

AMERICAN UNIVERSITY OF BEIRUT

ASSOCIATION OF SOCIAL SUPPORT WITH RESILIENCE AS
MODERATED BY DEPRESSION, ANXIETY, AND
PERSONALITY IN MULTIPLE SCLEROSIS PATIENTS

by
JOELLE RICHARD MASSOUH

A thesis
submitted in partial fulfillment of the requirements
for the degree of Master of Science in Nursing
(Adult Gerontology)
to the Hariri School of Nursing
at the American University of Beirut

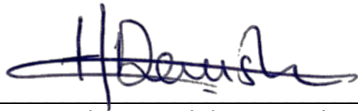
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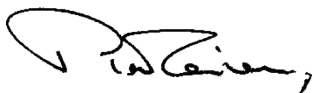
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AN ABSTRACT OF THE THESIS OF

Joelle Richard Massouh for Master of Science in Nursing
Major: Nursing (Adult Gerontology)

Title: Association of Social Support with Resilience as Moderated by Depression, Anxiety, and Personality in Multiple Sclerosis Patients

Multiple Sclerosis (MS) is a chronic autoimmune neurologic condition that affects adults in the prime of their youth, and it is the leading cause of non-traumatic neurological disability in young and middle-aged adults. From the shock of diagnosis to the unanticipated relapses and the dreaded progression, People living with MS (PwMS) are faced with adversity at every corner. Despite the unpredictability of the MS course, some PwMS cope well but others do not. Resilience could determine how PwMS will mend when faced with such challenges, and it is defined by the ability to adapt to their newfound lifetime change generated by their MS diagnosis and disease course.

Depression and anxiety have been linked with increased morbidity and mortality in MS, but research targeting the effects of these mental health issues on resilience remains inadequate. Few studies have showed an association between some personality factors (neuroticism and extraversion) and resilience. While it is understood that social support affects resilience, there is no consensus whether this relationship is direct or affected by other variables, such as anxiety, depression, or personality.

As the concept of resilience remains understudied in the MS population, the specific aim of this research study was to explore the effect of social support on resilience, as moderated by depression, anxiety, and personality in a sample of MS patients at the first regional multidisciplinary MS center in Beirut, Lebanon.

A sample of 100 participants with MS were recruited, 80% had relapsing remitting MS, 59% were women, mean age 37.47 ± 11.23 years, mean disability score EDSS 2.19 ± 1.98 , and almost half of the sample had a history of depression. Resilience was high at 83.61 ± 12.98 . The percentage of patients with suicidal ideations in this sample was high at 8%. About 44% of the variability in resilience scores is predicted by social support, depression, and extraversion. Higher social support and extraversion and lower depression scores were associated with higher resilience. The relationship between social support and resilience is moderated by extraversion.

Results highlight the need to consistently examine resilience with an anthropological lens that views illness as a concept that is culturally constructed, in addition to a biopsychosocial lens to account for the multifaceted nature of MS

CONTENTS

ACKNOWLEDGMENT.....	v
ABSTRACT.....	vi
LIST OF ILLUSTRATIONS.....	vii
LIST OF TABLES	ix

Chapter

1. INTRODUCTION	1
1.1. Background.....	1
1.2. Study Aims and Hypothesis.....	3
2. REVIEW OF LITERATURE	5
3. METHODS.....	10
3.1. Protection of Human Participants, Study Design, and Procedures.....	10
3.2. Sample and Setting.....	11
3.3. Methods of Measurement.....	12
3.4. Data Analysis Plan.....	14
4. RESULTS	17
4.1. Description of the Sample and Instruments.....	17
4.2. Suicidal Ideations.....	21
4.3. Outcome Variable.....	21
4.4. Association Analysis.....	22
4.5. Moderation Analysis.....	25
5. DISCUSSION	28
5.1. Summary of Findings.....	28
5.2. Predictors of Resilience.....	30
5.3. Moderation Analysis.....	30
5.4. Limitations.....	31
5.5. Potential Threats to Validity.....	31

5.6. Implications for Nursing Practice.....	32
5.7. Recommendations for Future Research.....	34
5.8. Conclusion.....	34
REFERENCES.....	35

ILLUSTRATIONS

Figure	Page
1. Wagnild Model of Resilience.....	6
2. Black and Dorstyn Model of Resilience.....	7
3. Study's Hypothetical Model.....	9

TABLES

Table	Page
1. Concepts Measured and Tools Used.....	13
2. Participants' Demographic Characteristics.....	18
3. Participants' Multiple Sclerosis (MS) History.....	18
4. Predictor Variables: API raw scores, HSCL-25 and SSI scores.....	20
5. Outcome Variable: RS-14.....	21
6. Bivariate Analysis between the Demographics, Clinical Characteristics and RS-14 score.	23
7. Bivariate Pearson's (Demographics, clinical characteristics, personality, anxiety, depression, and social support) Correlations with Resilience.....	23
8. Regression Analysis.....	25
9. Moderation Analysis.....	26

DEDICATION

To my patients, those resilient people living with MS, who everyday continue to teach me something new. They have made me the MS nurse I am today. I am grateful for touching their lives and allowing them to touch mine.

To my mother Jamal and my father Richard, whose unwavering support and sheer selflessness are the reasons for my existence. This is an ode to their resilience against life's trials and tribulations.

To my sister, Angela, my north star, my querencia. For always picking up my broken pieces, mending them with gold lacquer, and leaving me more beautiful for having been broken.

CHAPTER 1

INTRODUCTION

A. Background

Multiple Sclerosis (MS) is a chronic autoimmune neurologic condition that affects adults in the prime of their youth; it usually presents in a relapsing-remitting course distinguished by attacks of different neurological deficits intercepted by periods of remission. The disease course is marked by unpredictability due to the waxing and waning nature of its course.¹

The interplay between an individual's genetic predisposition and possible environmental elements is thought to trigger an immune response resulting in demyelination in the Central Nervous System (CNS), a hallmark of the disease. MS predominantly affects people between 20 and 40 years of age,² and subsequently, it is the leading cause of non-traumatic neurological disability in young and middle-aged adults.³ MS also predominantly affects women; in the last few years, an increase in its incidence, specifically in women, has led to an increase in the female to male ratio.³ Hormonal fluctuations impact the risk of MS relapses; thus, family planning poses a challenge for women living with MS as they navigate decisions regarding pregnancy in the setting of their disease.²

In Lebanon, the epidemiology of MS has not been explored until a recent study showed that Lebanon is a moderate to high-risk area for MS, with a female to male ratio of 2:1.⁴

From the shock of diagnosis to the unanticipated relapses and the dreaded progression, People living with MS (PwMS) are faced with adversity at every corner.⁵ The presentation of MS could include motor, sensory, or cognitive symptoms such as diplopia, blurred vision, numbness, electric sensation, gait imbalance, paresis, difficulty walking,

spasticity, ataxia, dysphagia, fatigue, cognitive decline, urinary disturbances, sexual dysfunction, and depression; these could recur throughout the lifespan of PwMS.^{5,6}

