objectives of the study, ensuring their eligibility, and ultimately recruiting them in the study by asking them kindly to meet at the university campus.

2. Study protocol

Approval for the conduct of this research study was granted by the Institutional Review Board IRB of AUB in 30 July 2019. Flyers for recruitment that included the aims and objectives of the study were given to individuals contacted by phone. The purpose of the study was described and all questions and concerns addressed. Recruitment and data collection took place between September and November 2019. Each participant was enrolled in this study for a total of 1 hour during which 3 questionnaires were conducted face-to-face. This took place in a private setting at AUB (NFSC department, room 520 clinical research room) or at the participants' office. The participants were given two copies of the Consent to Participate in a Research Study' forms, given time to read the document, and the opportunity to ask further questions prior to providing their written consent. See consent form in Appendix I and II. Once the consent forms were signed, a copy was collected by the investigator and a copy was given to the participant. Next, a history questionnaire is Self-administered in addition to the two test Generalized Anxiety Disorder GAD7 and Patient health questionnaire PHQ9. The questions from the survey were read to these subjects by the investigator who also recorded the responses on the paper and pencil survey questionnaire form. Additional privacy was offered to subjects who preferred to fill the questionnaire on their own. The subjects who completed all aspects of the study received a stipend (\$10 as a compensation for their waiting time and transportation).

C. Instruments

1. Tests

The history questionnaire is a brief questionnaire composed of 4 questions that

gathers information about the participant's previous mental status, drastic lifestyle change, previous treatments or medication intake. We used the Patient Health Questionnaire-9 (PHQ-9) to measure symptoms of depression over the last 2 weeks period. This self-report scale, which is based on the DSM-IV, has been used to measure both the severity of depressive symptoms as well as the diagnosis of major depression. The scale has been shown to have good sensitivity and specificity. It has been used in different settings and has been translated into different languages including Arabic and validated in different cultures including Saudi Arabia and Lebanon. Scores on the PHQ-9 are interpreted as follows: score 0–4: no depression; score 5–9: mild depression; score 10–14: moderate depression and score ≥ 15 : severe depression. We have used the PHQ-9 as a screen for the diagnosis for major depression. (Sawaya *et al.*2016b)

We used the Generalized Anxiety Disorder-7 (GAD-7) to measure symptoms of anxiety over the last 2 weeks. Like the PHQ-9, the GAD-7 is a self-report questionnaire based on DSM-IV criteria of generalized anxiety disorder. This scale was also shown to have good sensitivity but specificity has been variable. This scale has also been used in different settings and in different countries including Lebanon. Scores on the GAD-7 were interpreted as follows: score 0–4: no anxiety; score 5–9: mild anxiety; score 10–14: moderate anxiety and score ≥ 15 : severe anxiety. As with the PHQ-9, we also used the GAD-7 for the diagnosis of generalized anxiety disorder. (Sawaya *et al.*2016)

Lifestyle related Data such as Mediterranean dietary patterns, physical activity, smoking, and BMI were collected from the study “Validity and Reliability of a Food Frequency Questionnaire to Assess Dietary Intake among Lebanese adults” done on the same population. We developed a combined healthy lifestyle index for each participant based on the current Recommendations for healthy lifestyle. Each participant received a

score of one for each of the lifestyle factors if they were never smokers; were regularly active, i.e. performing 150 min/week of moderate intensity physical activity or 60 min/week of vigorous intensity physical activity; had a “normal” BMI of 25 kg/m^2 ; and the Mediterranean diet pattern score = 1 (MDP scored of 3 and 4 is considered =1) otherwise participants received a score of zero for each of these factors. Lifestyle Factors score is generated by summing the score for each of the four components (smoking, MDP score, physical activity, and BMI).

The Mediterranean score is based on the intake of olive oil, fibers, fruits, vegetables, fish, meat and refined cereals. First, an energy-adjusted value was obtained for each individual using the residual method for the daily consumption of olive oil, fiber, fruits, vegetables, and fish. Second, the quintile cut-offs (among eaters and mild PHQ group of the energy) adjusted intake of each of these food groups was conducted. Third, one to five points were given for participants falling in the first to fifth quintile, respectively, for the consumption of presumed favorable food groups. An inverse scoring was given for presumed harmful food groups (meat, refined cereals). Finally, points are summed to obtain the total MDP score whereby higher scores indicating better adherence to the Mediterranean dietary pattern.

2. Ethical Considerations

The investigator accessed information from or about participants through a paper and pencil survey questionnaire (n=85). A private area where the encounter was not discernable to any observers was available for conducting the questionnaires. The minimal risk with regards to possible loss of privacy and embarrassment are outweighed by subjects knowing their mental health status, whether it is being controlled, and

whether there is a need for intervention. Steps taken to assure that the identities of subjects and their health information were protected included the study subjects being classified by ID number and only known to the research team.

In the event the depression screening questions indicated suicidal ideation, consideration for their safety was foremost. The investigator is Master's level Nutritionist, have a certification in Life coaching and a volunteering experience in a mental health NGO. The investigator spoke further with the subjects who indicated on the PHQ-9 questionnaire think that you would be better off dead or that you want to hurt yourself in some way. In addition, each subject was given a copy of the flyer with the contact information of the resources needed for referral if needed.

Economically disadvantaged individuals may be considered vulnerable to coercion. However, the value of the stipend (e.g. \$10) that the subjects received for completing the questionnaires was minimal.

3. Study Variables

The predictor variables of this study are the sociodemographic characteristics of the sample, lifestyle factors, Mediterranean dietary pattern, exercise, depression, and anxiety. Secondary data was used for the Lifestyle factors. While mental health questionnaires (PHQ9 and GAD7) were self-administered and scored. The outcome variable of the study are Depression and anxiety, with scores represent: 0-5 = mild 6-10 = moderate 11-15 = moderately severe 16-20 = severe depression/anxiety.

4. Data Management

Lifestyle factors (Exercise, smoking, BMI); Mediterranean score (olive oil, cereals, fruits and vegetables...); Depression score (PHQ-9); Anxiety score (GAD-7) were all scored by the PI using SPSS (Statistical Package for Social Sciences) 25.0.

5. Statistical Analysis

The data that were collected on 85 subjects (n=85) was included in the final analysis. Statistical analysis was planned in regards to each research question. Frequencies were obtained on all variables that were ordinal, dichotomous or categorical with SPSS 25.0 software. Mean, median, and standard deviations and ranges, minimum and maximum values were obtained on continuous variables.

Pearson r was used to determine whether there was a relationship between depression, anxiety and Socio-demographic and lifestyle characteristics. The t-test to compare means between Socio-demographics and lifestyle characteristics of the study population to determine whether there is difference in the lifestyle factors of different socio demographic characteristics. Also, t- test was used to understand the association of lifestyle score with depression and anxiety. A p-value less than 0.05 was considered statistically significant.

CHAPTER IV

RESULTS

Table 4. Socio-demographic and lifestyle characteristics of the study population by gender (n=85).

Socio-demographic variables	Total (n=85)	Males (n=55)	Females (n=30)	p-value
Age (years)				
23-34	30(35.3)	14(25.5)	16(53.3)	$X^2=8.84$
35-44	25(29.4)	16(29.1)	9(30.0)	P=0.012
45 and above	30(35.3)	25(45.5)	5(16.7)	
Place of residence				
Beirut	36(42.4)	21(38.2)	15(50)	$X^2=1.110$
Outside Beirut	49(57.6)	34(61.8)	15(50)	P=0.292
Marital status^b				
Single	31(36.5)	13(23.6)	18(60)	$X^2=11.07$
Married	54(63.5)	42(76.4)	12(40)	9 P=0.001
Education level				
Up to intermediate level	23(27.1)	21(38.2)	2(6.7)	$X^2=14.03$
High school	11(12.9)	9(16.4)	2(6.7)	1
University/technical diploma	51(60)	25(45.4)	26(86.7)	P=0.001
Type of employment				
Academic	11(12.9)	3(5.5)	8(26.7)	$X^2=7.753$
Non- Academic	74(87.1)	52(94.5)	22(73.3)	P=0.005
Income per month (L.L.)^c				
Below 3,000,000	43(50.6)	35(63.6)	8(26.7)	$X^2=10.61$
3,000,000 and above	42(49.4)	20(36.4)	22(73.3)	4 P=0.001
Crowding Index				
<1	38(44.7)	22(40)	16(53.3)	$X^2=1.396$
≥1	47(55.3)	33(60)	14(46.7)	P=0.237
Smoking^d				
Non-smoker	37(43.5)	18(32.7)	19(63.3)	$X^2=7.397$
Smoker	48(56.5)	37(67.3)	11(36.7)	P=0.007
How long have you been a smoker (Years)	11.1±1.2	36±1.4	11±2.3	P=0.432
Physical Activity				
Low	17(20)	8(14.5)	9(30)	$X^2=3.070$

Moderate	57(67.1)	40(72.7)	17(56.7)	P=0.215
High	11(12.9)	7(12.7)	4(13.3)	
Body Mass Index (BMI) (kg/m²)				
Normal (18.5-24.9)	23(27.1)	6(10.9)	17(56.7)	X ² =20.83 2 P=0.000
Overweight (25.0-29.9)	33(38.8)	27(49.1)	6(20)	
Obese (≥30)	29(34.1)	22(40)	7(23.3)	
MDP-Score				
Below median	47(55.29)	35(63.6)	12(40)	X ² =4.38
Above median	38(44.7)	20(36.36)	18(60)	P=0.036

p-value was derived from chi-square for categorical variables and from independent t test for continuous variables
 BMI: body mass index (kg/m²), ^bSingle including divorced and widowed, ^cL.L. Lebanese Lira, ^dNon smoker including never smoker and past smokers.

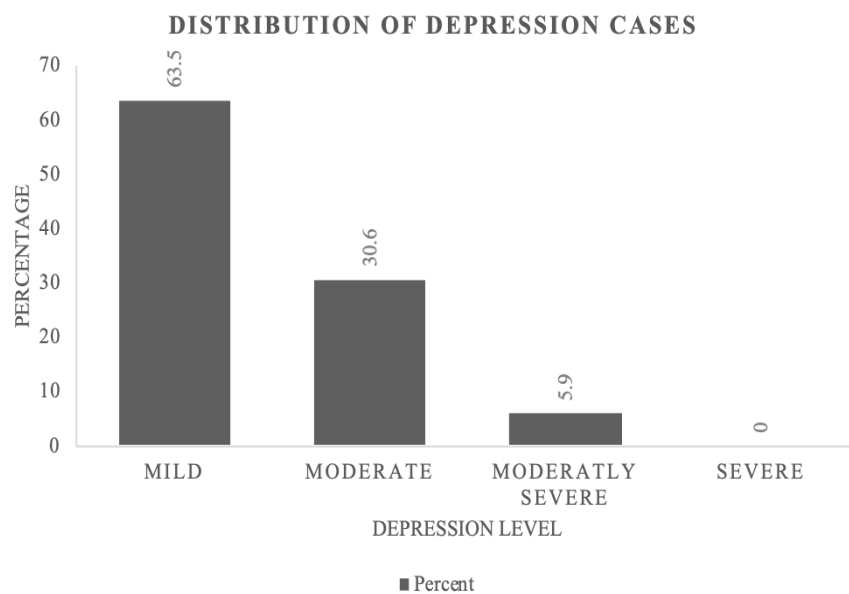
A. Descriptive Characteristics of Study Participants

The number of participants who consented to participate in the study was 85 participants out of 120 initial participants. Table 4 describes the socio-demographic characteristics of the study population. Of the 85 Lebanese adults participating in the study, 55 (65 %) were males and 30 (35%) were females. The age of the participants ranged between 23 to 45 years and above among which 29.4% are below the age of 35 years. Of the participants, 72.9 % were either overweight or obese and 72.9 % of the participants reached an educational level of high school and above. Of the participants, 87.1 % were non- academic AUB/AUBMC staff members. The crowding index was greater than 1 for 55.3 % of the participants and the total monthly income of the participants exceeded 2000 USD (1\$= 1500 LBP) for half of them.