Owing to its unique presentation in each person, MS came to be known as a snowflake disease, but phenotypes have emerged to describe the course of the illness better. Around 85% of patients present with a relapsing-remitting course (RRMS), distinguished by the occurrence of distinct relapses (new and continuous neurologic symptoms lasting for at least 24 hours) interspersed with intervals of neurologic stability or remission. If RRMS patients are left untreated or failed their treatment, 2-3 % per year and around 50% after 10-15 years after disease onset will stop developing relapses and start progressing gradually (i.e., more physical and cognitive disabilities), fitting the phenotype of Secondary Progressive Multiple Sclerosis (SPMS).^{7,8} Around 10-15% of patients develop insidious progression from onset of disease without ever suffering from any definite relapses, fulfilling the phenotype of Primary Progressive Multiple Sclerosis (PPMS).²

Despite the unpredictability of the MS course and living with uncertainty, some PwMS cope well with this chronic illness, but others do not.⁶ Even in the context of advanced disability, some PwMS appear to have adjusted, interestingly so, to their worsening condition. The need to demarcate what factors help them do so is vital for all PwMS. Resilience could determine how PwMS will mentally adjust to or mend when faced with such challenges. Resilience is defined by the ability to adapt to their newfound lifetime change and chronic stressors generated by their MS diagnosis and disease course.⁹

The prevalence and incidence of MS have been increasing globally (especially in women), partly owing to the refinement of diagnostic criteria (which results in earlier diagnosis), but also due to a true increasing incidence delineating a rising risk of MS.²

MS affects the individual's normal functioning through overt physical disability (ataxia, motor weakness) or covert symptoms (fatigue, depression); this, in turn, impedes

their social engagement, grossly diminishing the quantity and quality of social support they have access to.⁶ Social support was found to improve adaptation and support resilience, ultimately improving wellbeing and sense of purpose; it has also been correlated with better mental health outcomes.¹⁰

Compared to other neurological conditions that cause disability, PwMS were found to have lower resilience scores, which ultimately undermines their quality of life.¹¹ Resilience is protective of an individual's wellbeing, and it has been shown to predict a better response to treatment in those suffering from mental health problems.⁵ Depression and anxiety are especially important because they have been linked with increased morbidity and mortality (suicide) in MS.¹⁰ However, empirical research targeting the effects of these mental health issues on resilience remains inadequate.⁶

Studies relating to the personality traits that help PwMS face adversity have been lacking, except for the findings from one study that showed that the personality trait of high neuroticism negatively affects resilience.¹² This negative relationship between resilience and neuroticism was previously found in other studies in individuals who do not have MS.¹³ Other studies found positive associations between resilience and extraversion.¹⁴

While it is understood that social support affects resilience, there is no consensus whether this relationship is direct or affected by other variables, such as anxiety, depression, or personality.⁶

B. Study Aims and Hypothesis

As the concept of resilience remains understudied in the MS population, the specific aim of this research study was to explore the effect of social support on resilience, as moderated by depression, anxiety, and personality in a sample of MS patients at the first regional multidisciplinary MS center in Beirut, Lebanon. A secondary aim of this study was

to assess the association of clinical and sociodemographic characteristics with resilience in a sample of MS patients. We hypothesized that there is a positive association between social support and resilience in MS patients. Depression, anxiety, and personality could serve as moderators between social support and resilience.

CHAPTER 2

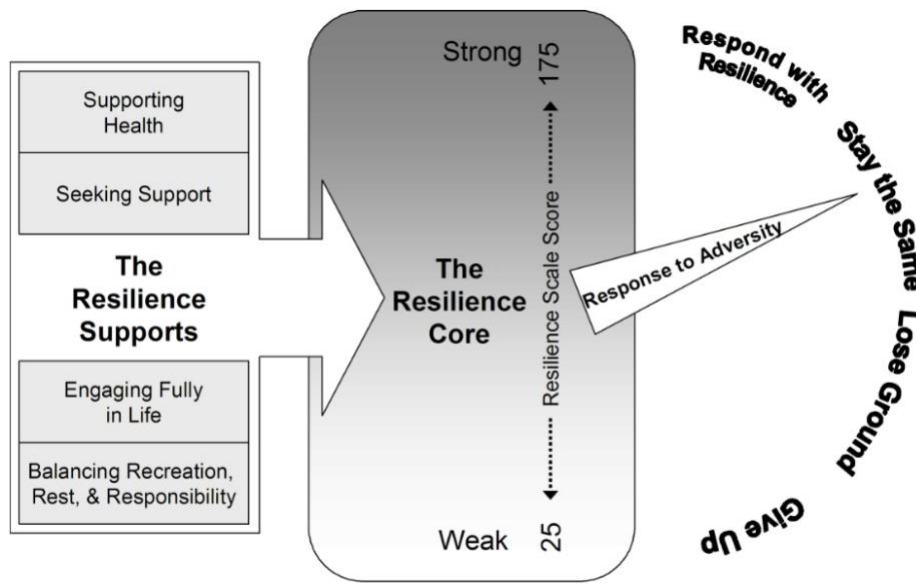
REVIEW OF LITERATURE

During the 1970s, researchers studied resilience in children living under exceedingly hectic conditions like poverty and mental or physical disabilities; then in the 1980s and 1990s, the focus turned to adults who had experienced overwhelming hardships such as debilitating illnesses in old age or parents of children with chronic disabilities.⁹ Resilience used to be solely viewed as a personal trait needed to ameliorate hardships. In doing so, individuals end up becoming stronger in the aftermath of adversity. Just like a positive reinforcement loop, people can become more resilient after bouncing back.

Now, in addition to the earlier view on resilience, resilience is also viewed as a more dynamic, multifaceted concept, a protective feature that distinguishes individuals who adapt better and recover.⁵ More recently, psychological, emotional, and biological backgrounds of resilience have been explored as a subject of great interest by the scientific community. Global interest in studying resilience has spiked considerably.^{1,5,10,11,15,16,17}

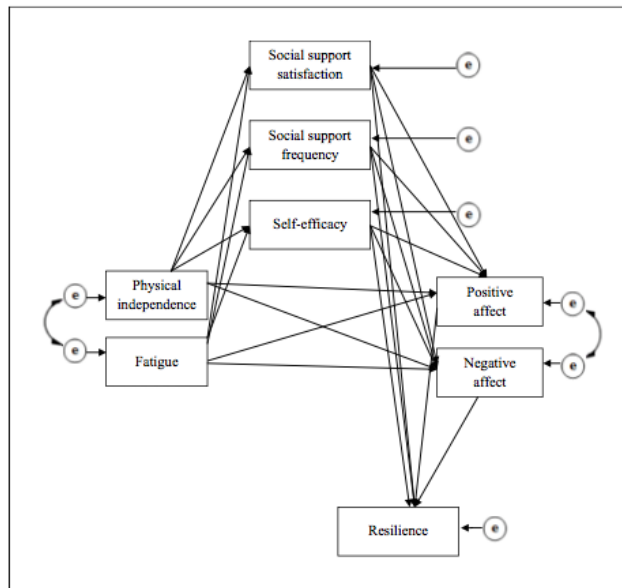
In MS, why some patients fare better than others might be explained by resilience as well.⁵ Many definitions of resilience have been published, and a model of resilience was proposed.⁹ The Wagnild model (Figure 1) suggests that seeking and giving social support is a significant antecedent for resilience, which implies an association between social support and resilience.^{6,9}

Figure 1. Wagnild Model of Resilience⁹



In a 2013 Australian study, Black and Dorstyn also developed a model of resilience in MS. The researchers suggested that psychosocial variables, including social support and affect, are often better predictors of resilience outcomes than illness variables such as disability level and fatigue (Figure 2). Psychosocial variables contribute to positive health outcomes more than disease-specific variables and patient characteristics. Often the research findings in this population did not discern a correlation between resilience and disease characteristics like disease duration and physical disability level.⁵ In the below figure 2, fatigue and physical independence indirectly influenced resilience through their effect on social support, self-efficacy, and affect. Resilience was directly predicted by affect, but social support impacted resilience in an indirect way.⁶

Figure 2. Black and Dorstyn Model of Resilience



Social support has been defined as support available to a person through societal relations to other individuals or groups or communities.¹⁸ In a systematic review of resilience in individuals suffering from physical ailments, social support was found to be highly predictive of and associated with resilience.¹⁹

Psychiatric comorbidities are prominent in demyelinating disorders. It is estimated that the lifetime prevalence rates of depression and anxiety in MS are around 50% and 30%, respectively. Depression and anxiety are associated with decreased quality of life in PwMS.²⁰ In MS, depression is multifactorial; etiology can be traced back to genetic, neuroinflammatory, and psychological elements.⁵ The severity of depression was found to be related to lesions in the temporal region (and hippocampal atrophy), and atrophy in the frontal lobe; but also, the connections between the temporal and frontal lobes mediated by the suprainular brain area (arcuate fasciculus) involves white matter tracts significant to the regulation of mood.²¹

In a 2015 study, researchers studied the resilience of patients newly diagnosed with MS and concluded that problem-focused coping styles promote resilience as opposed to emotion-focused coping styles. Moreover, depression and anxiety were significantly

associated with low use of problem-focused strategies and high use of emotion-focused strategies, and with less resilience. Depression and anxiety seem to restrict the psychological resources an individual requires for successful coping, but positive emotions like happiness and enthusiasm promote psychological growth.²⁰

This adds to the existing knowledge that depression and anxiety are especially essential to manage in people diagnosed with MS and recommends that psychological interventions, along with other possible social interventions, synergistically foster resilience in MS patients.²⁰

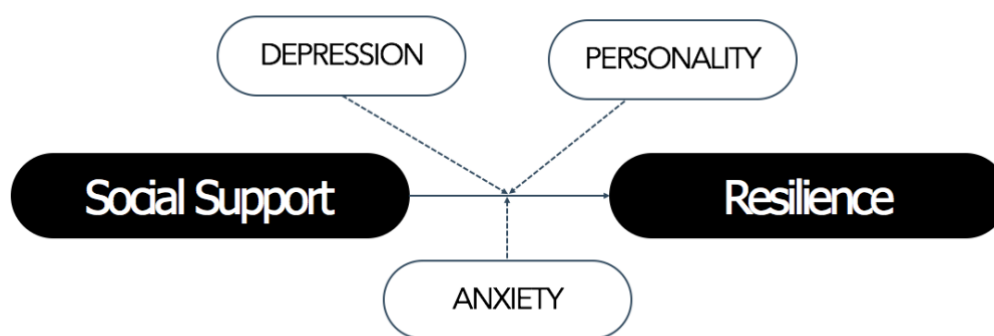
Identifying MS patients with anxiety and depression and intervening could improve resilience and result in a better quality of life for PwMS. There are only a few studies that have examined the relationship of anxiety and depression with resilience in PwMS and other neurological diseases; on the other hand, these issues have been extensively studied in healthy individuals or those with psychiatric illnesses.²² In Japan, researchers have lately studied the association between resilience and anxiety and depression in both MS and neuromyelitis optica spectrum disorder (NMOSD). They showed that resilience is negatively associated with depression and anxiety and positively associated with quality of life (QoL) in people with MS/NMOSD.⁵ Secondary symptoms, such as depression, seem to be more detrimental to the physical and psychological health of these individuals than the level of disability foisted upon them due to their disease.²³

As previously discussed, resilience has evolved from being perceived as a trait to a dynamic process. Resilience, by definition, necessitates the presence of two conditions: exposure to adversity and positive adaptation following said adversity.²² This does not conflict with the possibility that some personality traits are associated with resilience, but as previously mentioned, this area of research in MS has been deficient. Previous studies have shown that high neuroticism negatively affects resilience,¹² whereas extraversion positively

affects resilience.¹⁴ Further research is imperative to describe the personality traits of resilient PwMS.

Combining elements from the aforementioned two models and evidence from the literature, in this research we studied the association of social support with resilience, with the possible moderating effects of depression, anxiety, and personality (Figure 3).

Figure 3. Study's Hypothetical Model



CHAPTER 3

METHODS

This chapter contains a detailed description of the study design, setting, data sources, sample, measures, and procedures used in this study.

A. Protection of Human Participants, Study Design, and Procedures

The study was approved by the Institutional Review Board (IRB) at the American University of Beirut. The confidentiality of data was maintained throughout the data collection phase. Information that identifies participants directly was not collected. Questionnaires and electronic files were stored in a locked cabinet and a password-protected computer in the principal investigator's office.

The study used a cross-sectional correlational descriptive design. PwMS were recruited from a specialized multidisciplinary MS center in a tertiary hospital in Beirut, Lebanon. Patients presenting for consultation or treatment at the Nehme and Therese Tohme Multiple Sclerosis center, who already agreed to enroll in the AUBMC's Multiple Sclerosis Interdisciplinary Research (AMIR) database, were invited to participate in this study. Data were collected during regular patient visits to the MS center, whereby patients are usually approached by research assistants or fellows for the AMIR longitudinal study. These patients were asked to fill additional questionnaires on depression, anxiety, social support, resilience, and personality. The tools are self-administered and were administered once.