As related to lifestyle practices, 56.5 % of the participants reported to be smokers with an average mean of 11.1 ± 1.2 years of smoking. For physical activity, results showed that 20% of the participants were engaged in low intensity physical activity while only 12.9% reported to perform high intensity physical activity and no more than half had a moderate intensity physical activity (Table 4). There were notable

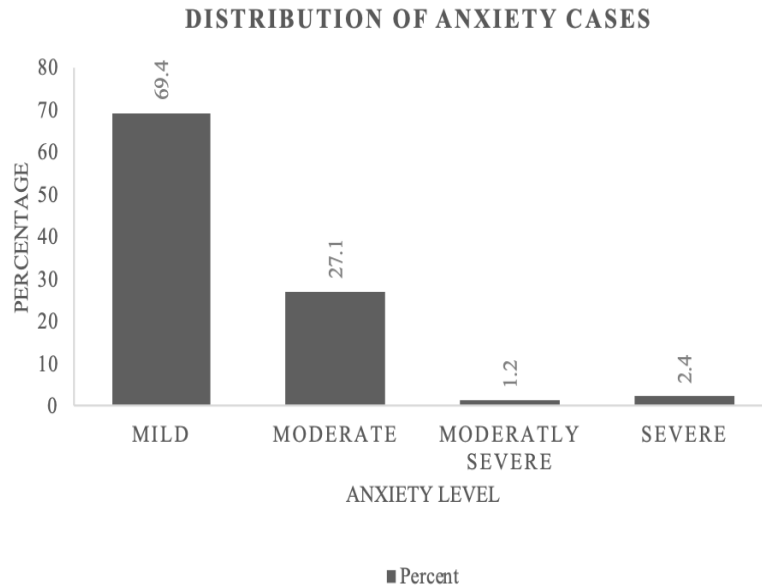
differences between females and males with respect to sociodemographic characteristics. The mean age of the females was less than that of males; the majority of females were single, had a university degree and a salary > 2000 USD compared to males. more males were a smoker and in the overweight and the obesity ranges while males reported to be more physically active than females (Table 4).

Graph 1. Percentage Distribution of subjects according to Depression.



Graph.1 shows the distribution of subjects according to depression severity. Based on the sample of N=85 adults working in various faculties and offices at the American University of Beirut (AUB), The majority (63.5%) of the participants had mild depression while 30.6 % had moderate depression, 5.9 % had moderately severe and there was no reported case of severe depression (Graph 1). Our results cast a new light on the prevalence of depression among the Lebanese adults. Nearly 36.5% of the working Lebanese adults suffer from moderate to moderately severe depression.

Graph 2. Percentage Distribution of subjects according to Anxiety.



Graph.2 highlights the distribution of subjects according to anxiety severity. Mild anxiety was the most common (69.4%) in the sample population. Followed by moderate anxiety level (27.1%), severe anxiety (2.4%) and finally moderately severe anxiety (1.2%). From the results, it is clear that 30.7 % of the working Lebanese adults have a form of generalized anxiety disorder. In this study participant with a score higher than 6 were considered having moderate symptoms of anxiety and depression although according to Sawaya et.al any score of 10 or above indicated the presence of a depressive or anxiety disorder and any score of 9 or below indicated its absence. It's important to mention that GAD7 and PHQ9 are screening tools and not a diagnostic tools. (Sawaya *et al.*2016)

Table 5. Socio-demographic and lifestyle characteristics of the study population by mild depression vs other (moderate, moderate severe and severe) (n=85).

Socio-demographic variables	Total (n=85)	Mild depression (n=54)	moderate, moderate severe and severe depression (n=31)	p-value
Age (years)				
23-34	4.6±0.91	20(37.0)	10(32.3)	X ² =2.104
35-44	5.9±1.11	13(24.1)	12(38.7)	P=0.349
45 and above	4.4±0.66	21(38.9)	9(29.0)	
Place of residence				
Beirut	5.9±1	21(38.9)	15(48.4)	X ² =0.728
Outside Beirut	4.12±0.48	33(61.1)	16(51.6)	P=0.394
Marital status^b				
Single	5.4±0.88	20(37)	11(35.5)	X ² =0.21
Married	4.6±0.63	34(63)	20(64.5)	P=0.886
Education level				
Up to intermediate level	4.0±0.68	15(27.8)	8(25.8)	X ² =1.796
High school	6.9±2.19	5(9.3)	6(19.4)	P=0.407
University/technical diploma	4.8±0.64	34(63)	17(54.8)	
Type of employment				
Academic	5.2±0.98	6(11.1)	5(16.1)	X ² =0.440
Non- Academic	4.8±0.57	48(88.9)	26(83.9)	P=0.507
Income per month (L.L.)^c				
Below 3,000,000	4.4±0.753	29(53.7)	14(45.2)	X ² =0.575
3,000,000 and above	5.3±0.698	25(46.3)	17(54.8)	P=0.448
Crowding Index				
<1	4.6±0.78	26(48.1)	12(38.7)	X ² =0.710
≥1	5.0±0.69	28(51.9)	19(61.3)	P=0.400
Smoking^d				
Non-smoker	3.4±0.55	26(48.1)	11(35.3)	X ² =1.285
Smoker	5.56±0.79	28(51.9)	20(64.5)	P=0.257
How long have you been a smoker (Years)	-	28±1.6	19±1.8	P=0.261
Physical Activity				
Low	5.9±1.02	9(16.7)	8(25.8)	X ² =2.414
Moderate	5.0±0.67	36(66.7)	21(67.7)	P=0.299
High	2.6±0.83	9(16.7)	2(6.5)	
Body Mass Index (BMI) (kg/m²)				
Normal (18.5-24.9)	4.0±0.72	15(27.8)	8(25.8)	X ² =0.055

Overweight (25.0-29.9)	5.3±1.05	21(38.9)	12(38.7)	P=0.973
Obese (≥30)	5.1±0.72	18(33.3)	11(35.3)	

p-value was derived from chi-square for categorical variables and from independent t test for continuous variables. ¹BMI: body mass index (kg/m²), ²Single including divorced and widowed, ³L.L. Lebanese Lira, ⁴Non smoker including never smoker and past smokers. The total column include the mean score of the PHQ9.

Table 5 reports the Socio-demographic and lifestyle characteristics of the study population between the mild depression group vs the others (moderate, moderate severe and severe depression). There were no statistically significant differences between the characteristics of the two groups according to Pearson chi-square test. This indicates that people with mild depression does not differ from people with severe depression in terms of lifestyle characteristics and demographics.

Table 6. Percentage of energy intake of subjects according to depression.

Food Groups	Total(n=85)	Mild Depression(n=54)	moderate, moderate severe and severe depression(n=31)	P-Value
Refined-Cereals and cereals-based products	10.1±0.69	10.8±0.93	9.08±0.96	0.357
Whole Bran-Cereals and cereals-based products	2.9±0.40	2.5±0.383	3.6±0.88	.015
Pasta and other cereals	8.12±0.6	8.4±0.8	7.62±0.8	0.034
Potatoes and potato-based products	6.19±0.4	5.85±0.6	6.79±0.6	0.379
Vegetables and vegetable-based dishes	8.38±0.49	8.4±0.64	8.2±0.75	0.945
Fruits and fresh fruit juice	4.9±0.39	4.8±0.47	5.1±0.68	0.67

Meat	6.95±0.6	7.09±0.7	6.7±1	0.337
Poultry	4.45±0.4	4.57±0.5	4.23±0.7	0.732
Eggs	1.44±0.2	1.43±0.2	1.44±0.3	0.788
Fish and seafood	1.45±0.2	1.33±0.2	1.66±0.4	0.101
Pulses	3.67±0.4	3.7±0.5	3.6±0.6	0.2
Nuts and seeds	2.54±0.3	2.28±0.4	2.99±0.6	0.332
Milk and dairy products	4.8±0.4	5.24±0.5	4.02±0.5	0.067
Yogurt and yogurt-based products	2.24±0.2	2.38±0.3	1.99±0.3	0.825
Pizzas and pies	10.29±0.8	9.8±1	11.1±1	0.458
Fats and oils	2.5±0.26	2.5±0.32	2.4±0.45	0.927
Olive oil	2.2±0.25	2.0±0.31	2.5±0.45	0.368
Sugar and sugar derivatives	3.54±0.4	3.19±0.4	4.13±0.8	0.641
Cakes and pastries	5.82±0.5	5.95±0.6	5.6±0.8	0.606
Honey, jam, molasses, pudding, ice-cream and halaweh	1.47±0.2	1.26±0.2	1.8±0.4	0.221
Alcoholic beverages	0.99±0.6	1.32±1	0.41±0.2	0.181
Non-alcoholic beverages	2.96±0.3	3.07±0.3	2.7±0.4	0.037
Miscellaneous	0.91±0.2	0.85±0.3	1.02±0.3	0.583

Table 7. Intake of Energy and Nutrients according to depression.

<i>Nutrient</i>	<i>Total(n=85)</i>	<i>Mild Depression(n=54)</i>	<i>moderate, moderate severe and severe depression(n=31)</i>	<i>P-Value</i>
<i>Energy (Kcalories)</i>	<i>1995.62±63</i>	<i>1946.2±78</i>	<i>2081.6±108</i>	<i>0.766</i>
<i>Protein (%)</i>	<i>14.94±0.3</i>	<i>15.09±0.4</i>	<i>14.69±0.4</i>	<i>0.072</i>
<i>Proteins (g)</i>	<i>73.7±2.5</i>	<i>72.73±3.4</i>	<i>75.45±3.7</i>	<i>0.424</i>

<i>Carbohydrate (%)</i>	43.87±0.6	43.68±0.8	44.2±0.8	0.320
<i>Carbohydrate (g)</i>	219.6±7.9	212.9±9.5	231.2±14	0.716
<i>Fat, Total (%)</i>	40.54±0.5	40.43±0.6	40.74±0.8	0.709
<i>Fat, Total (g)</i>	89.7±3.03	87.21±3.76	94.22±5.1	0.408
<i>Cholesterol (%)</i>	0.1018±0.005	0.1023±0.006	0.1010±0.008	0.754
<i>Cholesterol (mg)</i>	223.8±13	218.45±16	233.33±21.64	0.395
<i>Saturated Fat (%)</i>	10.53±0.2	10.49±0.26	10.59±0.37	0.663
<i>Saturated Fat (g)</i>	23.25±0.82	22.55±1	24.45±1.4	0.366
<i>Monounsaturated Fat (%)</i>	15.8±0.34	15.03±0.45	15.45±0.5	0.938
<i>Monounsaturated Fat (g)</i>	33.83±1.4	32.72±1.82	35.76±2.19	0.846
<i>Polyunsaturated Fat (%)</i>	9.02±0.2	9.01±0.27	9.04±0.32	0.805
<i>Polyunsaturated Fat (g)</i>	19.93±0.8	19.20±0.9	21.21±1.4	0.051
<i>Dietary Fiber, Total (g)</i>	18.66±0.7	17.97±0.9	19.86±1.21	0.992
<i>Sugar, Total (%)</i>	13.73±0.45	13.51±0.5	14.1±0.8	0.677
<i>Sugar, Total (g)</i>	68.39±2.94	66.1±3.65	72.3±4.9	0.562
<i>Sodium (mg)</i>	2412±85	2313±112	2585±125	0.529
<i>Potassium (mg)</i>	2395±83	2329±105	2511±135	0.677
<i>Vitamin A (RE)</i>	1049±69	1004±89	1127±108	0.618
<i>Beta-Carotene (µg)</i>	3860±248	3893±336	3803±355	0.229
<i>Alpha-Carotene (µg)</i>	459.8±60.56	486.55±90.5	413.3±53.18	0.209
<i>Vitamin C (mg)</i>	80.55±4.16	79±5.14	83.23±7.16	0.764
<i>Calcium (mg)</i>	798.7±26	786.3±33	820±42	0.732
<i>Iron (mg)</i>	12.6±0.5	11.8±0.55	13.95±0.9	0.185
<i>Vitamin D (µg)</i>	1.25±0.11	1.25±0.1	1.24±1.2	0.515
<i>Alpha-Tocopherol (mg)</i>	10.48±0.5	10.24±0.63	10.89±0.77	0.900
<i>Thiamin (mg)</i>	1.272±0.05	1.24±0.06	1.325±0.08	0.861
<i>Riboflavin (mg)</i>	1.755±0.1	1.72±0.14	1.80±0.15	0.327
<i>Niacin (mg)</i>	57.5±9	58.89±12.3	55.09±11.6	0.347
<i>Pyridoxine (Vitamin B6) (mg)</i>	1.52±0.06	1.47±0.07	1.62±0.1	0.175
<i>Folate (Total) (µg)</i>	316.57±12.7	302.76±15.43	340.6±21.8	0.484
<i>Folate (DFE)</i>	323.8±12.77	309.8±15.3	348.1±22.42	0.300
<i>Cobalamin (Vitamin B12) (µg)</i>	5.05±0.57	4.52±0.63	5.97±1.11	0.074
<i>Biotin (µg)</i>	14.68±6.46	14.42±0.9	15.13±1.1	0.634

<i>Phosphorus (mg)</i>	979.47±35.74	956±44.6	1020±60	0.606
<i>Magnesium (mg)</i>	282.4±9.76	271.1±11.55	301.96±17.33	0.271
<i>Zinc (mg)</i>	9.17±0.36	9.05±0.47	9.37±0.57	0.627
<i>Manganese (mg)</i>	3.97±0.39	3.58±0.4	4.65±0.82	0.541

Tables 6-7 illustrates the mean and t-test value of energy and nutrients intake estimated by FFQ according to depression severity. The mean caloric intake for the adults enrolled in the study sample measured by FFQ was found to be 1995.62±63 kcal.

On the other hand, the mean caloric intake of people with severe depression is higher (2081.6±108) than that of the mild depression participants. Also, subjects with mild depression consumed less sugar, less whole bran cereals and cereal based products while they significantly have more pasta and alcohol intake compared to others. While The differences in nutrients intake between the two groups were not statistically significant.

Table 8. Socio-demographic and lifestyle characteristics of the study population by mild Anxiety vs others (moderate, moderate severe and severe) (n=85).

Socio-demographic variables	Total (n=85)	Mild anxiety(n =59)	moderate, moderate severe and severe anxiety (n=26)	p-value
Age (years)				
23-34	4.0±0.55	21(35.6)	9(34.6)	X ² =0.190
35-44	4.6±1.0	18(30.5)	7(26.9)	P=0.909
45 and above	4.3±0.57	20(33.9)	10(38.5)	
Place of residence				
Beirut	4.8±0.73	23(39)	13(50)	X ² =0.897
Outside Beirut	3.8±0.44	36(61.0)	13(50)	P=0.344
Marital status^b				
Single	4.8±0.61	21(35.6)	10(38.5)	X ² =0.064
Married	3.98±0.5	38(64.4)	16(61.5)	P=0.800

Education level				
Up to intermediate level	3.6±0.60	18(30.5)	5(19.2)	X ² =3.855
High school	6.8±1.5	5(8.5)	6(23.1)	P=0.146
University/technical diploma	4.07±0.4	36(61)	15(57.7)	
	9			
Type of employment				
Academic	4.7±1.03	6(10.2)	5(19.2)	X ² =1.315
Non- Academic	4.24±0.4	53(89.8)	21(80.8)	P=0.251
	4			
Income per month (L.L.)^c				
Below 3,000,000	4.1±0.60	32(54.2)	11(42.3)	X ² =1.027
3,000,000 and above	4.4±0.54	27(45.8)	15(57.7)	P=0.311
Crowding Index				
<1	4.6±0.78	25(42.4)	13(50)	X ² =0.425
≥1	5.0±0.69	34(57.6)	13(50)	P=0.515
Smoking^d				
Non-smoker	4.2±0.57	25(42.4)	12(46.2)	X ² =0.105
Smoker	4.4±0.57	34(57.6)	14(53.8)	P=0.746
How long have you been a smoker (Years)	-	10.23±1.	13.3±2.5	P=0.416
		3		
Physical Activity				
Low	5.3±1.06	9(15.3)	8(30.8)	X ² =3.140
Moderate	4.3±0.48	41(69.5)	16(61.5)	P=0.208
High	2.7±0.81	9(15.3)	2(7.7)	
Body Mass Index (BMI) (kg/m²)				
Normal (18.5-24.9)	4.9±0.8	13(22.0)	10(38.5)	X ² =2.549
Overweight (25.0-29.9)	4.1±0.7	25(42.4)	8(30.8)	P=0.280
Obese (≥30)	4±0.58	21(35.6)	8(30.8)	

p-value was derived from chi-square for categorical variables and from independent t test for continuous variables. BMI: body mass index (kg/m²), ^bSingle including divorced and widowed, ^cL.L. Lebanese Lira, ^dNon smoker including never smoker and past smokers. The total column include the mean score of the GAD7.

Table 8. depicts the socio-demographic and lifestyle characteristics of the study population by mild Anxiety vs others. Although there were no statistically significant differences in the characteristics of the two groups, Participants who were more physically active (84.8%) and working in the academic field (19.2 %) had lower anxiety level.

Table 9. Percentage of energy intake of subjects according to anxiety.

<i>Food Groups</i>	<i>Total(n=85)</i>	<i>Mild anxiety(n=59)</i>	<i>moderate, moderate severe and severe anxiety (n=26)</i>	<i>P-Value</i>
<i>Refined-Cereals and cereals-based products</i>	10.1±0.69	10.8±0.89	8.63±0.97	0.108
<i>Whole Bran-Cereals and cereals-based products</i>	2.9±0.40	2.6±0.45	3.7±0.83	0.185
<i>Pasta and other cereals</i>	8.12±0.6	8.84±0.73	6.5±0.8	0.067
<i>Potatoes and potato-based products</i>	6.19±0.4	6.08±0.54	6.44±0.75	0.499
<i>Vegetables and vegetable-based dishes</i>	8.38±0.49	8.1±0.51	8.9±1.1	0.032
<i>Fruits and fresh fruit juice</i>	4.9±0.39	4.8±0.47	5.1±0.68	0.67
<i>Meat</i>	6.95±0.6	6.7±0.7	7.5±1	0.787
<i>Poultry</i>	4.45±0.4	4.17±0.5	5.07±0.8	0.211
<i>Eggs</i>	1.44±0.2	1.5±0.23	1.14±0.3	0.797
<i>Fish and seafood</i>	1.45±0.2	1.48±0.2	1.38±0.4	0.820
<i>pulses</i>	3.67±0.4	3.7±0.5	3.4±0.6	0.153
<i>Nuts and seeds</i>	2.54±0.3	1.91±0.3	3.97±0.77	0.001
<i>Milk and dairy products</i>	4.8±0.35	4.98±0.45	4.38±0.5	0.122
<i>Yogurt and yogurt-based products</i>	2.24±0.2	2.5±0.3	1.63±0.3	0.496
<i>Pizzas and pies</i>	10.29±0.8	10.77±1	9.2±1.5	0.750
<i>Vegetable based dishes</i>	4.23±0.4	4.23±0.4	4.24±0.7	0.687
<i>Fats and oils</i>	2.5±0.26	2.8±0.35	1.7±0.23	0.007
<i>Olive oil</i>	2.2±0.25	2.3±0.31	1.8±0.45	0.719
<i>Sugar and sugar derivatives</i>	3.54±0.4	3.10±0.34	4.52±0.9	0.370
<i>Cakes and pastries</i>	5.82±0.5	5.95±0.54	6.27±0.9	0.348
<i>Honey, jam, molasses, pudding, ice-cream and halaweh</i>	1.47±0.2	1.4±0.2	1.6±0.27	0.393

<i>Alcoholic beverages</i>	0.99±0.6	1.31±1	0.25±0.13	0.162
<i>Non-alcoholic beverages</i>	2.96±0.3	2.75±0.3	3.44±0.5	0.945
<i>Miscellaneous</i>	0.91±0.2	0.67±0.12	1.45±0.6	0.002

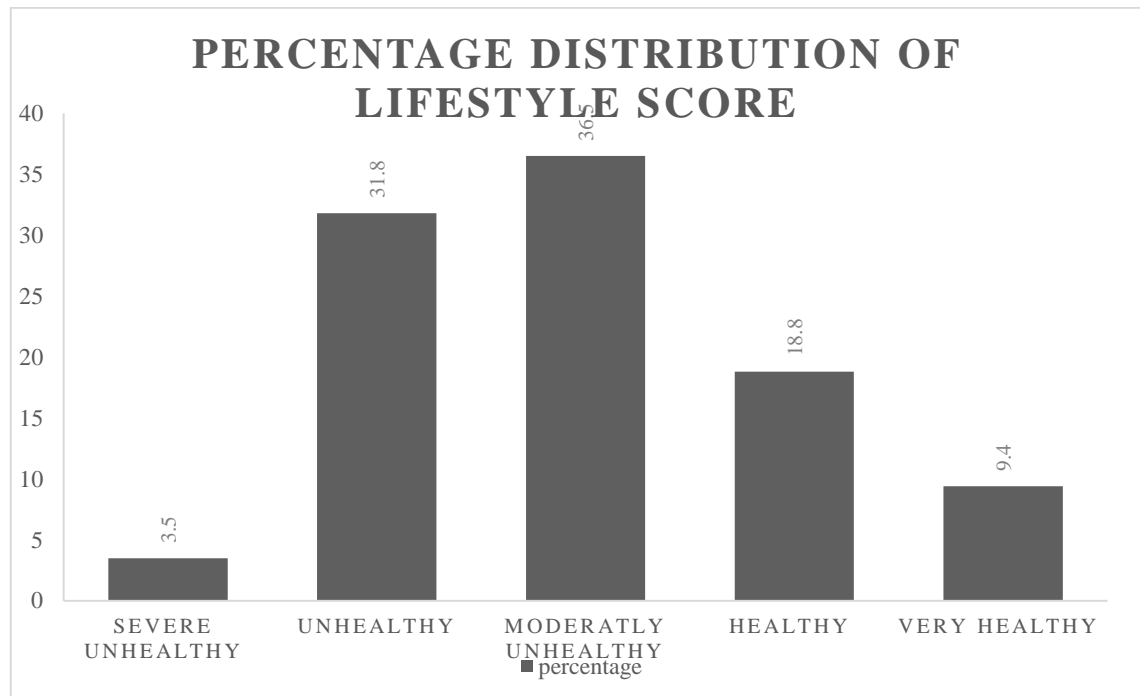
Table 10. Intake of Energy and Nutrients according to anxiety.