B. Sample and Setting

1. Setting

The sample was a non-probability convenience sample that included 100 patients with confirmed MS recruited from the Nehme and Therese Tohme Multiple Sclerosis center at the American University of Beirut Medical Center (AUBMC). AUBMC is the largest tertiary medical center in Lebanon and includes a 420-bed hospital that serves over 360,000 patients annually. It offers comprehensive tertiary/quaternary medical care and referral services in a wide range of specialties together with medical, nursing, and paramedical training programs at the undergraduate and post-graduate levels. Its effect on the medical sector and on improving people's lives is without equal in Lebanon and the region. It continues to be the primary referral center for complicated clinical cases in Lebanon and across the MENA region. The Nehme and Therese Tohme Multiple Sclerosis Center, inaugurated in October 2011, is the first of its kind in the region, offering state-of-the-art resources to provide the most advanced, specialized, and multidisciplinary care, supported by an extensive program of research and education, in order to improve the lives of PwMS.

2. *Sample*

Potential participants were invited to participate if they are: Lebanese or non-Lebanese patients diagnosed with MS who agreed to participate in the study, ages above 18 years, and able to communicate in Arabic. Potential participants were excluded if they were experiencing an MS relapse. The sample size calculation was based on multiple linear regression as the statistics of choice. Based on a significance level of 0.05, a power of 0.8, and a medium effect size of 0.15, a minimum of 100 subjects is needed. The sample size calculation was done with G-Power Software.²⁴

C. Methods of Measurement

At the Nehme and Therese Tohme MS Center at AUBMC, data from consenting patients are entered prospectively into a database named the AUBMC Multiple Sclerosis Interdisciplinary Research (AMIR). Demographics [age, gender, education, marital status], type of MS, disability measures such as the Expanded Disability Status Scale (EDSS) and the Multiple Sclerosis Functional Composite score (MSFC) which are both MS-specific measures of the disease were collected from the AMIR database and medical records.

1. *The Resilience Scale*

The primary study data collection tool was The Resilience Scale™, specifically the 14-item Resilience Scale™ (RS-14) in its Arabic version.⁹ Earlier studies support the content and construct (convergent and discriminant, known groups) validity of The Resilience Scale™ (25 items and the RS-14), and the scale has demonstrated reliability with alpha coefficients measuring internal consistency varying from 0.84 to 0.94. The shorter resilience scale was initially developed to decrease participant burden and improve responses, and it was found to be strongly correlated with The Resilience Scale™ ($r = 0.97, p < 0.001$). Cronbach's alpha for the RS-14 was 0.93.⁹ In this study, Cronbach's alpha for the RS-14 was 0.876.

2. *ENRICHD Social Support Instrument*

Social support was measured using the ENRICHD Social Support Instrument (ESSI), a seven-item measure that evaluates the four defining attributes of social support: emotional, instrumental, informational, and appraisal.²⁵ Internal consistency for the ESSI, using Cronbach's alpha, was 0.88, and the intra-class correlation coefficient was 0.94.²⁵ The Arabic version of the ESSI revealed high reliability and validity estimates; internal

consistency for the ESSI using Cronbach's alpha was 0.902.^{26,27} In this study, Cronbach's alpha for the ESSI was 0.849.

3. Hopkins Symptoms Checklist

Anxiety and depression were measured using the Arabic version of the Hopkins Symptoms Checklist-25 items (HSCL-25).²⁸ This 25-item symptom inventory measures symptoms of anxiety and depression with 10 items for anxiety symptoms and 15 items for depression symptoms. The scale for each question includes four categories of response (ranging from Not at all to Extremely rated 1 to 4, respectively). The bifactor model, anxiety, and depression showed an adequate confirmatory factor index of 0.842.²⁸ In this study, Cronbach's alpha for the HSCL was 0.857.

4. Arab Personality Inventory - 70

The Arab Personality Inventory (API), a measure of personality in the Arab Levant, was used to measure the personality of PwMS in this sample.²⁹ This is a 70-item inventory with 7 factors, including Agreeableness/Soft Heartedness, Honesty/ Integrity, Unconventionality, Emotional Stability, Conscientiousness, Extraversion/Positive Social Relatedness, and Intellect. In this study, Cronbach's alpha for each of the factors was: Agreeableness 0.692, Honesty 0.651, Unconventionality 0.479, Emotional Stability 0.356, Conscientiousness 0.721, Extraversion 0.830, and Intellect 0.740.

Table 1. Concepts Measured and Tools Used

Concept	Tools
Demographics	Researcher developed tool, medical record review, and self-report.
MS Indices	
Medical History	

Disability Measures	Medical record review for Expanded Disability Status Scale Multiple Sclerosis Functional Composite Scores
Social Support	ENRICH Social Support Inventory
Depression and Anxiety	Hopkins Symptoms Checklist-25 items
Personality	Arab Personality Inventory
Resilience	14-item Resilience Scale

D. Data Analysis Plan

The data analysis plan included a preliminary analysis, a description of the sample and instruments, testing of aims, and moderation analysis. Data analysis was organized around the proposed research aims. The level of significance for statistical tests was set at $p < 0.05$.

1. Preliminary Analysis

A preliminary analysis was done with data screening and cleaning. All data were entered into SPSS 25.0 software (IBM SPSS Statistics, Armonk, New York) daily. This was double checked for accuracy of the information every week and before analysis. Univariate descriptive statistics, missing values, outliers, ranges, means, and standard deviations were evaluated as an additional method of assessing for accuracy of input.³⁰

2. Description of the Sample and Instruments

Descriptive statistics to describe the sample and the variables measured in the study were used. Demographic characteristics, including gender, age, level of education, and marital status, were described using means, standard deviations, and frequencies. Medical history was also itemized. MS indices such as time since diagnosis, time since first

symptoms, disease type, level of disability, and cognition, were analyzed to describe the characteristics of PwMS.

Predictor variables were collected, and scores on HSCL-25, ESSI, and API were used to report depression and anxiety, social support, and personality, respectively. Means and standard deviations were reported as necessary.

Descriptive statistics of the RS-14, as well as its reliability statistics, were also calculated and reported. Items in the resilience scale were reported on a 7-point Likert scale. Scores were itemized and categorized into disagreeing (Likert scale 1, 2, and 3), neutral (Likert scale 4), and agree (Likert scale 5, 6, and 7) and reported as a percentage.

3. *Association Analysis*

Scores on the resilience scale were compared across demographics and clinical characteristics (gender, level of education, marital status, nationality, and history of psychiatric diseases) using independent t-test and analysis of variance tests as appropriate. Additionally, Pearson's *r* was used to ascertain correlations between variables such as age, time since diagnosis and first symptoms, depression, anxiety, social support, and resilience.

Variables that showed associations with resilience scores (dependent variable) at the univariate level with a *p*-value of less than 0.1 were entered in a multivariable regression model. The main advantage of a multivariable linear regression model is that it allows concurrent examination of the distinctive effects of several Independent Variables (IV) on the Dependent Variable (DV).³⁰ From a linear regression equation, the overall variance explained by the model, as well as the unique contribution (strength and direction) of each IV were obtained.