<i>Nutrient</i>	<i>Total(n=85)</i>	<i>Mild anxiety(n=59)</i>	<i>moderate, moderate severe and severe anxiety (n=26)</i>	<i>P-Value</i>
<i>Energy (Kcalories)</i>	1995.62±63	1970±73	2053±128	0.223
<i>Protein (%)</i>	14.94±0.3	15±0.35	14.83±0.5	0.523
<i>Proteins (g)</i>	73.7±2.5	72.75±2.73	75.93±5.6	0.418
<i>Carbohydrate (%)</i>	43.87±0.6	43.65±0.74	44.3±0.92	0.274
<i>Carbohydrate (g)</i>	219.6±7.9	215.2±8.84	229.4±17	0.275
<i>Fat, Total (%)</i>	40.54±0.5	40.54±0.6	40.57±0.9	0.472
<i>Fat, Total (g)</i>	89.7±3.03	88.8±3.64	91.9±5.5	0.420
<i>Cholesterol (%)</i>	0.1018±0.005	0.1029±0.006	0.0995±0.009	0.648
<i>Cholesterol (mg)</i>	223.8±13	221.03±14.2	230.33±27	0.460
<i>Saturated Fat (%)</i>	10.53±0.2	10.49±0.26	10.63±0.4	0.512
<i>Saturated Fat (g)</i>	23.25±0.82	22.94±1	23.94±1.5	0.498
<i>Monounsaturated Fat (%)</i>	15.18±0.34	15.09±0.40	15.40±0.7	0.451
<i>Monounsaturated Fat (g)</i>	33.83±1.4	33.33±1.72	34.96±2.47	0.793
<i>Polyunsaturated Fat (%)</i>	9.02±0.2	9.09±0.2	8.86±0.31	0.225
<i>Polyunsaturated Fat (g)</i>	19.93±0.8	19.84±0.9	20.15±1.4	0.678
<i>Dietary Fiber, Total (g)</i>	18.66±0.7	18.1±0.84	19.93±1.35	0.836
<i>Sugar, Total (%)</i>	13.73±0.45	13.09±0.5	15.1±0.8	0.953
<i>Sugar, Total (g)</i>	68.39±2.94	64.62±3.4	76.9±5.48	0.309
<i>Sodium (mg)</i>	2412±85	2395±106	2451±143	0.772
<i>Potassium (mg)</i>	2395±83	2339±98	2522±155	0.902

<i>Vitamin A (RE)</i>	1049±69	1003±82	1153±128	0.413
<i>Beta-Carotene (µg)</i>	3860±248	3879±300	3816±446	0.585
<i>Alpha-Carotene (µg)</i>	459.8±60.56	462±84	454±53	0.106
<i>Vitamin C (mg)</i>	80.55±4.16	79±5	84.8±7.6	0.369
<i>Calcium (mg)</i>	798.7±26	795±31.5	806±47	0.925
<i>Iron (mg)</i>	12.6±0.5	12±0.5	14.01±1	0.218
<i>Vitamin D (µg)</i>	1.25±0.11	1.31±0.13	1.11±0.2	0.864
<i>Alpha-Tocopherol (mg)</i>	10.48±0.5	10.63±0.64	10.13±0.67	0.308
<i>Thiamin (mg)</i>	1.272±0.05	1.26±0.06	1.29±0.1	0.399
<i>Riboflavin (mg)</i>	1.755±0.1	1.79±0.13	1.67±0.18	0.870
<i>Niacin (mg)</i>	57.5±9	64.4±11.75	41.78±11.22	0.024
<i>Pyridoxine (Vitamin B6) (mg)</i>	1.52±0.55	1.46±0.06	1.66±0.13	0.105
<i>Folate (Total) (µg)</i>	316.57±12.7	308±15.45	335±22	0.789
<i>Folate (DFE)</i>	323±12.7	314±15.5	344±22.4	0.970
<i>Cobalamin (Vitamin B12) (µg)</i>	5.05±0.6	4.42±0.6	6.47±1.3	0.012
<i>Biotin (µg)</i>	14.68±0.7	14.96±0.85	14.03±1.2	0.921
<i>Phosphorus (mg)</i>	979.4±35.7	974.9±41.8	989.7±69	0.890
<i>Magnesium (mg)</i>	282.4±9.76	275.3±11.06	298.3±19.7	0.381
<i>Zinc (mg)</i>	9.17±0.36	9.1±0.41	9.33±0.72	0.937
<i>Manganese (mg)</i>	3.97±0.4	3.79±0.5	4.38±0.65	0.938

Tables 9-10 shows the mean and t-test value of energy and nutrients intake estimated by FFQ according to anxiety severity. Closer inspection of the table shows that the mean caloric intake for the adults with severe anxiety in the study is higher (2053±128) than that of the mild anxiety participants. Also, subjects with severe anxiety consumes significantly more nuts and vegetables compared to others. While they have lower niacin intake and higher vitamin b 12 intakes.

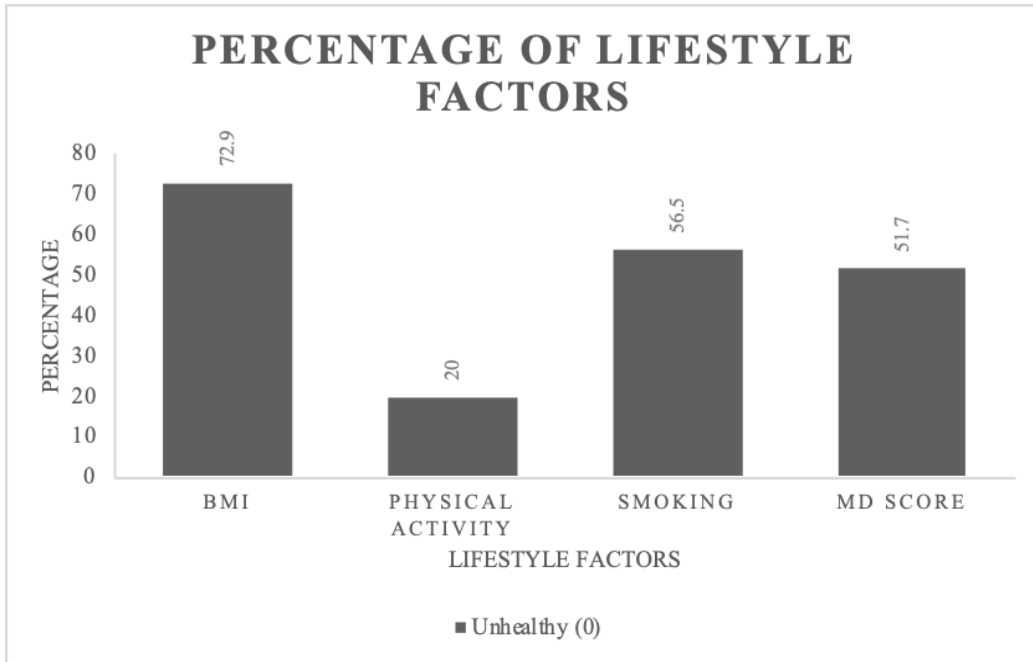
Graph 3. Percentage Distribution of lifestyle score.



Severe unhealthy lifestyle= score of 0
Unhealthy lifestyle= score of 1
Moderately unhealthy lifestyle= score of 2
Healthy lifestyle= score of 3
Very healthy lifestyle= score of 4

According to graph 3. The majority of the sample population have an unhealthy and a moderately unhealthy lifestyle (score of 1 to 2). Both extremes, severe unhealthy lifestyle and the very healthy lifestyle have the lowest percentages (3.5%; 9.4%). Interestingly, the majority of the participants had a moderately unhealthy lifestyle.

Graph 4. Prevalence of each components in the lifestyle score.



The highest contribution to the lifestyle score is the BMI (72.9%) this means that the majority of the population had a normal BMI. While the lowest contribution is for the physical activity (20%) which shows a low activity level among the participants.

Table 11. Association of lifestyle score with depression.

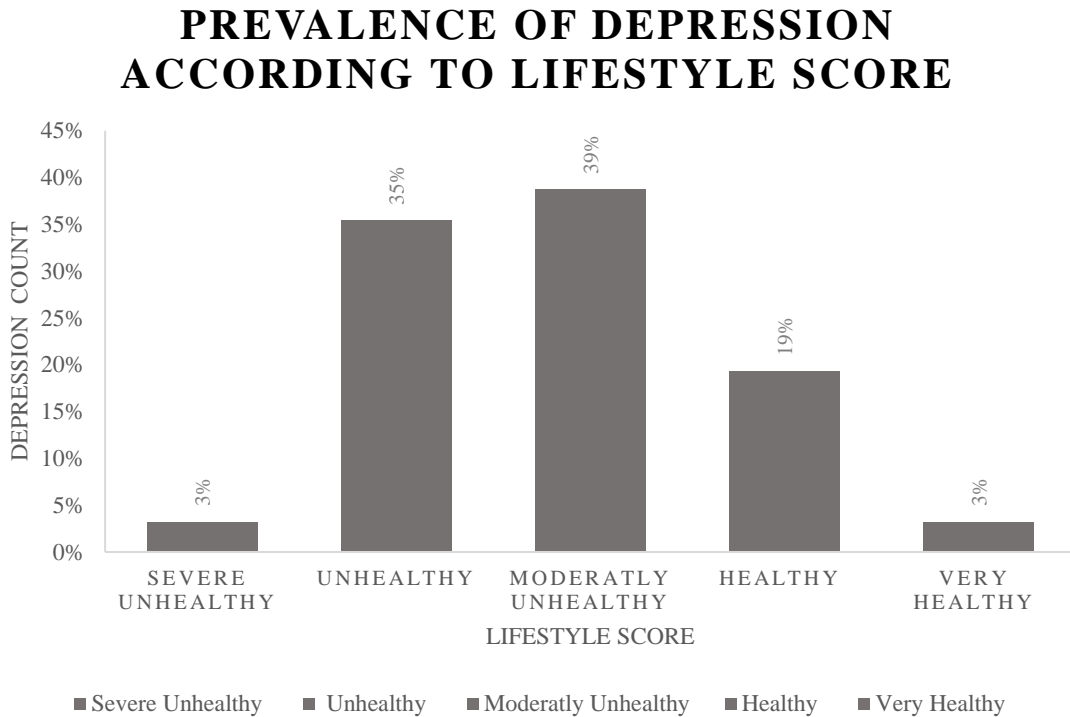
	<i>Total(n=85)</i>	<i>Mild depression (n=54)</i>	<i>Other(n=31)</i>	<i>P-Value</i>
<i>Lifestyle score</i>	<i>1.9±0.1</i>	<i>2.07±0.1</i>	<i>1.8±0.1</i>	<i>0.308</i>

Lifestyle score is made up of physical activity, Mediterranean score, BMI, and smoking

The association between the lifestyle score and depression severity is studied in the table 12. Subjects with mild depression had a higher lifestyle score (2.07±0.1), this shows that depression is related to a lower lifestyle score or an unhealthy lifestyle.

These results are not statistically significant (P-value = 0.308).

Graph 5. Prevalence of depression according to lifestyle score.



In the participants with depression, the distribution peaks in the moderately unhealthy lifestyle then the cases decrease to reach the lowest percentage (3%) in the very healthy lifestyle group. This bar chart shows that depression is inversely related to the lifestyle score. This is an important finding in the understanding of the relationship between lifestyle factors and depression.

Table 12. Association of lifestyle score with anxiety.

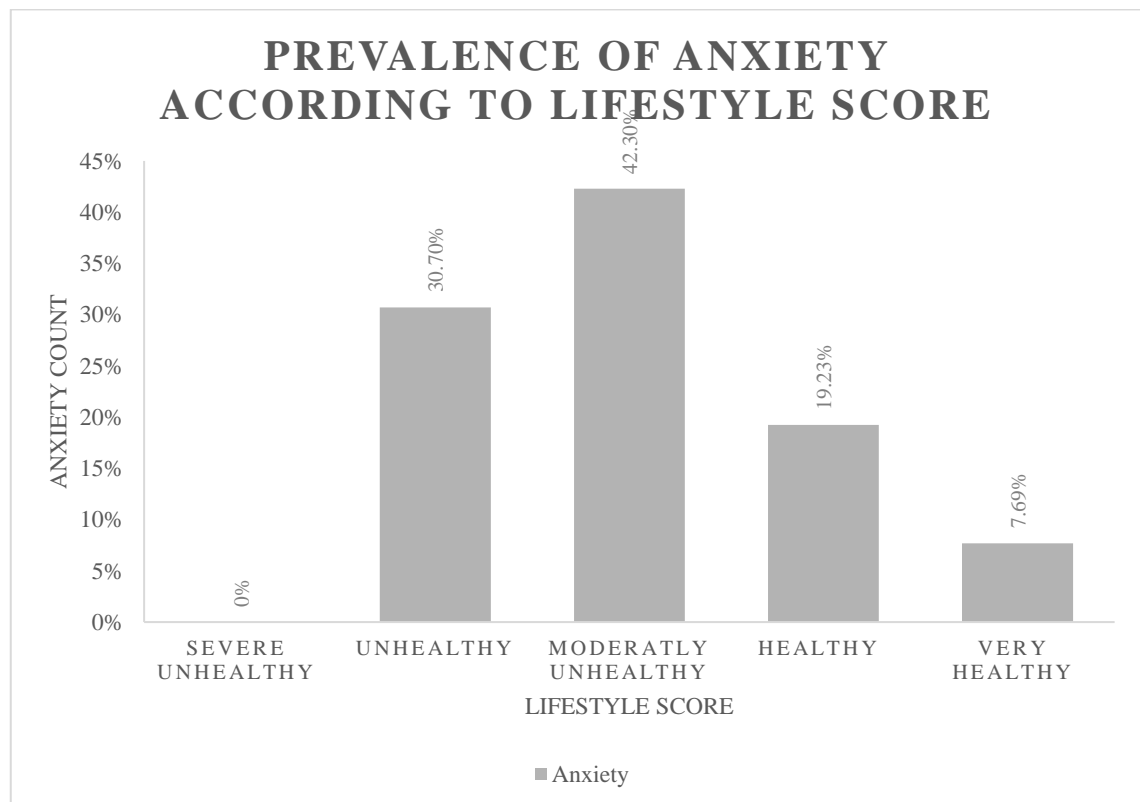
	<i>Total(n=85)</i>	<i>Mild anxiety(n=59)</i>	<i>Other(n=26)</i>	<i>P-Value</i>
<i>Lifestyle score</i>	<i>1.98±0.1</i>	<i>1.96±0.1</i>	<i>2.03±0.1</i>	<i>0.765</i>

Lifestyle score is made up of physical activity, Mediterranean score, BMI, and smoking

The lifestyle score is computed based on the physical activity Level (0 = no physical activity; 1= moderate to high physical activity), BMI (0= underweight,

overweight or obese; 1= normal BMI), Smoking (0= smoking; 1= Nonsmoker) and the Mediterranean diet score (MDP score) (olive oil, fibers, fruits, vegetables, fish, meat, refined cereals intake were distributed into 4 quartiles). Table 11. Describes the association between the lifestyle score and the anxiety level. Participants with severe anxiety had a healthier lifestyle (2.03 ± 0.1) compared to the ones with mild anxiety. These results are not statistically significant (P-value = 0.765).

Graph 6. Prevalence of anxiety according to lifestyle score.



In the participants with anxiety, the distribution peaks in the moderately unhealthy lifestyle (42%) then the cases decrease to reach the lowest percentage (8%) in the very healthy lifestyle group. The most interesting aspect of this graph is that it shows that anxiety decreases in the participants with a healthy lifestyle.

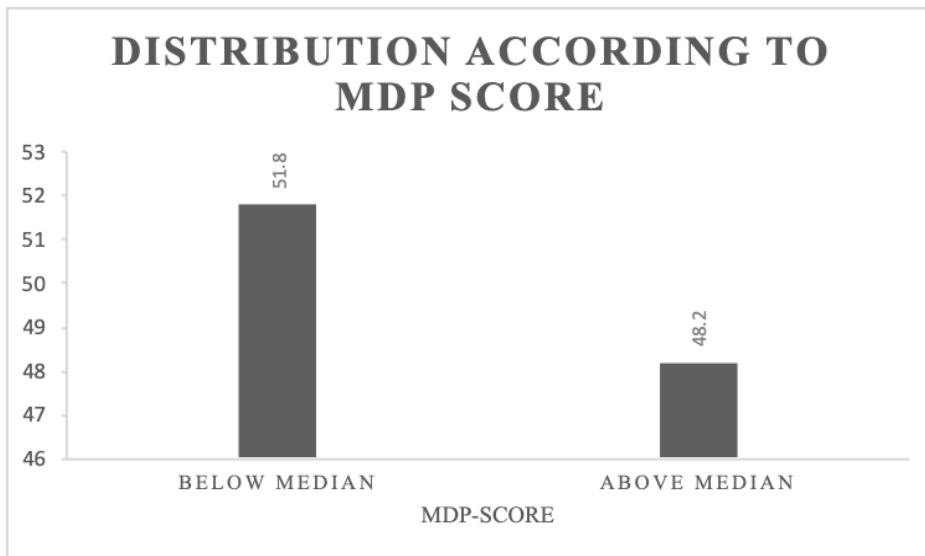
Table 13. Socio-demographic and lifestyle characteristics of the study population by Lifestyle Score.

Socio-demographic variables	Total (n=85)	p-value
Age (years)		
23-34	2.1±0.19	P=0.513
35-44	1.9±0.21	
45 and above	1.8±0.14	
Place of residence		
Beirut	1.9±0.18	P=0.880
Outside Beirut	1.9±0.13	
Marital status^b		
Single	2.3±0.17	P=0.004
Married	1.7±0.13	
Education level		
Up to intermediate level	1.5±0.15	P=0.028
High school	1.8±0.26	
University/technical diploma	2.1±0.15	
Type of employment		
Academic	2.8±0.22	P=0.002
Non- Academic	1.8±0.11	
Income per month (L.L.)^c		
Below 3,000,000	1.6±0.12	P=0.008
3,000,000 and above	2.2±0.16	
Crowding Index		
<1	1.0±0.17	P=0.411
≥1	0.9±0.13	
Smoking^d		
Non-smoker	1.3±0.09	P=0.00
Smoker	2.7±0.14	
Physical Activity		
Low	1.3±0.22	P=0.012
Moderate	2.0±0.12	
High		
Body Mass Index (BMI) (kg/m²)		
Normal (18.5-24.9)	2.86±0.19	P=0.00
Overweight (25.0-29.9)	1.66±0.13	
Obese (≥30)	1.5±0.15	

It is apparent from this table that being single and having a higher education level are statistically significantly related to a healthier lifestyle P=0.004 and P=0.028.

Interestingly There was a significant positive relationship with academic employment, having a salary higher than 2000 USD and having a higher score on the lifestyle score.

Graph 7. Percentage Distribution According to MDP Score.



Over half (51.8%) of the study sample fall below the median of the Mediterranean score. The Mediterranean score is based on the intake of olive oil, fibers, fruits, vegetables, fish, meat and refined cereals.

The results in this chapter indicate that there is an association between the demographics and lifestyle score with depression and anxiety. The next chapter, therefore, moves on to discuss this relationship in light of previous studies.

CHAPTER V

DISCUSSION

A. Major findings of the study.

To our knowledge, the present study is a pioneer in examining the association of mental health with lifestyle factors and nutrition in the Lebanese context. The results of this study shed the light on the prevalence of mental health and its correlation with lifestyle factors and aid in the understanding of the diet-disease link. The lifestyle factors such as smoking, BMI, Physical activity and Mediterranean dietary patterns of the sample population were assessed using FFQ, socio-demographic questionnaire, lifestyle questionnaire and anthropometric assessment, while the severity of depression and anxiety was evaluated through the administration of the PHQ9 and GAD7 to the same subjects. Among the major findings of the study was the high prevalence of anxiety and depression across the sample. Few statistics are done locally to study the impact of mental health, and it's occurrence in Lebanon. This topic should be a major concern because there is an alarming increase in mental illnesses in Lebanon while there is no serious efforts to target it. Also, the high prevalence of mental illness is accompanied by a change in the Lebanese dietary patterns. This suggests an association between the individuals mental health and their lifestyle factors.

B. Major findings on mental health.

The prevalence of depression and anxiety among working Lebanese adults was nearly 36.5% and 30.7 % respectively in our study sample. These results are consistent with previous studies that shows that one-fourth of the Lebanese adult population met

criteria for any of the DSM-IV disorders, and one-third were estimated to do so by age 75 y (Karam *et al.*2008). Two decades of civil war in Lebanon in the last century affected the mental health of the majority of Lebanese people. Since the end of the war in 1991, sporadic bouts of violence, particularly bombings in civilian areas and political and economic instability have continued to instill a sense of fear, anxiety and insecurity. (Chahine & Chemali2009). Lebanon was found to have the 4th highest prevalence of any mental disorder among 15 countries surveyed in 2002–03. (Demyttenaere *et al.*2004)

These results shed the light on the importance of mental health awareness and the lack of beneficial treatments in Lebanon. The healthcare system in Lebanon is one of the few in the Middle East region that still does not have a mental health policy. Mental health services are typically limited to urban centers, under-funded, and at times fail to meet treatment demands. (Karam *et al.*2008) These percentages (depression 36.5% and anxiety 30.7 %) of the prevalence of mental health were taken before the deterioration of the situation in Lebanon. There has been long-standing political unrest and a severe socioeconomic collapse in the country since October 2019. The country's deterioration has been aggravated by the COVID-19 outbreak and its subsequent local and international mental health repercussions (Tandon2020) . It then reached its worst peak following Beirut's blast; the devastating explosion resulted in at least 180 deaths, 6000 injuries, and an estimated 300,000 homeless people (IRC2020) These crisis will definitely result in an elevated rate of mental illnesses in the country.

In this study, there was no differences in the socio-demographic characteristics and lifestyle factors between the categories of depression, anxiety and no mental illness. These findings are not in line with previous research, whereby the majority of studies

found significant impact of lifestyle on mental health. For instance, according to Velten et al. all lifestyle factors that were considered in the study were found to be associated with the mental health outcomes. Better mental health was linked to higher frequency of physical and mental activity, moderate alcohol consumption (i.e. not increased or no alcohol consumption) , non-smoking, a body mass index within the range of normal to overweight (i.e. not underweight or obese) and a regular life rhythm. The healthier lifestyle choices an individual makes, the higher life satisfaction and lower psychological distress he or she tends to have (Velten *et al.*2014). Although there is a difference in the lifestyle factors such as the percentage of physical activity is lower in people with anxiety compared to those without anxiety but this difference did not reach statistical significance. Similarly, percentage of having a BMI higher than 30 (obese) is greater in people with depression compared to their counterpart. This may be justified by the fact that the gravity of the situation in Lebanon including the civil war (1975), Israel invades (1982), Prime minister assassination (2005), Israel attacks (2006), government collapses, border tensions, refugee crisis (2013), economic crisis, garbage crisis, forest fires and the revolution (17th of October 2019) has affected all populations groups and no one was spared (*Lebanon profile - timeline.*2018). The magnitude of stress and mental pressure has masked any effect that diet or lifestyle may have.

According to the CDC, Experiencing traumatic or stressful events, such as physical or sexual abuse, the death of a loved one, or financial problems is a well-known causes of mental illness (*Mental health conditions: Depression and anxiety.*2020). Lebanese adults were raised in an era where civil war was at its peak also from this period till now Lebanon is facing many economic hardships and instability in terms of social security

and other life aspects. So these life situations have a tremendous effect on all Lebanese adults mental health that's why the role of lifestyle factors may be minute.