We assessed the absence of multicollinearity, which entails that the independent variables are not strongly inter-correlated. This was tested in Pearson's correlation matrix

performed before the regression analysis. The correlation coefficients between all independent variables were set to smaller than 0.8. Additionally, the Variance Inflation Factor (VIF) was used to detect multicollinearity; scores greater than 4 were judged indicative of multicollinearity. Normality assumptions were tested and met.³⁰

4. Moderation Analysis

The purpose of this analysis was to examine the possible moderating effects of depression, anxiety, and personality factors between social support and resilience in PwMS. A moderator variable implies an additional interaction effect between the IV (Social Support) and DV (Resilience Score); when introducing a moderating variable to the analysis, it changes the direction or magnitude of the relationship between the IV and the DV.

All variables, including the predictor (social support), were centered around the mean to reduce any possible multicollinearity. Then, an interaction term was created from each of the possible moderators with the main predictor or independent variable. The centered predictor (Social Support), the 3 centered possible moderators (Depression, Anxiety, and personality factors), and the 3 interactions (moderators and social support) were entered in a regression model with the dependent variable. Only the interaction term with a significant effect was retained, and another regression was run. Finally, the last regression model was calculated after controlling for the significant moderator variable to determine the direction and magnitude of change of the relationship between the IV and the DV when comparing among different groups of the moderating variable.

CHAPTER 4

RESULTS

This chapter contains a detailed description of the analysis and results. The specific aim of this study was to assess the effect of social support on resilience, as moderated by depression, anxiety, and personality in a sample of MS patients at the first regional multidisciplinary MS center in Beirut, Lebanon. A secondary aim of this study was to assess the association of clinical and sociodemographic characteristics and personality on resilience in a sample of MS patients.

A. Description of the Sample and Instruments

1. Sample Characteristics

Data collection took place over 2 months from November through December 2019. All 100 participants were recruited through a routine outpatient visit. Three-quarters of the sample were Lebanese, and the majority were women (59%) [Table 2]. This gender disparity, with more than half of the sample being women, reflects the setting demographics at recruitment and is consistent with international MS epidemiology; MS affects women more frequently than men in a 2:1 ratio.³¹ The participants had a mean age of 37.5 years, and 57% of them were married. Sixty-one percent of the sample had a university education.

Table 2. Participants' Demographic Characteristics

Demographic Variable	Range; Mean \pm SD; N (%)
Age in years	18 to 70 years; 37.47 \pm 11.23
Gender: Female	59 (59)
Marital Status: Married	57 (57)
Nationality	
Lebanese	74 (74)
Syrian	17 (17)
Others	(9)
Level of Education	
Can Read and Write/ Elementary	1 (1)
High School	38 (38)
University	61 (61)

2. MS Disease Indices

The mean duration of MS in this sample was 6.9 ± 6.49 years, while the time since the appearance of the first symptoms was 9.15 ± 6.55 years [Table 3]. The majority of the participants had relapsing-remitting (80%) and secondary progressive (13%) MS. The mean disability score EDSS was 2.19 ± 1.98 . Mean SDMT was at 48.83 ± 14.36 . Half of the sample had a history of depression [Table 3].

Table 3. Participants' Multiple Sclerosis (MS) History

Variable	Mean \pm SD; N (%)
Time since MS Diagnosis in years	6.91 \pm 6.50
Time since Appearance of First Symptoms in years	9.15 \pm 6.55
Disease Type	
Relapsing-Remitting MS	80 (80)
Secondary Progressive MS	13 (13)
Primary-Progressive MS	6 (6)
Progressive Relapsing MS	1 (1)
Expanded Disability Status Scale [EDSS] Score	2.19 \pm 1.98
Symbol Digit Modalities Test [SDMT] Score	48.83 \pm 14.36
History of Bipolar Disease	3 (3)

Predictor variables were collected, and scores from the tools (Hopkins Symptoms Checklist Anxiety and Depression Subscales [HSCL-A and HSCL-D], ENRICH Social Support Scale [ESSI], and Arab Personality Index [API]) are reported in Table 4. Means and standard deviations were reported as appropriate.

Mean raw scores of the API were calculated and compared to the mean scores suggested by the tool's authors. Participants were rated as low, typical, or high based on the subscale cutoffs of z-score equal or less than -1 SD, z-score within +/- 1 SD, or z-score equal or more than +1 SD respectively.²⁹ Seventy-nine percent of this sample had typical agreeableness, 73% had typical conscientiousness, 69% had typical emotional stability, 61% had typical extraversion, 75% had typical honesty, 68% had typical intellect, and 57% had typical unconventionality. The general personality disposition of the MS sample was similar to those of the normed community sample in the Levant.

Anxiety scores measured by the HSCL-A ranged from 1 to 4 [Table 4] with a median of 1.9 and a mean score of 1.99 ± 0.63 . About 40% of this sample reported they had felt fearful and nervous, and 60% reported having felt weak. Almost 40% of this sample suffered from headaches either a lot or moderately.

Depression scores on the HSCL-D ranged from 1 to 3 in this MS sample [Table 4] with a median of 2.07. When a cutoff point of greater or equal to 2.1 points was used for depression screening, 49% of this sample screened positive for depression.³² Almost half of this sample reported they cry easily (54%), are hopeless for the future (47%), worry (55%), blame themselves for things (44%), or feel everything requires a lot of effort (45%). Thirty-eight percent of the sample reported having difficulty falling or remaining asleep while 32% reported feeling lonely and alone. An alarming 8% of the participants in this sample reported having suicidal ideations.

Social support, measured using the ESSi, was high in this sample with a mean score of 23.91 ± 5.61 and a range of 7 through 31 [Table 4]. Almost 80% of the sample had someone who showed them love and affection, and 60% had someone available to help them with their daily chores. Almost 65% had someone available to give them good advice about a problem and provide them with emotional support, while 60% had someone available to them whom they can count on to listen to them when they need to talk.

Table 4. Predictor Variables: API raw scores, HSCL-25 and SSI scores

Predictor Variable	(Range) Mean \pm SD, N (%)
Agreeableness	(23) 42.09 \pm 4.44
<i>Low</i>	15 (15)
<i>Typical</i>	79 (79)
<i>High</i>	5 (5)
Conscientiousness	(21) 43.91 \pm 4.40
<i>Low</i>	8 (8)
<i>Typical</i>	73 (73)
<i>High</i>	19 (19)
Emotional Stability	(21) 22.25 \pm 4.11
<i>Low</i>	28 (28)
<i>Typical</i>	69 (69)
<i>High</i>	0 (0)
Extraversion	(27) 41.06 \pm 5.96
<i>Low</i>	19 (19)
<i>Typical</i>	61 (61)
<i>High</i>	18 (18)
Honesty	(22) 43.09 \pm 5.22
<i>Low</i>	5 (5)
<i>Typical</i>	75 (75)
<i>High</i>	13 (13)
Intellect	(22) 40.58 \pm 5.14
<i>Low</i>	22 (22)
<i>Typical</i>	68 (68)
<i>High</i>	5 (5)
Unconventionality	(27) 33.21 \pm 5.51
<i>Low</i>	39 (39)
<i>Typical</i>	57 (57)
<i>High</i>	0 (0)
Hopkins Symptoms Checklist- Anxiety score	1.99 \pm 0.63
Hopkins Symptoms Checklist- Depression score	2.06 \pm 0.59
ENRICHED Social Support Inventory score	23.91 \pm 5.61

B. Suicidal Ideations

As previously mentioned, 8% of the participants in this sample reported having suicidal ideations, but none had an active suicidal plan. A closer look at this group revealed that they have a mean age of 37.6 years, a duration of 8.1 years since diagnosis, EDSS of 2.7, RS score of 67.75 (on the low end), ESSI score of 21.87, depression score of 2.88, and anxiety score of 2.6. Around 63% of them were males, college-educated, single, and had a history of depression. Around 38% of the suicidal participants suffered from SPMS.