This study suggested, though not significant, an association between depression and anxiety with higher energy (Kcalories) intake level. It supports evidence from previous observations that Energy intake was higher in men who reported anxiety or depressed mood (Hakkarainen *et al.*2004). Furthermore, there is some evidence to suggest that elevated stress levels are associated with a greater desire for hedonic, highly palatable foods that are energy dense. This may contribute to excess energy intakes and weight gain. Chronic stress elicits a more passive response driven by the HPA axis (hypothalamic-pituitary-adrenal axis), with increases in cortisol that may entice people to consume hedonic, energy-dense foods and potentially lead to unwanted weight gain and obesity (Torres & Nowson2007). The high-energy intake in subjects with depression and anxiety may be driven by the elevated hormonal level associated with stress.

Moreover, subjects with mild depression significantly consumed less Whole Bran-Cereals and cereals-based products ($p= 0.015$), as compared to subjects with depression behavior. Comparison of the findings with those of other studies confirms that subjects reporting depressed mood consumed more carbohydrates than subjects with no symptoms (Hakkarainen *et al.*2004). This finding is consistent with the attempt by subjects with depression to alleviate the carbohydrate craving associated with symptoms of depression. (Hakkarainen *et al.*2004). While these results contradicts the findings of Gibson-Smith et al. that higher non-refined grain consumption was significantly related to lower depression and anxiety arousal severity and lower odds of

having a current clinically diagnosed disorder compared to controls (Gibson-Smith *et al.*2019). The possibility that a carbohydrate-rich low-protein meal could raise serotonin level gave rise to the proposal that some people with depression may self-medicate by eating high proportions of carbohydrate (Wurtman & Wurtman2017).

Additionally, two other findings of this study merit comment. First, subjects with moderate depression consumed significantly less pasta and other cereals than the subjects with mild depression. Second, the same participants drank less nonalcoholic beverages. These results are consistent with the assumption that consumption of diets low in carbohydrate tends to precipitate depression, since the production of brain chemicals serotonin and tryptophan that promote the feeling of well-being, is triggered by carbohydrate rich foods. (Rao *et al.*2008)

Furthermore, these results support the idea that coffee or tea may decrease the risk of depression. (Kang *et al.*2018)This may explain why nonalcoholic beverages intake was common to the participants with mild depression compared to the participants with moderate depression.

As discussed, carbohydrate intake and depression are a controversial topic since people with depression consumed more carbohydrates while low carbohydrate diet may be related to depression. These relationships may partly be explained by the fact that Sugar intake could increase depression risk over its potential influence on Brain-derived neurotrophic factor (**BDNF**) levels and inflammation which are both discussed as potential biological explanations for depression. (Knüppel *et al.*2017). BDNF, one of the major neurotrophic factors, plays an important role in the maintenance and survival of neurons and in synaptic plasticity. Several lines of evidence suggest that BDNF is

involved in depression, such that the expression of BDNF is decreased in patients with depression. (Dwivedi2009)

Other mechanism may be inflammation, compared to individuals with no depression symptoms, those with major depressive disorder (MDD) demonstrate increased concentrations of several peripheral and cerebrospinal fluids inflammatory markers including IL-1, C-reactive protein (CRP), and monocyte chemoattractant protein-1. (Liu *et al.*2016). Furthermore, postprandial hypoglycemia and addiction-like effects of sugar influencing neurotransmitters could link sugar intake with low mood. (Knüppel *et al.*2017)

In contrary, carbohydrates significantly increased plasma tryptophan and positively influenced performance and mood under stress. (Markus2007) .This inconsistency may be due to certain types of foods and their particular components such as saturated fat content may have affected our findings.

Despite the fact that Gibson-Smith et al. found a clear association between depression and anxiety severity and diet quality we found that participants with anxiety had significantly higher vegetables and vegetable-based dishes, nuts and seeds and lower fats and oils intake.

Remarkable result to emerge from the data is that subjects with anxiety had a significantly lower intake of niacin ($p=0.024$). This substantiates previous findings in the literature that niacin/tryptophan deficit symptoms include several nervous system pathologies (Gasperi *et al.*2019). The role of niacin as an antioxidant micro-nutrient has been established in a variety of research. The mechanisms through which niacin protects the body against oxidative stress can be retaining the glutathione redox cycle, and also, decreasing NADPH/total NADP⁺ ratio as well as increasing the NAD⁺

content while oxidative stress is one of the mechanisms causing mental disorders (Ilkhani *et al.*2016). Regardless of the lack of studies of niacinamide and anxiety correlation, case reports suggested that Large pharmacological doses of niacinamide were effective in relieving the symptoms of anxiety in these patients. Even though niacinamide's mechanisms of action have not been substantiated from controlled clinical trials, this agent does appear to have a wide spectrum of beneficial effects upon anxiety disorders. (Prousky2005). It is warranted that properly designed randomized controlled trials are developed in order to identify niacin therapeutic effect on anxiety and adverse effects profile.

We found that participants in the moderate anxiety group had a significantly higher intake of vitamin b 12 compared to the mild anxiety group. While this contradicts the literature, the finding of Beezhold *et al.* revealed that the mood of individuals eating a plant-based diet, without intake of animal-derived nutrient forms known to be essential for mental health, does not appear to be adversely affected, and may be better than the mood experienced by similar individuals eating an animal-based diet. (Beezhold *et al.*2015) . It's generally known that Vitamin B12 (cobalamin) is an essential water-soluble micronutrient of microbial origin. It is naturally found in animal food products, including meat, poultry, (shell) fish, eggs, milk, and other dairy products. Vitamin B12 is generally not present in plant foods. (Obeid *et al.*2019)

These results may show that an individual mood is independent of his vitamin b 12 intake which contrasts previous studies.

C. Findings on the Lifestyle factors.

Regarding the Lifestyle factors, we studied the association between the mental health specifically anxiety and depression and lifestyle score. We computed the lifestyle factors as a score, including physical activity, BMI, smoking and the Mediterranean diet. There was no statistically significant difference between the different means. We can conclude that there is no association between the lifestyle scores and mental health. Even though these results differ from some published, a 2-year follow up study investigating lifestyle indicators including physical exercise, sleep duration, alcohol use, body mass index, smoking status, and a composite lifestyle index are associated with the depression course in older adults found that BMI, physical activity and smoking did not predict the course of depression in older adults. (Bruin *et al.*2018)

Concerning the percentage distribution of the lifestyle factors, the majority of the sample population falls between moderately unhealthy lifestyle and healthy lifestyle. Therefore, it may indicate that the Lebanese working adults have an unhealthy lifestyle. It is worth mentioning that the prevalence of depression and anxiety decreases whenever the lifestyle score increase. This means that healthier lifestyle may affect the mood. This is in line with the following study that showed that a number of lifestyle factors have been recognized to play an important role in positively modifying medical and psychiatric diseases and their associated morbidity and mortality. These include, eating healthy food, greater physical activity, cessation of smoking, avoidance of alcohol and illicit substances. (Zaman *et al.*2019)

It is important to note that when compared to the lifestyle scores, single individuals had a significantly higher score which suggests that they have a healthier

lifestyle. Although this may seem obvious, it contradicts literature. Being married is associated with improved all-cause mortality. Across multiple European and Asian countries, and in the United States, mortality risk appears to be 1.2–2.5-fold higher for widowed, divorced, or never-married individuals compared to those who are married. (Robards *et al.*2012). While As proposed by Berge et al. married men were more likely to be overweight/obese compared to single/casually dating and committed dating/engaged young adult males (Berge *et al.*2014).These contradictory results may be due to the dynamic of the relationship and life events these couples are going through.

Our study provides further evidence for the importance of education, employment and income on individuals health. There was a significant positive correlation between having a university/technical diploma, academic employment and salary above 2000 USD with a higher lifestyle score p-value respectively $P=0.028$, $P=0.002$, $P=0.008$.

One of the explanations may be that Education leads to better, more stable jobs that pay higher income and allow families to accumulate wealth that can be used to improve health. Also, adults with less education are more likely to smoke, have an unhealthy diet, and lack exercise. (Zajacova & Lawrence2018). Additionally, individuals with the higher incomes that accompany education have more resources to purchase healthy foods, afford the time and expenses associated with regular physical activity, have easy transportation to health care facilities or work locations, and afford health care expenses. (Kaplan *et al.*2015)

Over half of the study sample fall below the median of the Mediterranean score. These results offer compelling vital evidence for the westernization of the diet in the Mediterranean region. The low adherence to the Mediterranean diet found in this study is in accordance with the nutrition transition that many countries around the globe are witnessing, especially Mediterranean countries. In these countries, traditional rich diets in fruits and vegetables are gradually eroding and being replaced by more Western-type diets that are energy-dense and rich in simple sugars and saturated fats. (Bonaccio *et al.*2017). This supports the finding of Naja et al. Using the LMD scores, adherence to the MD decreased significantly between 1997 and 2015 MD among adolescents (10–19 years old) in Lebanon as well as for each sex. (Naja *et al.*2020). While the Mediterranean dietary patterns significantly improve markers of inflammation (Schwingshackl & Hoffmann, 2014) and the adherence to a Mediterranean Dietary Pattern ensures an adequate intake of fruits, nuts, vegetables, cereals, legumes or fish, essential sources of nutrients linked to depression prevention.(Sánchez-Villegas, Henríquez, Bes-Rastrollo, & Doreste, 2006) It's important to note that the low adherence to the Mediterranean diet in the Lebanese diet pattern is in concordance with the increased prevalence of depression among our sample.

D. Strengths, limitations and potential biases of the Study.

1. Strengths of the Study

Several strengths of this study need to be noted. First, the PHQ9 tests used was validated in the Lebanese adults and all tests were translated to Arabic. Moreover, data collection was performed by a well-trained interviewer who maintained a neutral and nonjudgmental attitude during data collection. Furthermore, a lifestyle and a

Mediterranean diet pattern scores were created to have a holistic outlook at the lifestyle exposure and not limit the research to single environmental factors.

2. Limitations of the Study

It is plausible that a number of limitations might have influenced the results obtained. The main limitation to the study is the small sample size (N = 85). There is a high likelihood that the sample does not adequately represent the general Lebanese adult population. Although this is a limitation but we have found a high prevalence of depression and anxiety. This may reveal the widespread of mental illnesses in the Lebanese adults. Furthermore, the turbulent times that the country has experienced while we were undergoing data collection may have affected the results. Another limitation is the self-reported questionnaires. This may have influenced the answers specially when talking about a sensitive topic such as depression and anxiety. It is important to note that the lifestyle and nutritional data used in this study dated back to 2017. As imagined the lifestyle and eating patterns does not differ tremendously within 2 years. This is proven by the fact that the research that studies changes in eating patterns are cohort study that follows a sample for a long period. Also, participants were asked if they had a drastic lifestyle change in order to be excluded from the study. Finally, due to the design of the study, a cross-sectional study, we can't deduce a causal relationship between mental health and lifestyle factors.

3. Potential Biases in the Study and Ways Adopted to Minimize them

Considering the above limitations, some potential biases might be present which might affect the internal validity of the study. At the data collection level, the main

biases that might be present are recall, memory, social desirability, and study effect biases. The main recall biases that this study might entail are that subjects with depression and anxiety tend to underestimate their symptoms. These potential recall biases were minimized by training the interviewers not to drill on answers and avoid asking leading questions. As for memory bias, it might be present in retrospective assessment tools like GAD 7, PHQ 9, History questionnaire and cross-sectional which were used in this study. This bias was minimized by giving the interviewees sufficient time for adequate recall. Also, the recalling period was short (2 weeks ago). In addition, the interviewer was thoroughly trained not to give any judgmental attitude throughout the interview which helped minimize social desirability bias of potentially giving answers that are perceived as desirable. Self-selection bias may be present because people who suffer from mental illnesses may refuse to participate. Although this may have affected our result, we found a high prevalence of depression and anxiety. Mental health may be a disabling disease so there's a healthy worker effect. At the data entry level, data entry errors were minimized by extensively training the interviewers on data entry programs used.