C. Outcome Variable

The mean resilience score was high at 83.61 ± 12.98 . Sixty-five percent scored moderately high to high on resilience while 17% scored moderate, and 18% were on the low end, low, or very low. Participants scored highest on their ability to manage one way or another. Ninety-three percent reported their belief in themselves gets them through hard times, while about 90% maintained their interest in things. More than 85% of the participants reported their ability to get through difficult times because they have experienced difficulty before. Participants scored lowest on their ability to take things in stride, be dependable in emergencies, and handle many things at a time.

Table 5. Outcome Variable: RS-14

Item	Agree	Neutral	Disagree
I usually manage one way or another.	97	1	2
I feel proud that I have accomplished things in my life.	84	8	8
I usually take things in stride.	70	14	16
I am friends with myself.	81	9	10
I feel that I can handle many things at a time.	79	7	14
I am determined.	86	7	7
I can get through difficult times because I have experienced difficulty before.	87	8	5
I have self-discipline.	80	9	11

I keep interest in things.	91	3	6
I can usually find something to laugh about.	79	9	12
My belief in myself gets me through hard times.	93	3	4
In an emergency, I am someone people can rely on.	79	11	10
My life has meaning.	87	7	6
When I am in a difficult situation, I can usually find my way out of it.	84	8	8

D. Association Analysis

The clinical and sociodemographic characteristics variables were examined in relation to resilience: age, gender, marital status, nationality, education, time since MS diagnosis, time since the appearance of first symptoms, disease type, EDSS score, SDMT score, and history of bipolar disease and depression [Table 6 and 7].

Females had higher mean resilience than men [84.88 versus 82.73; $p= 0.418$], and married participants had higher resilience than single [84.42 versus 82.53, $p= 0.498$] ones, but these differences were not statistically significant. Lebanese patients had lower resilience than non-Lebanese participants [85.46 versus 82.96, $p= 0.400$], but this difference did not reach statistical significance.

Secondary Progressive MS patients had the lowest resilience scores, although no statistically significant differences were found by disease type. Relapsing MS patients had higher resilience than Progressive (84.38 versus 80.55, $p=0.24$). Patients with a history of depression had significantly lower resilience [78.65 versus 88.19, $p< 0.001$].

Table 6. Bivariate Analysis between the Demographics, Clinical Characteristics and RS-14 score

Variable	Mean Resilience Score	SD
Gender		
<i>Male</i>	82.73	12.96
<i>Female</i>	84.88	13.06
Marital Status		
<i>Single</i>	82.53	15.61
<i>Married</i>	84.42	10.65
Nationality		
<i>Lebanese</i>	82.96	13.78
<i>Non-Lebanese</i>	85.46	10.36
Education		
<i>High School</i>	84.53	12.95
<i>University</i>	82.97	13.16
Disease Type		
<i>Relapsing-Remitting MS</i>	84.38	12.68
<i>Secondary Progressive MS</i>	77.62	15.67
<i>Primary-Progressive MS</i>	84.00	7.80
<i>Progressive Relapsing MS</i>	98.00	.
History of Bipolar Disease		
<i>Yes</i>	82.67	13.32
<i>No</i>	83.64	13.04
History of Depression		
<i>Yes</i>	78.65*	14.78
<i>No</i>	88.19*	8.99

*p<0.05

Table 7. Bivariate Pearson's (Demographics, clinical characteristics, personality, anxiety, depression, and social support) Correlations with Resilience

Variable	Pearson Correlations
Age	0.124
Time since MS Diagnosis in years	0.049
Time since Appearance of First Symptoms in years	0.007
EDSS Score	-0.061
SDMT Score	-0.014
Arab Personality Inventory score	
<i>Agreeableness</i>	0.319**
<i>Conscientiousness</i>	0.499**
<i>Emotional Stability</i>	-0.259*
<i>Extraversion</i>	0.488*
<i>Honesty</i>	0.233*
<i>Intellect</i>	0.504*

<i>Unconventionality</i>	-0.193
Hopkins Symptoms Checklist- Anxiety Subscale score	-0.427**
Hopkins Symptoms Checklist- Depression Subscale score	-0.549**
ENRICHED Social Support Inventory score	0.426**

*p< 0.05 and ** p< 0.001

A standard multiple regression analysis was performed between resilience and a series of independent variables collected in this study and based on the results of the bivariate analysis. All variables with a $p < 0.1$ were entered in the regression model except for a history of depression since another measure of depression, HSCL-Depression, was used.

Social Support, Depression, Anxiety, and API subscales Agreeableness, Conscientiousness, Emotional Stability, Extraversion, Honesty, and Intellect explained about 55% of the variance in resilience. Although the bivariate correlation between social support and resilience was statistically significant, social support did not contribute significantly to the regression in this model. Anxiety as well did not significantly predict the value of resilience (standardized $\beta = -0.006$, $p = 0.957$). Similarly, all API personality factors, except Extraversion, lost statistical significance.

Consequently, a second regression analysis was run, with Social Support, Depression, and Extraversion only, and the model explained 44% of the variance in resilience [$F(3, 94) = 26.467$, $p < 0.001$], with R^2 at 0.458. The adjusted R^2 value is 0.441; in other words, about 44% of the variability in resilience scores is predicted by social support, depression scores, and extraversion. The size and direction of the relationships suggested that higher social support and extraversion and lower depression scores were associated with higher resilience [Table 8].

An analysis of standard residuals was done, which showed that the data contained no outliers (Std. Residual Min = -2.559, Std. Residual Max = 2.060). Tests to see if the data met the assumption of collinearity indicated that multicollinearity was not a concern (Social

Support Score, Tolerance = 0.846, VIF = 1.182; Depression Score, Tolerance = 0.852, VIF = 1.174; and Extraversion Score, Tolerance = 0.893, VIF = 1.119).³⁰ Moreover, the correlation coefficients between all independent variables were smaller than 0.8. The data met the assumption of independent errors (Durbin-Watson value = 1.535). A visual examination of a plot of the standardized residuals by the regression standardized predicted values showed that the data met the assumptions of homogeneity of variance and linearity.

Table 8. Regression Analysis

Model	Unstandardized		Beta	t	Sig.	Confidence Interval	
	B	SE				Low	Upper
(Constant)	60.508	9.752		6.204	0.000	41.444	79.872
Social Support	0.456	0.193	0.195	2.361	0.020	0.073	0.840
Depression	-8.597	1.806	-.392	-4.76	0.000	-12.183	-5.011
Extraversion	0.729	0.176	0.332	4.138	0.000	0.379	1.079

*Dependent Variable: Resilience (RS-14)

E. Moderation Analysis

To test the hypothesis that the relationship between social support and resilience is complex and multifactorial and more specifically whether depression, anxiety, and extraversion moderate the relationship between social support and resilience, a hierarchical multiple regression analysis was conducted.

In the first step, four variables were included, social support, depression, anxiety, and extraversion. These variables accounted for a significant amount of variance in resilience, $R^2 = 0.441$, $F(4, 93) = 20.098$, and $p < 0.001$. To avoid potential high multicollinearity with the interaction term, the three variables were centered around the mean, and interaction terms between social support and each of the three possible moderators [depression, anxiety, and extraversion] were created.

Next, the three interaction terms [social support*depression; social support*anxiety; and social support*extraversion] were added to the regression model, which accounted for a significant proportion of the variance in resilience $R^2 = 0.515$, $F(7, 90) = 15.737$, $p < 0.001$.

Table 9. Moderation Analysis

Model	Unstandardized		Beta	Sig.	Confidence Interval	
	B	SE			Low	Upper
(Constant)	85.140	0.983		0.000	83.187	87.049
Social Support centered	0.253	0.189	0.108	0.183	-0.122	0.627
Depression centered	-7.755	2.210	-0.353	0.001	-12.146	-3.364
Anxiety centered	-2.427	1.992	-0.118	0.226	-6.385	1.531
Extraversion z-score	3.621	0.987	0.285	0.000	1.661	5.582
SS centered * Dep centered	-0.061	0.384	-0.017	0.874	-0.824	0.701
SS centered * anxiety centered	0.472	0.369	0.135	0.204	-0.260	1.205
SS centered * extravert centered	-0.582	0.161	-0.285	0.000	-0.902	-0.263

*Dependent Variable: Resilience (RS-14)

Then, the two interaction terms that were found to be not significant (social support*depression and social support*anxiety) were removed from the model. The variables remaining in the model accounted for a significant amount of variance in resilience, adjusted $R^2 = 0.511$, $F(5, 92) = 21.249$, and $p < 0.001$.

The only significant interaction was found between social support and extraversion. Subsequently, 3 regression models were run simultaneously to check the direction and magnitude of the relationship between social support and resilience when comparing among those with low, typical, or high extraversion. Among participants with low extraversion, high social support significantly predicted higher resilience. Among participants with high extraversion, low social support predicted higher resilience.

Table 10. Extraversion Analysis

Model		Unstandardized		Beta	t	Sig.	Confidence Interval	
		B	SE				Low	Upper
Low	(constant)	78.116	2.884		27.090	0.000	71.969	84.262
	Anxiety-Cent	-6.404	7.377	-0.227	-0.868	0.399	-22.128	9.320
	Support-Cent	1.267	0.406	0.520	3.118	0.007	0.401	2.133
	Depress-Cent	-7.801	7.148	-0.293	-1.091	0.292	-23.036	7.435
Typical	(constant)	84.626	1.187		71.274	0.000	82.249	87.004
	Anxiety-Cent	-2.037	2.236	-0.125	-0.911	0.366	-6.515	2.441
	Support-Cent	0.308	0.247	0.145	1.249	0.217	-0.186	0.802
	Depress-Cent	-7.947	2.671	-0.421	-2.976	0.004	-13.295	-2.599
High	(constant)	90.496	1.787		50.640	0.000	86.663	94.329
	Anxiety-Cent	-10.392	5.319	-0.665	-1.954	0.071	-21.799	1.016
	Support-Cent	-0.939	0.391	-0.520	-2.405	0.031	-1.777	-0.101
	Depress-Cent	-1.528	4.769	-0.106	-0.320	0.753	-11.758	8.701

*Dependent Variable: Resilience (RS-14)

CHAPTER 5

DISCUSSION

This section presents a summary of the study findings, examination of the results in relation to existing research and theoretical framework, limitations of the study, implications for practice, and recommendations for further research.

A. Summary of Findings

This was a sample of 100 participants with MS (59% women, 57% married, 61% had a university degree, mean age 37.47 ± 11.23 years) recruited from a tertiary medical center in Lebanon. Eighty percent of this sample had relapsing remitting MS, whereas 19% had progressive MS. The mean time since MS diagnosis was 6.908 years and the mean time since the appearance of first symptoms was 9.15 years. The mean disability score EDSS was mild at 2.19 ± 1.98 . Mean SDMT was at 48.83 ± 14.36 . Almost half of the sample had a history of depression.

Resilience, the study's primary outcome, was high at 83.61 ± 12.98 . Sixty-five percent of this sample scored moderately high to high on resilience while 17% scored moderate, and 18% were on the low end, low, or very low.

Personality factors were explored in this study, and 79% of this sample had typical agreeableness, 73% had typical conscientiousness, 69% had typical emotional stability, 61% had typical extraversion, 75% had typical honesty, 68% had typical intellect, and 57% had typical unconventionality. Anxiety scores with the HSCL-A ranged from 1 to 4, with a median of 1.9 and a mean score of 1.99 ± 0.63 . Depression scores with the HSCL-D ranged from 1 to 3 in this MS sample with a median of 2.07. When a cutoff point of greater or equal

to 2.1 points was used for depression screening, 49% of this sample screened positive for depression; this is in line with the literature in MS. Social support, measured using the ESSI, was high in this sample with a mean score of 23.91 ± 5.61 and a range of 7 through 31.

Females had higher mean resilience than men, and married participants had higher resilience than single, but these differences were not statistically significant. Lebanese patients had lower resilience than non-Lebanese participants, but this difference was not statistically significant. Secondary Progressive MS had the lowest resilience, although no significant differences were found by disease type; studies have shown that disease severity per se is not correlated to resilience.⁵ Patients with a history of depression had significantly lower resilience than their clinically non-depressed counterparts.

Finally, about 44% of the variability in resilience scores is predicted by social support, depression, and extraversion. The size and direction of the relationships suggest that higher social support and extraversion and lower depression scores were associated with higher resilience.