CHAPTER VI

CONCLUSION AND RECOMMENDATIONS

To our knowledge, this study is the first to evaluate the prevalence of mental health such as anxiety and depression, the prevalence of a healthy lifestyle, the Mediterranean diet, and their association among Lebanese adults. Two scores were created including the lifestyle score, which covers BMI, smoking status, and physical activity, and the MDP score. The study's findings demonstrated that anxiety and depression are widespread among Lebanese adults (36.5% and 30.7% respectively). This accompanies the change of their dietary pattern as the majority of the sample participants fall below the median for the Mediterranean dietary pattern score. This proves the low adherence to the Mediterranean diet. Also, the majority of the Lebanese working adults had a moderately severe unhealthy to a moderately healthy lifestyle . Although, they have a moderate to high physical activity level, more than half are smokers and more than half were either overweight or obese. Interestingly, education level, higher income and academic employment were significantly associated with a healthier lifestyle. This sheds light on the importance of education in a way to reduce obesity and level of other metabolic diseases. Furthermore, lower niacin intake is present in subjects with anxiety and low nonalcoholic beverages intake is associated with depression. No clear statistical significant association was found between lifestyle factors and mental health such as depression and anxiety. The high prevalence of mental health shows the need to maximize the treatment.



As for future studies, a bigger sample and a less turbulent time and life situation would lead to a clearer association between mental health and nutrition. In addition,

further studies should assess the importance of the Mediterranean diet and its association with mood disorders. This study's data was collected before the COVID-19 pandemic and we still found high scores of anxiety and depression symptoms in the Lebanese adults. In the future, it's essential to study the prevalence of these mental health issues after the pandemic. This study contributed in joining both fields of psychology and nutrition as it has been proven in the literature that they are interlinked.

APPENDICES

APPENDIX I

PARTICIPANT CONSENT FORM (ENGLISH VERSION)

  <p>American University of Beirut Faculty of Agricultural and Food Sciences <i>American University of Beirut</i></p>
<p>RESEARCH CONSENT FORM, PROTOCOL #30 JUL 2019</p> <p>RECEIVED</p>
<p>1. Title of Research</p> <p>The impact of Nutrition and Lifestyle factor on depression and anxiety</p>
<p>2. Principal Investigator</p> <p>Dr. Farah Naja, American University of Beirut</p>
<p>3. What is the purpose of this study?</p> <p>The purpose of this study is to investigating the impact of lifestyle factors such as diet, physical activity on mental health especially anxiety and depression. Our goal is to compare the lifestyle and dietary intake data that was collect via the validation of food frequency study that you previously participated in, with your mental health, in order to study the impact of lifestyle habits on mental health. Subjects who have agreed to be contacted for future studies and want to participate in this study will sit in a private setting with a research assistant and complete 2 tests and 1 history questionnaire (history of antidepressant medication usage or history of being diagnosed having any mental health before) related to mental health (PHQ 9 composed of 9 questions and GAD7 composed of 7 questions). The target samples size is 110 participants.</p>
<p>4. How will we recruit subjects like you?</p> <p>All subjects who participated in "The validation of food frequency questionnaire among Lebanese adult" study and have agreed to be contacted for future studies will be asked if they want to take part in this study.</p>
<p>5. What will I do if I choose to be in this study?</p> <p>You will be asked to complete 2 tests and 1 history questionnaire with a research assistant related to your mental health.</p>
<p>6. How long will I be in the study?</p> <p>You will sit with a research assistant one time only and complete the 2 tests and 1 history questionnaire that is estimated to take around 1 hr</p>
<p>7. What are the possible risks or discomforts?</p> <p>The questionnaire is sensitive and might upset, cause disturbance or emotional distress to participants as it investigates their mental health well-being.</p> <p><i>Institutional Review Board American University of Beirut</i></p>
<p>30 JUL 2019</p> <p>APPROVED</p> <p>Page 1 of 3</p>



RESEARCH CONSENT FORM, PROTOCOL #:

8. Are there any potential benefits?
There are no personal direct benefits for you if you choose to participate. However, your participation may help the research team at AUB to study the link between lifestyle habits and mental health. This might help in developing new recommendations for mental health. The filled survey will be reviewed by the research team and participants who screen positive for suicidal ideation will be immediately referred to a mental health service, or the counselling service in the infirmary in addition to providing them with the pamphlet that includes resources.
9. Are there costs to me for participation?
You will receive a monetary compensation (10 USD) in cash on the day of the interview as a compensation for your waiting time.
10. Who can I contact if I have questions about the study?
If you have questions or concerns, or if you think the research has hurt you in any way, you can contact: Dr. Farah Naja Tel: 009611350000, ext: 4504 Email: fn14@aub.edu.lb If you have questions about your rights as a volunteer, or you want to talk to someone outside the research team, please contact: Biomedical Sciences Institutional Review Board American University of Beirut, Lebanon Tel: 00961 1 374374, ext: 5445 Email: irb@aub.edu.lb
11. Will information about me and my participation be kept confidential?
Data collection will be conducted in a manner that preserves the confidentiality of all subjects and ensures that no breach of participants' privacy occurs. All the data will be collected, managed and stored by team members only. A random coded study ID will be assigned to each participant at the time of enrollment. This study ID will be used to identify all data collected. The study ID key will be contained in a password protected file on password protected computers accessible only to the investigators of the study, as well as the selected research team members involved in data entering, cleaning and coding. All hard copies will be stored in locked cabinets with access only to the investigators. The project's research records may be reviewed by the research team at Nutrition and Food Science department at AUB and records will be monitored and may be audited by the IRB while ensuring confidentiality. Any published reference to the data obtained in this study will not make reference to any of your personal data in identifiable form.

*Institutional Review Board
American University of Beirut*

30 JUL 2019

Page 2 of 3

APPROVED



RESEARCH CONSENT FORM, PROTOCOL #:

12. What are my rights if I take part in this study?	
Your participation in this study is voluntary. You may choose not to participate or, if you agree to participate, you can withdraw your participation at any time without penalty or loss of benefits to which you are otherwise entitled.	
Documentation of Informed Consent	
<i>I have had the opportunity to read this consent form and have the research study explained. I have had the opportunity to ask questions about the research study, and my questions have been answered. I am prepared to participate in the research study described above. I will be offered a copy of this consent form after I sign it.</i>	
Participant's Signature	Date Time
Participant's Name	
Researcher's Signature	Date Time
Researcher's Name	<i>Institutional Review Board American University of Beirut</i>
30 JUL 2019	

APPROVED

APPENDIX II

PARTICIPANT CONSENT FORM (ARABIC VERSION)



American University of Beirut
Faculty of Agricultural and Food Sciences

RESEARCH CONSENT FORM, PROTOCOL #:
American University of Beirut

30 JUL 2019	1. عنوان البحث
RECEIVED	تأثير التغذية ونمط الحياة عامل على الاكتئاب والتقلبات المزاجية
	2. الباحث الرئيسي
	3. فرح نجاء، الجامعة الأمريكية في بيروت
	3. ما هو الغرض من هذه الدراسة؟
	والغرض من هذه الدراسة هو التحقيق في تأثير عوامل نمط الحياة مثل النظام الغذائي، والنشاط البدني على الصحة العقلية وخاصة القلق والاكتئاب. هدفنا هو مقارنة نمط الحياة والمدخول الغذائي التي تم جمعها من خلال التحقق من صحة دراسة تواتر الطعام التي سبق أن شاركت فيها، مع صحتك العقلية، من أجل دراسة تأثير عادات نمط الحياة على الصحة العقلية. الأشخاص الذين وافقوا على الاتصال بهم لإجراء دراسات مستقبلية ويرغبون في المشاركة في هذه الدراسة سوف يجلسون في غرفة خاصة مع مساعد باحث وإكمال اختبارات واستبيان حول تاريخ صحتك النفسية (تاريخ استخدام الأدوية المضادة للاكتئاب أو تاريخ تشخيص إصابته بأي صحة عقلية من قبل) الصحة النفسية (PHQ 9) يتكون من 9 أسئلة و GAD7 تتألف من 7 أسئلة) المشارك المستهدف هو 110 مشارك.
	4. كيف سنقوم باختيار أشخاص مثلك؟
	جميع الأفراد التي شاركت في دراسة "التحقق من صحة استبيان تواتر الطعام بين اللبنانيين البالغين" والتي وافقت على الاتصال بهم في الدراسات المستقبلية سوف تُسأل عما إذا كانوا يرغبون في المشاركة في هذه الدراسة.
	5. ماذا أفعل إذا اخترت أن أكون في هذه الدراسة؟
	سيُطلب منك إكمال اختبارات واستبيان حول تاريخ صحتك النفسية مع مساعد باحث يتعلق بصحتك العقلية.
	6. كم من الوقت سوف أكون في الدراسة؟
	سوف تجلس مع مساعد باحث مرة واحدة فقط وتكمل الاختبارات واستبيان التاريخ الذي يقدر بحوالي ساعة واحدة.
	7. ما هي المخاطر المحتملة أو المضايقات؟
	الاستبيان حساس وقد يزعجه ويسبب اضطرابات أو اضطرابات عاطفية للمشاركين لأنه يحقق في صحتهم العقلية.
	8. هل هناك أي فوائد محتملة؟

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Faculty of Agricultural and Food Sciences

RESEARCH CONSENT FORM, PROTOCOL #:

لا توجد فوائد شخصية مباشرة لك إذا اخترت المشاركة. ومع ذلك، قد تساعد مشاركتك فريق البحث في الجامعة الأميركية في بيروت في دراسة الصلة بين عادات نمط الحياة والصحة العقلية. هذا قد يساعد في تطوير توصيات جديدة للصحة العقلية. سيقوم فريق البحث بمراجعة الاستبيان المملوء، وسيتم إحالة المشاركين فورًا الذين يتم الكشف عن تفكيرهم في الانتحار إلى خدمة الصحة العقلية، أو إلى خدمة الاستشارة في المستوصف بالإضافة إلى تزويدهم بالكتيب الذي يتضمن الموارد.

9. هل هناك تكاليف بالنسبة لي للمشاركة؟

سوف تتلقى تعويضًا نقديًا (10 دولارًا أمريكيًا) عن وقت الانتظار والنقل.