The mean age in this sample was 37.47 ± 11.23 years, with 59% of the sample being women. The mean age and gender distribution, with more than half of the sample being women, reflect the setting demographics at recruitment and is consistent with international MS epidemiology. A recent study showed that female prevalence in MENA was about 72.3%, which is higher than this sample.³³

The mean time since MS diagnosis was 6.91 years and the mean time since the appearance of first symptoms was 9.15 years, indicating about 2.24 years delay in diagnosis comparing to a 3.5 years delay in the MENA region.³³ This could be attributed to awareness efforts around MS.

The percentage of patients with suicidal ideations in this sample was high, 8%; in a 2018 study by Taail et al., the rate of suicidal ideations in PwMS was 2.1%, which was

significantly higher than the general population.³⁴ It is to be noted that data collection was started around 1 month of October 2019, the beginning of a time of high stress for people residing in Lebanon, marked by widespread and unpredictable protests. The unprecedented political uprising resulted in toppling the government, marking a period of political and economic unrest. The timing of data collection was ideal to test resilience; it captured the fragile and non-resilient PwMS.

B. Predictors of Resilience

Social support was expectedly high in this sample given the cultural context of this study being conducted in Lebanon, a country that thrives on a large repertoire of family relations where the family is perceived as the foundation of the society.³⁵ We found a positive and moderate correlation between social support and resilience.

C. Moderation Analysis

The relationship between social support and resilience is moderated by extraversion. High social support among participants with low extraversion predicted higher resilience. But, low social support among those with high extraversion predicted higher resilience as well. This moderation effect is antagonistic, where increasing the moderator would modulate the effect of the predictor on the outcome. In other words, introverts, who were well supported, were more resilient; but extroverts, who were not well supported, still had high resilience. This is the first study to show this relationship, although previous studies concluded that there might be an indirect relationship between social support and resilience.⁶ The interaction between social support and extraversion was found in different contexts: in relation to burnout among nurses ³⁶ and when exploring the use of social support and other coping strategies among undergraduate students.³⁷ Further analysis of the different

dimensions of extraversion and social support in relation to resilience is recommended for future studies.

D. Limitations

This study is not without limitations. The choice of a cross-sectional design limits the ability to infer causality. Future considerations will include a longitudinal design aiming to measure resilience and other variables at multiple time points. The possibility of recall bias is possible because participants were asked to recall symptoms that happened to them in the past. The presence of their significant others may have helped with the recall. Additionally, participants may also respond in socially desirable ways. This was controlled by reassuring participants that their responses are anonymous; in addition, the instruments were handed to the participants by research fellows who were not directly involved in the clinical care of the participants.

The use of non-random sampling methods may have affected the generalizability of the findings, but to reiterate, the MS center is a referral center that attracts Lebanese and non-Lebanese patients from different geographical areas in and outside of Lebanon.

The recruitment occurred at a specialized MS center with lots of resources and patient support; this is a center where PwMS have access to specialized nurses, doctors, and pharmacists, ensuring they are well supported and educated regarding their disease. This could have positively affected their ability to cope with their illness.

E. Potential Threats to Validity

Validity concerns were addressed and planned for early in the research design phase, and for that purpose, each threat to validity was handled diligently as outlined below.

1. Internal Validity

Testing bias was a possible threat to internal validity; participants may be inclined to give socially desired responses when asked about their resilience, also, given the fact that the master's student writing this thesis is the same MS nurse caring for the patients and responsible for data collection. Additionally, the presence of family members with the patients during their stay at the center might have added to the social desirability bias as participants might refrain from giving an honest answer if he/she felt this would negatively affect their significant other. To control for all sources of biases, MS patients were given the questionnaire to self-administer.

Selection bias was also addressed in the design of this study; subjects were recruited from the largest MS center in Lebanon that attracts a heterogeneous sample of Lebanese and non-Lebanese patients with MS.

2. *External Validity*

Non-response bias can threaten external validity; the possibility of refusal to participate was high in previous studies conducted in Lebanon as Lebanese patients are not used to being asked to participate in research. The planned rigorous recruitment strategy and the detailed informed consent used in this study were designed to decrease the non-response bias. This was confirmed by the very low number of non-respondents in this study (less than 5%).

The non-random sampling methods may have affected the generalizability of the findings. As mentioned earlier, subjects were recruited from the largest MS center in Lebanon that attracts a heterogeneous sample that could be considered representative of the Lebanese patients with MS.

F. Implications for Nursing Practice

There is a trend toward rising MS prevalence in the Middle East over the last few decades, consistent with the globally increasing prevalence.³³

While healthcare professionals increasingly realize the need for individuals and families to cope with MS, this has outpaced their awareness of the need to assist individuals on how to acquire resilience. Thus, it is imperative for bedside nurses and Clinical Nurse Specialists (CNSs) to understand the myriad factors that influence resilience in patients living with MS. Our results add to the evidence that specialized mental health CNSs in the hospital (inpatient and outpatient settings) and the community are essential. A great deal of conceptual work is still needed to understand resilience in patients living with chronic illnesses and the effect of cultural, political, and societal factors in developing countries grounded in a paternalistic culture and limited resources.

The main strength of this study is its uniqueness in Lebanon and the MENA region. Lebanon lacks published research on resilience in chronic illnesses; as such, the determinants of resilience in Lebanese MS patients remain unknown and unstudied. This was the first study, to our knowledge, to examine resilience in a sample of Lebanese patients with MS. Therefore, consistent with an anthropological lens that perceptions about health and illness are culturally constructed, culture becomes a fundamental context in which to consider patient experiences with chronic illnesses.

Additionally, our findings confirm the importance of social support in this cultural context; therefore, nurses should be cognizant of the need to involve family members or significant others in MS care while maintaining privacy and confidentiality. Moreover, when social support is lacking and in the absence of governmental or private organizations that help patients with MS, nurses should provide the support needed to improve resilience and help patients learn how to cope with MS. This is especially important in times of political and global unrest, such as in times of a revolution or a global pandemic.

Although our sample had high social support, this was not protective against depression and suicidality, especially under stressful conditions. This can be attributed to the organic etiology of depression in MS, as the severity of depression was found to be related to lesions in white matter areas significant to the regulation of mood.²¹ This is especially important for nurses to help in the detection of depression and in designing the appropriate interventions.

G. Recommendations for Future Research

Research is needed to understand how personality factors and psychological health as moderators may differentially affect subgroups, such as those defined by education, income, or socioeconomic status.

Longitudinal research on resilience will be explored in later studies, especially that this study's data collection was cross-sectional in the middle of a revolution. Re-measuring resilience at different time points and under different circumstances is worthy of consideration. The need for research at multiple sites, especially non-specialized clinics, where PwMS do not have access to specialized patient support, will also be considered.

Finally, a critical need remains for research to ascertain the effect of resilience on health and disease outcomes in PwMS.

H. Conclusion

Our study is the first study that explored resilience in PwMS in Lebanon. Our results highlight the need to consistently examine resilience with an anthropological lens that views illness as a concept that is culturally constructed, in addition to a biopsychosocial lens to account for the multifaceted nature of MS.

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