10. من الذي يمكنني الاتصال به إذا كانت لدي أسئلة حول الدراسة؟

إذا كانت لديك أسئلة أو مخاوف، أو إذا كنت تعتقد أن البحث قد أضر بك بأي طريقة، فيمكنك الاتصال بـ:
د. فرح نجا
هاتف: 4504، تحويلة: 009611350000
البريد الإلكتروني: fn14@aub.edu.lb
إذا كانت لديك أسئلة حول حقوقك كمتطوع، أو كنت ترغب في التحدث إلى شخص ما خارج فريق البحث، فيرجى الاتصال بـ:

مجلس المراجعة المؤسسية للعلوم الطبية الحيوية
الجامعة الأميركية في بيروت، لبنان
ext: 5445، Tel: 00961 1 374374
البريد الإلكتروني: irb@aub.edu.lb

11. هل ستبقى المعلومات الخاصة بي ومشاركتي سرية؟

سيتم إجراء جمع البيانات بطريقة تحافظ على سرية جميع الموضوعات وتضمن عدم حدوث أي انتهاك لخصوصية المشاركين. سيتم جمع جميع البيانات وإدارتها وتخزينها من قبل أعضاء الفريق فقط. سيتم تعيين معرف دراسة مشفرة عشوائيًا لكل مشارك في وقت التسجيل. سيتم استخدام معرف الدراسة هذا لتحديد جميع البيانات التي تم جمعها. سيتم تضمين مفتاح معرف الدراسة في ملف محمي بكلمة مرور على أجهزة كمبيوتر محمية بكلمة مرور لا يمكن الوصول إليه إلا للمحققين في الدراسة، وكذلك لأعضاء فريق البحث المختارين المشاركين في إدخال البيانات وتنظيفها وترميزها. سيتم تخزين جميع النسخ المطبوعة في خزائن مغلقة مع إمكانية الوصول إلى المحققين فقط. يمكن مراجعة سجلات بحث المشروع من قبل فريق البحث في قسم علوم التغذية والأغذية في الجامعة الأميركية في بيروت. سيتم مراقبة السجلات وقد يتم تدقيقها من قبل مجلس IRB مع ضمان السرية. أي إشارة منشورة إلى البيانات التي تم الحصول عليها في هذه الدراسة لن تشير إلى أي من بياناتك الشخصية في شكل محدد.

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12. ما هي حقوقك إذا شاركت في هذه الدراسة؟

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RESEARCH CONSENT FORM, PROTOCOL #:

<p>مشاركتك في هذا البحث مخير. يمكنك اختيار عدم المشاركة، أو في حالة موافقتك على المشاركة، يمكنك سحب مشاركتك في أي وقت دون غرامة أو فقدان المزايا التي يحق لك الحصول عليها.</p>	
توثيق الموافقة المستنيرة	
<p>لقد أتيت لي الفرصة لقراءة نموذج الموافقة وتوضيح الدراسة البحثية. لقد أتيت لي الفرصة لطرح أسئلة حول الدراسة البحثية، وتم الإجابة على أسئلتني. أنا مستعد للمشاركة في الدراسة البحثية المذكورة أعلاه. سيتم تقديم نسخة من استمارة الموافقة هذه بعد التوقيع عليها.</p>	
تاريخ توقيع المشارك	_____
زمن	
اسم المشترك	_____
تاريخ توقيع الباحث	_____
زمن	
اسم الباحث	_____

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APPENDIX III
HISTORY QUESTIONNAIRE

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02 JUL 2019

History Questionnaire **RECEIVED**

Interview Details

Name: _____ Date: _____ Time: _____

Questions to Ask Interviewer

Question #1: Over the last 2 years, Did you make any notable changes to your lifestyle?

Notes: _____

Question #2: Looking back to the information provided previously, is there any behavior that might be different now? (smoking, alcohol, diet, physical activity, weight...)

Notes: _____

Question #3: did you visit/ visiting now any therapist?

Notes: _____

Question #4: are you taking any medication for your mental health?

Notes: _____

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APPENDIX IV

GAD7 AND PHQ9 QUESTIONNAIRE (ENGLISH VERSION)

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PHQ-9 & GAD-7

17 JUN 2019

Over the last 2 weeks, on how many days have you been bothered by any of the following problems?	Not at all	Several Days	More than half the days	Nearly every day
1 Little interest or pleasure in doing things	0	1	2	3
2 Feeling down, depressed or hopeless	0	1	2	3
3 Trouble falling or staying asleep, or sleeping too much	0	1	2	3
4 Feeling tired or having little energy	0	1	2	3
5 Poor appetite or over eating	0	1	2	3
6 Feeling bad about yourself – or that you are a failure or have let yourself or your family down	0	1	2	3
7 Trouble concentrating on things, such as reading the newspaper or watching television	0	1	2	3
8 Moving or speaking so slowly that other people could have noticed, or the opposite – being so fidgety or restless that you have been moving around a lot more than usual	0	1	2	3
9 Thoughts that you would be better off dead or of hurting yourself in some way	0	1	2	3

PHQ9 – Total Score

Over the last 2 weeks, on how many days have you been bothered by any of the following problems?	Not at all	Several Days	More than half the days	Nearly every day
1 Feeling nervous, anxious or on edge	0	1	2	3
2 Not being able to stop or control worrying	0	1	2	3
3 Worrying too much about different things	0	1	2	3
4 Trouble relaxing	0	1	2	3
5 Being so restless it is hard to sit still	0	1	2	3
6 Becoming easily annoyed or irritable	0	1	2	3
7 Feeling afraid as if something awful might happen	0	1	2	3

GAD7 – Total Score

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APPENDIX V

GAD7 QUESTOINNAIRE (ARABIC VERSION)

Institutional Review Board
American University of Beirut

17 JUN 2019

GAD-7

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كل يوم تقريباً	أكثر من نصف الأيام	بعض الأيام	أبداً	خلال الأسبوعين الماضيين، كم مرة أقلقك المشاكل التالية؟ (ضع علامة "✓" للإشارة لجوابك)
3	2	1	0	1- الشعور بالغضب أو القلق أو الانفعال الشديد.
3	2	1	0	2- عدم القدرة على إنهاء القلق أو التحكم فيه.
3	2	1	0	3- القلق المفرط على أشياء مختلفة.
3	2	1	0	4- الصعوبة في الاسترخاء.
3	2	1	0	5- شدة الاضطراب لدرجة صعوبة البقاء في هدوء.
3	2	1	0	6- السرعة في الانزعاج أو الانفعال.
3	2	1	0	7- الشعور بالخوف كما لو أن شيئاً فظيماً قد يحدث.

(____ + ____ + ____ = Total Score T ____ For office coding)

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إعداد الأطباء روبرت إل سينتر، جانيت بي نيلسون وليزم، كيرت كرونك والزملاء، بمنحة تعليمية من شركة Pfizer Inc. لا يتم الحصول على
إذن لإعادة النسخ أو الترجمة أو العرض أو التوزيع.

APPENDIX VI

PHQ9 QUESTOINNAIRE (ARABIC VERSION)

Institutional Review Board
American University of Beirut

17 JUN 2019

استبيان عن صحة المرضى - 9 (PHQ-9)

أكثر من تقريباً كل يوم	عدة أيام	أبداً	ولاً مرة	خلال الأسبوعين الماضيين، كم مرة عانيت من أي من المشاكل التالية؟ (ضع علامة "✓" للإشارة لجوابك)
3	2	1	0	1. قلة الاهتمام أو قلة الاستمتاع بممارسة بالقيام بأي عمل
3	2	1	0	2. الشعور بالوزن أو خفق الصدر أو اليأس
3	2	1	0	3. صعوبة في النوم أو نوم متقطع أو النوم أكثر من المعتاد
3	2	1	0	4. الشعور بالتعب أو بامتلاك القليل جداً من الطاقة
3	2	1	0	5. قلة الشهية أو الزيادة في تناول الطعام عن المعتاد
3	2	1	0	6. الشعور بعدم الرضا عن النفس أو الشعور بأنك قد أخذت نفسك أو عائلتك
3	2	1	0	7. صعوبة في التركيز مثلاً أثناء قراءة الصحيفة أو مشاهدة التلفزيون
3	2	1	0	8. بدء في الحركة أو بطء في التحرك عما هو معتاد لدرجة ملحوظة من الآخرين / أو على العكس من ذلك التحرك بسرعة وكثرة الحركة أكثر من المعتاد
3	2	1	0	9. راونتك أفكار بقاء من الأفضل لو كنت ميتاً أو أفكار بأن تقوم بإيذاء النفس

_____ + _____ + _____ + 0 = Total Score: _____ (FOR OFFICE CODING)

إذا أشرت إلى أيٍّ من المشاكل أعلاه، فإلى أية درجة صفت عليك هذه المشاكل القيام بعملك، الاعتناء بالأمور المنزلية، أو الاسماج مع أشخاص آخرين؟

هناك صعوبات بالغة التعقيد

هناك صعوبات شديدة

هناك بعض الصعوبات

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لقد طور هذا الاستبيان كل من الدكتور روبرت سميتسر، الدكتور جانيث ويليامز، الدكتور كيرت كورنيك ورملائهم، وتم ذلك بفضل منحة من مؤسسة Pfizer Inc. ليست هناك أية حاجة للحصول على تصريح من أجل الاستنساخ أو الترجمة أو العرض أو التوزيع.

APPENDIX VII

FLYER WITH RESOURCES

To seek outpatient help

1. AUBMC, Department of Psychiatry, Private Clinics
Both Psychiatry & Psychology Services
Tel: 01-759620

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2. For reduced Price Clinics
AUBMC, Department of Psychiatry, OPD
Both Psychiatry & Psychology Services
Tel: 01-759620

Embrace Lifeline

The National Hotline for Emotional Support and Suicide Prevention in Lebanon
Call 1564 (7 days a week, 12pm to 2am)

Emergency

1. AUBMC, Emergency Department; 24/24 hours
Tel: 01-350000, Ext. 6600
2. Al Shifaa Hospital Emergency Department; 24/24 hours
Tel: 05-808380
Tel: 05-808286

لطلب المساعدة الخارجية

1. المركز الطبي في الجامعة الاميركية في بيروت، قسم الطب النفسي، العيادات الخاصة
كل من الطب النفسي وخدمات علم النفس
هاتف: ٠١/٧٥٩٦٢٠

2. المركز الطبي في الجامعة الاميركية في بيروت، قسم الطب النفسي، العيادات الخارجية - مستوصف
كل من الطب النفسي وخدمات علم النفس
هاتف: ٠١/٧٥٩٦٢٠

خط الحياة من Embrace

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الخط الساخن الوطني للدعم النفسي والوقاية من الانتحار في لبنان
اتصل على الرقم ١٥٦٤ (٧ أيام في الأسبوع، ومن الساعة ١٢ ظهرًا حتى ٢ صباحًا)

الطوارئ

1. المركز الطبي في الجامعة الاميركية في بيروت، قسم الطوارئ؛ ٢٤/٢٤ ساعة
هاتف: ٠١/٣٥٠٠٠٠ ت. ٦٦٠٠

2. قسم الطوارئ في مستشفى الشفاء؛ ٢٤/٢٤ ساعة
هاتف: ٠٥/٨٠٨٣٨٠
هاتف: ٠٥/٨٠٨٢٨٦

APPENDIX VIII

INVITATION SCRIPT

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17 JUL 2019

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**AUB Social & Behavioral Sciences
INVITATION SCRIPT**

Invitation to Participate in a Research Study

This notice is for an AUB-IRB Approved Research Study

For Dr. Farah Naja at AUB

Tel: 009611350000, ext: 4504 Email: fn14@aub.edu.lb

It is not an Official Message from AUB

I am inviting you to participate in a research study whose objective is to assess the impact of lifestyle score (diet, physical activity, smoking, blood markers and microbiota) on mental health. You will be asked to complete 2 questionnaires to be used to assess participants' mental health and one history questionnaire that contains questions about medication taken for mental health reasons.

You are invited because we are targeting all the participants (AUB/AUBMC faculty and staff) who previously participated in the "Validity and Reliability of a Food Frequency Questionnaire to Assess Dietary Intake among Lebanese adults" study and agreed to be contacted for future studies.

The estimated time to complete all the questionnaires is approximately 1hr.

The research will be conducted face to face with a research assistant.

Please read the consent form and consider whether you want to be involved in the study.

If you have any questions about this study, you may contact the investigator/research team (Dr. Farah Najah, Tel: 009611350000, ext: 4504 Email: fn14@aub.edu.lb for further information regarding the study).

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Version Date March 21, 2016
Version Number 1.1

1/1

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